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„Art takes time: an investigation of exposure time on emotional responses towards abstract and representative artworks"

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Contents

1 Introduction

Psychologists have examined the processing of art and what makes art special since the very first days of empirical psychology (Fechner, 1876; Leder, Belke, Oeberst & Augustin, 2004; Lipps, 1903). Although this field of study was not payed much attention for a long time, nowadays, what is called "empirical aesthetics," is a growing field of study in cognitive and neurological psychology (Augustin, Defranceschi, Fuchs, Carbon & Hutzler, 2011). Parallel to the evolving importance of aesthetics in the field of marketing strategies, fast changing design trends and clinical settings, psychological research on aesthetics is flourishing. The empirical research on art viewing is complex due to the diversity of underlying processes: not only are there diverse visual features such as colours, shapes, complexity, and symmetry, but there are also different possibilities of interpretations to an artwork, personal expectations, art expertise and previous experiences that play a role all together. Thus, there are personal differences in art processing that have partly to do with features of the artwork and partly with personal traits. Also, the way in which art is processed, might change over the time span of viewing. To understand the complex nature of art processing in all its nuances, there is still a long way to go. There are several studies on aesthetic cognitive processing and how it is influenced by the duration of viewing time (Bachmann & Vipper, 1983; Geday, Kupers & Giedde, 2007; Leder et al., 2004; Leder & Nadal, 2014). Especially the first stages of viewing are theoretically accessed (Leder & Nadal, 2014). They encompass the subconscious perceptual analysis, the implicit information gathering and further the explicit classification and first cognitive mastering that lead to a conscious cognitive appraisal and thus to an aesthetic judgement and possibly satisfaction. Based on the model of aesthetic appreciation and aesthetic judgements (Leder et al., 2004) the latter stages encompass loops to previous stages in order to increase understanding and affective mastering of the artwork. Nevertheless, what does really happen throughout those loops and are there features of the artwork that might have an effect on these loops of aesthetic appreciation? Although there are first approaches to explain what effect artworks can have on people that are exposed to an artwork for a longer duration, for example, testing ratings such as understanding, pleasure, arousal, motivation (Pelowsky, Markey, Forster, Gerger & Leder, 2017) many aspects have not been studied yet in experimental settings. Particularly notable here is the question of emotional responses with more complex nuances. Emotions have long been suggested as core to aesthetic or art experience, and are included as primary outputs and continuously updated factors in present models of art processing. However, due to the short exposure time of most lab studies, and arguments that lab settings may not even be able to elicit strong emotional responses, they have not received

as much consideration in present assessment. Specifically it is not known how emotional responses might evolve and vary over time.

The main aim of this study is to investigate whether complex emotions can be elicited by artworks in the laboratory and how this relates to exposure time. This study also looks at whether people report change in their emotions throughout the viewing duration and whether the reported intensity of emotions differs in different viewing time conditions. Furthermore, this study takes into account that abstract and representational art might be processed differently and also considers how the valence (positive or negative) might play a role not only in art evaluation but also in emotional reactions. To understand the possibly complex and not yet well understood emotional response towards artworks, this study examines the experienced emotions for abstract versus representational artworks in a setting of different viewing durations (100ms, 500ms, 6000ms, 30000ms). Besides the questions for basic positive versus negative emotion and assessment of personal liking, wanting to look for a longer duration, understanding and complexity, in this study additionally more complex, positive and negative (possibly transformative) emotions are collected.

This thesis will use the following organization: First, I discuss the theoretical background of empirical aesthetics and art perception with an emphasis on the emotional experiences that have been studied so far in the context of art viewing. Then, I introduce the literature regarding the choices of the study design. This involves (1) the specific emotions chosen for this study, (2) the time durations for viewing used in the experimental design and (3) the types of selected artworks. I then introduce the current study with the leading hypotheses as well as the methods, participants and settings and present the procedure, used questionnaires and finally the results and discussion. Lastly, a list of artworks, an abstract and the literature is given

2 Theoretical Background

2.1 Empirical Aesthetics and Emotional Arousal

What makes art experience so unique is one of the oldest questions of empirical psychology (Fechner, 1876). The psychological research on aesthetics is as old as empirical psychology itself. Fechner (1871) is seen as the founder of experimental, empirical psychology. He examined experimentally aesthetics as an experienced (and thus psychological) value that is driven by features of an object and subjective qualities. For him, works of art were of interest for psychological research because they were interesting on a basic, perceptive, visual level

and on a highly complex, integrating level (Fechner, 1876). Also, William James (1890) distinguished between primary and secondary layers of emotional responses to aesthetic stimuli. Both of these levels/layers touched potential emotional experience that is either more basic and bottom-up driven (such as positive and negative emotional affect or arousal) or more complex, top-down driven (such as awe, insight, confusion) with potential interactions to previous experiences, memory and context (Leder et al., 2004; Pelowski & Akiba, 2011; Tinio, 2013).

In the early days of psychology in the second half of 19th century and the beginning of 20th century, there was lively debate about the border between psychology and philosophy. The early Gestalt theorists (e.g. Theodor Lipps (1851-1914), Max Wertheimer (1880-1943), Kurt Lewin (1890-1947), Karl Stumpf (1848-1936) and Karl Bühler (1879-1963)) were interested in the study of aesthetics at the intersection of both disciplines, a time when it was discussed whether the whole or its parts are defining an object, artwork or other matter of debate. In the field of aesthetics, ambiguous perceptual experiences and alternative interpretations towards visual stimuli was matter of debate (Wertheimer, 1923). While perception was a main focus for Gestalt theorists, emotion was less so and played only a role as a factor that is elicited by the whole, the unity of artwork features.

With the paradigm change from Gestalt theory to Behaviourism, empirical aesthetics was no longer a prominent field of research (Leder & Nadal, 2014) and thus, the study of emotions towards artworks disappeared out of the scene of psychological research for quite a long time. In the middle of the 20th century, researchers recognised, with the rise of the cognitive revolution, that there is not only bottom-up processing—which assumes that perception goes from a stimulus to subjective perception—but also top-down processes, with the hypothesis that the perceiving person influences what is perceived. Only in the 1970s the study of aesthetics arose again in psychology with two models that aimed to explain the appreciation of aesthetics from a biological and cognitive perspective (Berlyne, 1974; Kreitler & Kreitler, 1972). Whereas Berlyne (1974) proposed that people seek to feel an optimal state of arousal, Kreitler and Kreitler (1972) stated that reactions give an orientation to seek for the meaning of an object. They propose the theory that art should lead to new states of arousal, that it is a carrier of multiple meanings and can evoke a variety of emotions. Their focus lies on the interaction between the artwork and the art viewer with his or her own set of experiences and understanding (Kreitler & Kreitler, 1980). Finally, emotions and their interaction with art and aesthetic experience played a role again. More and more key elements were discussed in order to examine how artworks are perceived, how they affect our emotions and in which ways they

can have in impact on the viewers. Martindale, Moore and West (1988) emphasized previous experiences as a key criteria to predict the appraisal of an artworks, whereas Lasher, Carrol and Bever (1983) see mental growth as the key aspect of artistic experience. For them, emotional responses accompany the process of resolving problems that are evoked through art. Later on, as methods for neuropsychological research became more advanced, other researchers, like Ramachandran and Hirstein (1999) proposed biological or neurological rules that underlie aesthetic experiences (peak shift effect) and thus explain emotions towards art in a way, that the more features of artworks are prototypical or essential, the more they evoke aesthetic experiences and emotions.

This was the onset of an (at first) slowly growing discipline of empirical aesthetics in psychology that evolved with the improving methodological possibilities (Leder & Nadal, 2014), and leading to multiple studies and theoretical discussions of interaction with art.

What has its roots almost 150 years ago, remains a vivid field of research, now more than ever. Leder et al. (2004) proposed an integrative model of information processing in aesthetic appreciation and aesthetical judgement. This model was revised to consider recent studies on empirical aesthetics (Leder & Nadal, 2014). It presents information-processing stages of aesthetical processing (Leder et al., 2004, Leder & Nadal, 2014). Its aim is to explain psychologically why people spend time on art viewing and what it is that elicits positive and self-rewarding aesthetic experiences. This involves five stages; starting with automatic processing through a stage of pre-classification of something as an artwork/object of aesthetic interest, followed by a stage of perceptual analysis (that involves basic visual features like complexity, contrast and symmetry), leading to a stage of implicit memory integration (e.g. familiarity or prototypical features play a role at this stage)), followed by a set of deliberate stages, starting with a stage of explicit classification (that involves the classification and identification of style, content, process of making and emotional valence), a stage of cognitive mastering and then an initial evaluation (in which information is combined for interpretation, aesthetic judgement and affective response). In all of the stages a continuous affective evaluation takes place and pays onto the final evaluation together with the different cognitive stages. Furthermore, expertise (e.g. in art making, art history) and taste affect the stages of classification, cognitive mastering and evaluation. Both the aesthetic judgement and the aesthetic emotion are outcomes of the model of aesthetic experience. This model describes the first around six seconds of art perception; it shows that artworks can be processed within these first seconds of viewing time enough to form a first aesthetic judgement and emotion.

Emotions are of crucial interest, as they seem to be one of the key elements of an aesthetic experience as shown both in conceptual analysis (Bergeron & Lopes, 2012) as well as on a neuropsychological level (Chatterjee & Vartanian, 2014). Aesthetic emotion is formed throughout different stages (Leder et al., 2004) and, as noted in the revised model by Leder and Nadal (2014), the emotional components are seen as one of the main topics to be examined as cognitive loops take place even after an initial aesthetic emotion. Whether it is possible that an initial aesthetic emotion will change, strengthen, weaken or get more complex or nuanced throughout several cognitive loops is not yet fully understood and worth consideration.

Pelowski et al. (2017) connects the early model stages by Leder and Nadal (2014) to time and considers different types of emotions (e.g. initial positive/negative evaluation, more complex, possibly profound emotions like awe, thrills or insight) for different stages of art processing in the Vienna Integrated Model of Art Perception (VIMAP). The VIMAP aims to explain the possible outcomes of encounters with art and to explain the possibly transformative quality of art. It recognizes that art viewing and processing is a process that might need re-loops of processing stages and that it might take a different amount of time per individual and artwork. Although previous models of art processing (e.g. Leder et al., 2004) also argue that processing loops take place even after the first processing round, these models don't offer an explanation for possible outcomes of an encounter with art. Due to the VIMAP (Pelowski et al., 2017) artwork features (e.g. form or attractiveness) that elicit bottom-up processing are intertwined with top-down contributions (that arise from e.g. memory or personality) and may lead to higher-order, possibly complex cognitions – the VIMAP offers a model to construct the complex relationship between bottom-up and top-down processing stages and their cognitive and emotional outcomes. Here, I will summarize the VIMAP and its possible Outcomes briefly, in order to continue the discussion of emotional responses towards artworks as a subject of interest.

The model proposes five possible outcomes of art processing and art appraisal. It describes the top-down cognitive processing as a stage of aesthetic processing that comes after the five stages of aesthetic processing by Leder and Nadal (2014). These stages might be seen as the cognitive and emotional loops provided by Leder and Nadal (2014). Although top-down processes are also involved in early processing stages (Chatterjee, 2004), in which identified content and experience of the viewer are integrated to some extent, these top-down processes are argued to be rather automatic and unreflective (Pelowski et al., 2017). The processes that are referred to as top-down processes in this study are more deliberate and part of later processing stages, in which the cognitive mastery takes place: the self-relevance and schema

congruence are formed based on the combination of cognitive and affective information, on the perceived meaning, pleasure and significance to the self and to the match of expectations and self-image to the task. The outcome of this processing step can either be Facile (Outcome 1) and therefore the processing would stop or it could lead to the experience of Novelty/Insight (Outcome 2) or Harmony/Flow/Emotional Resonance (Outcome 3) in which cases there would be a re-loop through the model accompanied by a higher state of arousal. It is also possible, that a Negative (Outcome 4) processing takes place, in which case the viewer decides whether there is a need to continue although no meaning can be extracted in this stage or a bad or ugly evaluation of the artwork takes place. If there is a high need to proceed with the processing of importance to the self, the art experience can be transformative (Transformation, Outcome 5), in which case the self-schema is changed through an experienced-based interpretation and the viewer goes through a re-loop of processing to Outcome 3. To shed light on the emotions that may accompany Outcomes 1-5 is one of the aims of the study. Pelowski et al. (2017) argue that certain art types that are disliked by many (e.g. conceptual or abstract art) might require more top-down related processing to synthesize context and training into a broader context. Furthermore, unpleasant images might need more top-down processing in order to appreciate the broader meaning context (Cooper & Silvia, 2009). Pelowski et al. (2017) also state that art might be initially boring and then exciting, or take time for a viewer to develop appreciation or complex emotions. What types of art elicit which types of emotional responses at what viewing time is also subject of this thesis.

2.2 Emotional Response and the Lab: Is Emotion Really Part of Art Viewing?

So far – I was introducing approaches and models that shaped our understanding of aesthetic processing and emotional reactions towards artworks. But, isn't it worth to question, whether emotions are – at all – such a main topic when we study aesthetic processing?

The question of emotional response, especially in a lab setting, is not theoretically and empirically settled. This mainly involves two issues, which will be considered below: (1) do people actually report any emotion with art? And if so, (2) do people report anything besides basic valence and arousal in laboratory settings (that allow for high levels of control in order to give empirical evidence)?

Many studies (e.g. Berlyne, 1974; Chatterjee, 2004; Silvia, 2005; Silvia, 2006; Chatterjee, 2009; Chatterjee, Widick, Sternschein, Smith & Bromberger, 2010; Locher, Krupinski, Mello-Thoms & Nodine, 2008), often based on the Leder et al. (2004) model, look at emotional affect such as positive/negative valence or arousal, but rarely go beyond these

basic, bottom-up effects on emotion (Pelowski & Akiba, 2011). What is almost missing is an examination of whether complex emotions may also be elicited during art studies in the laboratory.

The Pelowski et al.'s (2017) and Leder et al.'s (2004) arguments suggest that art can evoke personal associations, evaluations and also emotions that can differ greatly between two individuals according to their personality, culture mood and experience. At least, that is one approach to empirical aesthetics, which legitimizes this study and further research on the emotions that tie to art experience. On the contrary, Konecni (2008) argues, that art, both music and painting, can lead to a variety of effects on the listeners/viewers, most of which are non-emotional. Even in the rare cases that emotions are evoked by art, Konecni (2008) states that these are basic emotions (e.g. positive/negative valence) of usually low intensity and these emotions are probably only evoked through mediation of associations to events. Silvia (2009), on the other hand, highlights that aesthetic feeling is often simple and mild on a continuum from liking to disliking. But, beyond that, he states that there are more unusual emotions possible: he divides these emotions into three groups: knowledge emotions such as interest or confusion, hostile emotions such as anger or disgust and self-conscious emotions such as shame or pride. Some of these emotions are considered in this thesis. Pelowski and Akiba (2011) also argue that emotions can change throughout one encounter with an artwork, which leads to the question, whether people report changes in their emotions – which also finds consideration in the presented study.

Taking into account these papers (Pelowski et al., 2017; Silvia, 2009; Konecni, 2008), it is remarkable that the question of if (at all) people report emotions in a laboratory is rarely considered.

A set of particularly interesting emotions that might be evoked by art is considered in this study. These emotions might (possibly among others) be core responses towards art and are thus of interest for an examination of whether they arise at all in a laboratory setting and, if so, whether their reported intensity differs among time conditions.

2.3 Specific Emotions assessed in this study

The chosen emotions or feelings for this study were confusion, activation, excitement, anger, awe, being moved, thrills, anxiety, insight and chills. Although it is arguable whether these emotions are proper emotions from the literature of psychology and its definitions of "emotion", here they are treated as such, as they are possibly important states that are experienced in connection to art experience (Silvia, 2009; Rozin & Cohen, 2003). Furthermore, please note that these emotions are presented with a brief introduction in why and how they

have been a matter of debate in previous studies. Nonetheless, the contexts of the noted studies differ from one another and are only brought up in order to introduce findings about each emotion and state why they are particularly interesting in the context of aesthetic experience.

Confusion

First, confusion is a key candidate for art-related emotional experience. Silvia (2009) proposes that complexity is experienced when viewing artworks that are high in novelty, stimulus complexity and unfamiliarity and at the same time the viewer has a low ability to understand the artwork or cope with it. Pelowski et al. (2017) also propose that viewers might even experience confusion during art viewing but not seek resolution; ambiguous contents might be left open and accepted, and thus this may be one of the more constant feelings, especially in longer interactions with art.

Activation

Participants report activation from the very early stages of processing on (Pelowski et al., 2017), which makes it an interesting candidate to examine in this study. Silvia & Nusbaum (2011) also examined activation as a key experience in the context of art. Activation can be understood as a state of being impacted and feeling the urge to act or think (Pelowski et al., 2017).

Excitement

Excitement is one of the knowledge emotions, according to Silvia (2009). Silvia (2009) sees excitement next to bemusement as experience of pleasure when resolving art. Excitement might also play a role when individuals are aware of their rising activation (Pelowski et al., 2017).

Anger

Silvia (2009) places anger in the hostile emotions that can be an emotion towards an artwork. Izard (1977) proposes that there is a hostility triad of emotions consisting of anger, disgust and contempt. Silvia (2009) argues that anger is experienced when an event or content is contrary to one's goals and values. Pelowski et al. (2017) note that negative emotions such as anger stand in contrast to typical reactions (such as pleasure) that are associated with art, but on the other hand anger might be an important emotion in this study in order how different art styles of different positive/negative valence are processed with different viewing durations.

Awe

When the experienced emotions are discrepant, but not felt as a threat, Pelowski et al. (2017) argue that viewers might experience awe when exposed to art they find of great beauty, rarity or physical grandeur (Ryan, 2001) and find it beyond their capacity of processing or

controlling the experience. Furthermore, Konecni (2005) proposes that awe might be accompanied by a mixture of joy and fear. Thus, awe is an interesting emotion to look at in this study, as it is complex and might be evoked through art.

Being Moved

Being moved involves a sudden swell or peak in intensity of emotional experience (Pelowski et al., 2017). It may also be evoked by detecting and resonating with an emotion within the semantics of an artwork (Pelowski et al., 2017) and thus differ depending on time conditions. Menninghaus, Wagner, Hanich, Wassillwizky, Kuehnast and Jacobsen (2015) note that being moved is most closely associated with both sadness and joy and typically involves activation of both positive and negative states, which makes it interesting to examine also with artworks of positive and negative valence.

Thrills

Konecni (2005) and Pelowski (2006) report thrills to be (together with chills and tears) a powerful, deep state or emotion. Thrills can be induced through a pleasure of negative contents (Gerger, Leder & Kremer, 2014) or pleasure due to the sad content of an artwork (Hanich, Wagner, Shah, Jacobsen & Menninghaus, 2014). Pelowski et al. (2017) argue that thrills coincide with more complex processing of art.

Anxiety

Anxiety can be evoked through an artwork with high self-relevance (Pelowski et al., 2017). As described in the VIMAP model (Pelowski et al., 2017), viewers could only potentially feel anxiety when processing for a longer duration, which makes it an interesting emotion to look at in different time conditions.

Insight

Lasher et al. (1983) describe insight as the discovery of a new, resolving representation of previously conflicting representation; an automatic and effortless resolution of a cognitive conflict of representations. In the VIMAP model (Pelowski et al., 2017) insight is evoked after a schema change, which leads to the choice of examining insight as a potentially more complex emotion towards art in this study.

Chills

Chills (or shivers down the spine) may arise from spreading activation (Panksepp, 1995; Grewe, Kopiez & Altenmüller, 2009) or sudden increase of intensity (McCrae, 2007). Chills arise often with some amount of self-relevance (Pelowski et at., 2017) and therefore this state (or emotion, in case of this paper wording) is surveyed for as well.

2.4 Emotion and (Limited) Viewing Duration

Research suggests that viewing duration can cause aesthetical preferences (Glaholt & Reingold, 2009; Heidenreich & Turano, 2011; Isham & Geng, 2013) and that viewing duration can alter subjective ratings of art (Kleinke, Gitlin, & Segal, 1973). Viewing duration also has an effect on emotional and physiological responses (Lang et al., 1998). Thus, viewing duration is a crucial measure for research on aesthetic perception and appreciation.

Nowadays, in the growing field of empirical aesthetics, there are multiple studies on the early stages of art perception and processing (Augustin, Leder, Hutzler & Carbon, 2008; Leder & Nadal, 2014; Locher, Krupinski, Mello-Thoms & Nodine, 2008). Indeed, research shows, that many properties of visual stimuli are processed very fast. Locher et al. (2008) showed, that some structural and semantic properties are processed within 100ms after onset of viewing of an image. Other research on empirical aesthetics supports the assumption that many features are processed during a very short time span (Carbon & Leder, 2005). It seems that the first six seconds of art processing are enough time to process most of the visual features of an artwork. Hence, this time duration is often used as a rough window for empirical lab studies. But, as the integrated model of top-down and bottom-up processes in art perception (VIMAP) (Pelowski et al., 2017) suggests, some more complicated, top-down processes come online only after these first seconds of art perception. Research from art museum studies shows, that most people look at artworks for more than six seconds; Smith, Smith and Tinio (2017) found that people look at artworks for an average of 30 seconds when they were free to choose for how long they wanted to spend time looking at an artwork. In 2001, Smith and Smith conducted a study in the Metropolitan Museum of Art in New York City and found an average viewing time of 27.2 seconds per artwork, whereas Tröndle, Wintzerith, Wäspe and Tschacher (2012) reported an average viewing time of around 11 seconds. Brieber, Nadal, Leder and Rosenberg (2014) reported a viewing time of approximately 39 seconds. Although these findings differ significantly from one another, it seems that natural viewing durations of artworks are above six seconds. Nevertheless, most studies in laboratory settings did not control for viewing durations that are similar to the natural viewing times in museums. To understand, what exactly makes people look at artworks for a longer duration than they would need to process the main visual features, it is important to examine the cognitive and emotional appraisals that take place in the time after the viewing time of six seconds. Furthermore, it is striking, that six seconds seem to be enough to form a first aesthetical judgement and emotion, but as Leder and Nadal (2014) state, loops through the processing stages take place also after these first seconds. Thus, it is possible that initial judgements and emotions intensify, weaken

or change in other ways due to the loops. The VIMAP by Pelowski et al. (2017) offers a model for the positive, negative, indifferent and transformative reactions that people express towards art. This study may help to relate the proposed reactions towards art to time.

As the VIMAP model is among the first approaches of integrating previous models of art perception and derive inferences about the special role of art in our society, further research is needed to understand how people react towards art when looking at it for longer viewing durations compared to shorter viewing durations. Especially the emotional component of art processing is essential to be examined in detail to understand what effect art has and why it can have such a special and important role in some people's lives while it is barely present in other's. This study aims to add to a better understanding of emotional reactions towards artworks in a laboratory setting and to specifically look at possibly complex emotions and their perceived intensity in different time conditions. As this is among the first studies about more complex emotional responses towards artworks in a laboratory setting, one aim is to clarify whether complex, deep or transforming emotions can at all come online in a laboratory setting, contrary to Kenoceni's (2008) argument.

2.4.1 Past studies on viewing duration and art interaction

Cupchik and Berlyne (1979) showed that shorter presentation time (50ms) leads to higher levels of tension and alertness, while longer presentation time (500ms and 5000ms) lead to higher levels of pleasantness. Bachmann and Vipper (1983) demonstrated that perception of art stimuli evolved in the direction from "indifferent" to "involved," "complex" to "simple," "chaotic" to "regular," and "vague" to "precise" using different exposure times. They state that for the majority of the scales, the most divergent schools of painting were realism and abstractionism. Their results confirm that perception develops from a general and undifferentiated to more differentiated quality. The question remained open at what time or stage possibly deeper, more complex or transforming emotions develop and whether these could change over time. Smith, Bousquet, Chang and Smith (2006) examined a wide range of 24 adjectives in order to have a better understanding of the variety of art ratings. They have also varied the presentation times (1000ms, 5000ms, 30000ms and 60000ms) in order to have a more realistic experimental approach to the time that is spent on viewing an artwork. According to Smith et al. (2006) the time conditions did not lead to different evaluations of the artwork. Due to the small number of shown artworks, Smith et al. (2006) did not control for differences between positively and negatively valence artworks. Melcher and Bacci (2013) propose, that artworks can lead to reliable evaluation, which in their case means, that

evaluations of the same artwork are consistent at different dates in time. The current study does not shed light on the question whether evaluations are in general consistent over a period in one viewing session, but instead focuses on changes within one viewing occasion at only one date in time.

2.4.2 Target viewing durations for the present study

In this study viewing durations of 100ms, 500ms, 6000ms and 30000ms were chosen based on the literature review.

A viewing duration of 100ms was chosen because it is the minimum amount of time needed for a first impression formation based on colour and complexity features (Locher et al., 2008, Kuchinke, Trapp, Jacobs & Leder, 2009) to detect artwork, group some characteristics and form a first impression.

In between of the chosen time periods of 100ms and 500ms a first sensory and contextual information (e.g. title, artist) is processed; EEG study (Noguchi & Murota, 2013) proposes this first contextual assessment at 200-300ms. Just a glimpse later, at 300-400ms after image onset, an initial, basic evaluation of the image takes place and allows to divide into positive or negative evaluation (Munar et al., 2012). Due to these findings it seems that around 500ms should be enough to accomplish the processing of the VIMAP stages 1-4 (Pelowski et al., 2017). Furthermore, the viewing duration of 500ms was chosen as this is the time span needed to form a conscious perception of artistic features and to identify the meaning, depicted scenery or artist (Goffaux, Jacques, Mouraux, Oliva, Schyns, & Rossion, 2005; Torralba & Oliva, 2003; Noguchi & Murota, 2013) without reflecting and evaluating personal importance or historical context (Munar et at., 2012), thus rather a bottom-up processing is given at this time.

Geday et al., (2007) find that at 3000-4000ms are enough to form an emotional response, while Lengger, Fischmeister, Leder and Bauer (2007) found in their EEG study of aesthetic processing that the brain activity is uniform during the first five seconds and starts to differentiate afterwards, at around 6000-8000ms, which seems to be enough time to assess most aspects for an initial round of processing (Pelowski et al., 2017). The viewing duration of 6000ms was chosen because it is argued to be the amount of time to form a basic judgement of an artwork and to integrate the bottom-up information (visual features) with some top-down information (Graf & Landwehr, 2015; Leder & Nadal, 2014; Pelowski et al., 2017).

The viewing duration of 30sec represents a more realistic approach to art viewing, as it is the amount of time that seems to be close to findings on how long people look at an artwork in a naturalistic museum setting (Smith et al., 2017; Brieber et al., 2014, Smith & Smith, 2001).

30000ms are a much longer duration than what would be needed to form an initial aesthetic emotion. Thus, it seems that art viewers often take more time to look at an artwork and process it even after a first assessment is completed (Smith & Smith, 2001). Smith and Smith (2001) state that 30000ms are enough to "consume" an artwork both in a bottom-up and top-down way. According to Smith and Smith (2001) and Pelowski et al. (2017) this time should be sufficient for an initial emotion to change due to further processing of the artwork.

Surely, viewing times of longer than 30000ms are possible as well and thus, aesthetic processing may take longer than this time. Smith and Smith offer a concept they call "savoring", which may take place after at least one minute of viewing time, but may also take up to 20 minutes or longer. Leder and Nadal (2014) discuss the long extension in time with multiple cycles of perceptive, cognitive and emotional feedback loops as a key component of aesthetic experience that – of course – may take much longer than 30000ms. Nevertheless, 30000ms of viewing time are chosen as a maximum for this study in order to estimate tendencies of emotional responses towards artworks for longer viewing durations than most previous studies have assessed.

Note also that there is a difference between presentation times and viewing duration; presentation time is the artificially induced time slot that a participant is given to look at the artwork in an experimental setting while viewing time is the time a participant looks at an artwork. As in this study participants are given a certain presentation time per artwork and are in a laboratory, it is assumed that presentation time and viewing time is the same, as participants were looking at the screen for the time of the experiment.

2.5 Artistic style

One other aspect that we considered relates to general type of art. Artistic style in visual arts is a distinctive manner which permits the grouping of works into related categories (Fernje, 1995). For example, works of art can be grouped by different periods in history, abstract versus representative artworks or scenes versus portraits.

As previous research shows (Furnham & Walker, 2001), art novices tend to like representative art and to dislike abstract art. Also, symmetry, high contrast and familiarity lead to higher liking. This (Furnham & Walker, 2001) is one of the few studies that showed paintings for a longer time of 30000ms, but only asked for basic evaluation of liking and familiarity, so it is not yet understood whether or how more complex emotions for abstract versus representative artworks evolve.

One aspect of this paper is to examine whether the "first" bottom-up negative or positive impression that ties to different features, among which is the artistic style (abstract

versus representative), can change with longer viewing duration. As museums of modern art enjoy great popularity, it could be that abstract artworks, that by definition don't show a clear semantical content, are evaluated more negatively in short presentation durations as they are more difficult in terms of understanding or associations. Melcher and Bacci (2013) argue, that abstract artworks can convey emotions in a reliable manner, while Konecni (2008) argues that art cannot evoke emotions for the majority of cases. Smith et al. (2006) did not find significant changes of art evaluations depending on viewing time, but only four different paintings that had all different styles and content were shown, so no inferences could be made about how style may evoke different evaluations over time.

Thus, this study examines whether participants report emotions and also if changes occur during the viewing of an artwork and it examines actual changes in the ratings of liking, depending on viewing duration. It can be assumed, that abstract art requires longer viewing durations to be more liked because it needs more top-down processing to evoke emotions compared to representative artworks. A study by Baron (2014) examined whether viewing duration influences evaluations of the art experience but did not compare different artistic styles and did not ask for more complex, transforming emotions such as insight, confusion, excitement, awe, being moved, thrills or anxiety. Thus, the current study will shed light on the differences in art experience between different artistic styles on a deeper emotional level as well as on a more basic level of liking and valence. Marin and Leder (2015) also looked at the effect of viewing time on more basic evaluation of IAPS pictures (photos of objects and scenes) versus representative paintings and found differences in mean ratings of complexity and pleasantness. The results showed an inverted U-shape for the ratings of complexity and pleasantness across the viewing durations of 1s, 5s and 25s. Which means that in all three conditions (1s, 5s and 25s) low and high pleasantness/complexity were correlated stronger with arousal in contrast to medium-level pleasantness/complexity. In contrast to the current study, Marin and Leder (2015) only took into account photos and paintings with clear semantic content and did not look at the reactions towards abstract paintings that lack clear semantic content, which is part of the present study.

2.5.1 Effect of artistic style on appraisal

Different styles of art evoke different reactions and appraisals (Bachmann & Vipper, 1983). Cupchik and Gebotys (1988) demonstrated that participants that are naïve in art viewing (have no expertise in art history or painting) prefer realistic (representative) works of art to abstract (see also O'Hare & Gordon, 1977). Hekkert and van Wieringen (1996) showed that especially naïve viewers prefer paintings of prototypical objects compared to more ambiguous

representations of objects. The question remains, why abstract art is often liked by art experts, is valuable on the art market and why museums of modern art attract visitors. Werner Haftmann (1959), an art historian, proposed that abstract art is a "visual world language" that can be equally understood by all viewers for its lack of semantic content. Given the above findings, one might conclude that abstract art is not liked (by lay viewers), but equally understood and evaluated, but Brinkmann, Commare, Leder and Rosenberg (2014) found no evidence for consistent processing in terms of eye-movement patterns or homogenous responses for abstract artworks. Also, Latif, Gehmacher, Castelhano, and Munhall (2014) found that the number and length of fixations vary with different styles of art. In addition, Belke, Leder and Augustin (2006) found that while art experts use art styles to classify artworks according to similarity, non-experts classify artworks differently (e.g. by colour). Silvia (2010) found that lay viewers often react with confusion towards abstract art and lack interest in even trying to understand the abstract artwork. Thus, it is not likely that abstract art is a visual universal language because lay viewers and art experts come to different appraisals of abstract art (O'Hare and Gordon, 1977). Leder et al. (2004) argues, that it is essential to recognize and understand the individual style of an artwork for aesthetic experiences and style-related processing is (especially for abstract art) important for aesthetic experiences (Leder et al., 2004, Leder & Nadal, 2014).

2.5.2. Interaction of artistic style (abstract/representational) with viewing duration

Previous research found that representative artworks are liked more by lay viewers compared to abstract artworks (Furnham & Walker, 2001). One possible explanation might be, that previous studies only showed the artworks for a limited amount of time: this might be sufficient for representative artworks that depict clear semantical content, while it might be not enough time for abstract artworks to be processed properly. As previous studies on abstract art appraisal showed the paintings only for a limited amount of time (e.g. 10000ms by Cupchik & Gebotys, 1988), a possible explanation is, that abstract art needs more time to be evaluated positively due to a missing semantic content, which is attended to in this study. Previous studies also often lack a diverse set of paintings that encompass positively and negatively valenced artworks within the abstract and representative domain, which is taken into account in this study.

Lengger et al. (2007) found significantly higher activation in the brain for representational artworks in several regions of the brain. Also: More associations were reported by participants for representational paintings. Lengger et al. (2007) only took measures for the first 9250ms of viewing time, thus assumptions about the processes in the following time cannot be made based on this study. One possible explanation for the higher activation and

more associations for representational art might be, that abstract art needs more time to elicit associations.

3 Current Study

The leading question for the current study was whether emotions can – at all – be evoked by art in laboratory settings. If so, are these emotions rather basic or are moving, insightful experiences possible as well? Can emotions become salient early on or do emotions need some more viewing time to evolve? Furthermore, the current study combined aspects of the previously mentioned studies about viewing time, art perception and art evaluation as well as emotional response. It aimed to examine whether the previously found results could be replicated with abstract and representative paintings and to extend the previous experiments in the exploration of deeper, more complex and possibly transforming emotions. It also aimed to shed light on the question how abstract art is processed in contrast to representative art and how the duration of viewing influences different emotions and evaluations of artworks of different styles.

The participants were again divided into four groups for a between-subjects-design. The viewing duration per artwork was either 100ms, 500ms, 6000ms or 30000ms, depending on the experimental group. 17 ratings followed each artwork. The participants were asked about their emotions during the time when looking at the artwork. The ratings asked for basic positive and negative emotions as well as liking, complexity and understanding. In addition to this basic evaluation, the participants were also asked for more complex emotions such as confusion, activation, excitement, anger, awe, being moved, thrills, anxiety, insight and chills. To shed light on the processes that are taking place during the viewing duration, participants were also asked whether they would have liked to look at the artwork for a longer time and whether their emotions changed while looking at the artwork. Just like previous studies by Leder et al. (2004), Bachmann et al. (1983), Augustin et al. (2008), Baron (2014) and Pelowski et al. (2017), this study proceeded on the assumption that aesthetic cognitive processing takes place in sequels of different stages and that aesthetic experience is affected by presentation time (Baron, 2014).

After the presentation and evaluation of the artworks, participants filled out a questionnaire consisting of short forms of the need for affect scale (Maio & Esses, 2001), the need for cognitive closure scale (Roets & Hiel, 2011), the big five inventory (Rammstedt & John, 2007), the emotional complexity scale (Kang & Shaver, 2004), the absorption scale (Tellegen & Atkinson, 1974) and scales for the assessment of art evaluation, art preference, art

relation, art training and frequency of contact to art. These scales were accessed in order to control for confounding variables.

3.1. An Overview over the hypotheses

Hypothesis 1 (H1): People report complex emotions (such as activation, excitement, awe, being moved, thrills, insight, chills, anger, confusion, anxiety) in art studies in the lab.

Here, we hypothesized that people do report complex emotions when viewing artworks in a laboratory setting.

While there are several studies on aesthetic understanding and evaluation (Pelowski et al., 2016), it is not yet understood, whether complex emotions that go beyond a basic positive or negative evaluation, liking, complexity or understanding, can be elicited in a laboratory setting. While Konecni (2008) argues that true emotions, let alone deeply moving, complex or transforming emotions, cannot be evoked by art in a laboratory setting, there is no study today that would ask for more complex emotions (in this case we explore the emotional responses of confusion, activation, excitement, anger, awe, being moved, thrills, anxiety, insight and chills) in a laboratory setting with regard to different art types and viewing durations. As papers with viewing duration beyond six seconds are also scarce (Smith & Smith, 2001), this paper examines ratings of emotional experiences towards artworks in different viewing time (100ms, 500ms, 6000ms, 30000ms) conditions.

Hypothesis 2 (H2): Viewing duration influences emotional response, liking, understanding, complexity, emotional change and basic positive/negative affect.

Here, we hypothesized that viewing duration influences the emotional response, liking, understanding, complexity, emotional change and positive/negative affect.

It is expected that the duration of viewing per artwork influences the emotions that are reported by the participants. More specific, it is expected that participants will like (Leder et al., 2004; Brieber et al., 2014) and understand (Bachmann & Vipper, 1983) artworks more with longer viewing times. It is also expected that complex emotions (confusion, awe, activation, excitement, anger, being moved, thrills, chills, insight, anxiety) are stronger with longer viewing durations due to longer elaboration and top-down processes (Pelowski et al., 2014) and that emotional valence (positive or negative affect) is stronger for longer viewing durations, meaning that positively valenced artworks are evaluated as even more positive with longer viewing time whereas negatively valenced artworks are evaluated as even more negative with longer viewing durations. It is also expected that participants evaluate the artworks as less complex with longer viewing durations (Berlyne & Lawrence, 1964, Berlyne & Lewis, 1963).

Hypothesis 2.1 (H2.1): People have a low emotional response at 100ms and 500ms.

Here, we hypothesized that people have low emotional response at 100ms and 500ms.

Following previous research, a viewing duration of 100ms is the minimum amount of time needed for a first impression formation based on colour and complexity features (Locher et al., 2008, Kuchinke, Trapp, Jacobs & Leder, 2009) and to form a first impression of pleasantness. Thus, it is expected, that 100ms and 500ms viewing time evoke similarly weak emotional responses.

Hypothesis 2.2 (H2.2): People have stronger emotions with 30000ms viewing time compared to 6000ms or less.

Here, we hypothesize that people report stronger emotions after viewing an artwork for 30000ms compared to 6000ms or less.

It is expected, that 30000ms of viewing time elicit stronger emotions. As natural viewing time in a museum seems to be around 30000ms (Smith et al., 2017), it is expected that this time is enough for stronger and more complex emotions to be reported. The first up to 6 seconds are regarded as the time that is needed to process the visual properties and to form a basic evaluation of the artwork (Leder et al., 2004), while the following 24000ms of viewing time are expected to elicit stronger/more complex emotions (Pelowski et al., 2017).

Hypothesis 2.3 (H2.3): People experience more changes of emotions when looking at artworks for a longer duration.

Here, we hypothesize that people report more experienced changes of their emotions, the longer the viewing time has been.

This study aims to explore whether participants report changes of emotion during art viewing and hypothesizes that longer viewing time is correlated with more reported changes of emotion. It is expected that further processing loops take place during longer viewing durations and thus people may experience changes of their emotions more if they look at artwork for a longer time (Pelowski et al., 2017).

We also re-considered sub-hypotheses regarding appraisal, as presented below:

Hypothesis 3 (H3): Duration influences the aesthetic experience.

According to many previously cited papers, art is processed sequentially (Bachmann & Vipper, 1983; Leder et al., 2004; Augustin et al., 2008, Baron, 2014). To replicate these findings, this study examines how viewing duration influences aesthetic experience and compares ratings depending on different viewing times.

Hypothesis 3.1 (H3.1): Artworks are better understood when looked at for a longer duration.

Hypothesis 3.2 (H3.2): Artworks are perceived as less complex when looked at for a longer duration.

Commare, Rosenberg and Leder (2018) propose, that complexity encompasses both complexity of visual properties and semantic (content-related) complexity. Both sematic processing ease and perception of sematic depth are liked to complexity judgements (Commare et al., 2018). As they (Commare et al., 2018) concentrated on the effects on complexity ratings for art experts versus non-experts for different art types, this study aimed to show whether time may play a role in the ratings of complexity as well.

Hypothesis 4 (H4): Viewing duration and reported liking interacts with type of art.

Hypothesis 4.1 (H4.1): We hypothesized that longer viewing durations lead to higher ratings of liking for both representational and abstract artworks.

Hypothesis 4.2 (H4.2): We also hypothesized, that the difference of liking between long and short presentation time is greater for abstract art then for representational art.

Previous research found that representative artworks are liked more by lay viewers compared to abstract artworks (Furnham & Walker, 2001). One possible explanation might be, that previous studies only showed the artworks for a limited amount of time: this might be sufficient for representative artworks that depict clear semantical content, while it might be not enough time for abstract artworks to be processed properly. Lengger, et al. (2007) found significantly higher activation in the brain for representational artworks in several regions of the brain. Also: More associations were reported by participants for representational paintings. Lengger et al. (2007) only took measures for the first 9250ms of viewing time, thus assumptions about the processes in the following time cannot be made based on this study. One possible explanation for the higher activation and more associations for representational art might be, that abstract art needs more time to elicit associations. This study explores whether 30000ms of viewing time lead to a greater increase in liking for abstract art than for representational art.

3.2 Methods

3.2.1 Participants

This study used a final sample size of 113 participants (Mage = 22.42, SD = 4.57, 73 female). This was reduced from an initial sample of 122, with 9 participants excluded from the analysis due to missing data. All participants were psychology students at the University of Vienna and completed the study for course credit. All were lay viewers with no special training in fine arts or art history (as accessed in post-survey). The participants were divided into four subgroups. Each group had a certain viewing duration per artwork: 100ms (n = 30, Mage =

21.46, SD = 5.22, 18 female), 500ms (n = 25, Mage = 22.54, SD = 4.61, 17 female), 6000ms (n = 25, Mage = 22.39, SD = 4.13, 18 female) and 30000ms (n = 33, Mage = 23.23, SD = 4.78, 20 female). The study was approved by the Ethics Committee of the University of Vienna. It can be excluded that participants were informed about the real aims of the study.

3.2.2 Setting and Materials

The chosen stimuli were 67 digitalized paintings from the VAPS (Vienna Art Picture System). From the set of representative scenes and landscapes the 16 most positively valenced and the 17 most negatively valenced artworks were chosen from the VAPS. From the set of abstract paintings, the 17 most positively valenced and 17 most negatively valenced artworks were chosen from the VAPS. The artworks were produced by different artists in in different styles and at different time periods. The original set of artworks consisted of the 17 most positively valenced artworks from the VAPS, but one was excluded because it was too well known. The representative artworks showed landscapes without depicted persons or scenes with depicted persons from afar. No portraits were used as stimuli, because they evoke not only processed as paintings, but also as faces (see Leder, Tinio, Fuchs, & Bohrn, 2010).

With Adobe Photoshop the artworks were sized, so that their longer side (height or width) was 1000 pixels long. All artworks were used without frames and presented in a randomized order to each participant. The stimuli were presented on a flat monitor (19" Iiyama ProLite B1906S, 1280x1024 resolution, 60Hz). The artworks were centred on the screen with a white background.

3.2.3 Procedure

Participants completed the study in a Test room at the faculty of psychology of the University of Vienna. Up to four participants completed the study in the same room and at the same time. The space was divided with walls between the computers, forming cubicles for a private sphere for each participant. They filled in a consent form explaining that they would be viewing works of art and would make ratings using a 7-point scale (1 “not at all,” 7 = “very much”) (Krosnick, 2018). The study was designed with Eprime software 2.0 (Psychology Software Tools, Inc.). Participants were divided based on randomized assignment to one of the four artwork exposure durations (100ms, 500ms, 6000ms, 30000ms) for a between-subjects design. Each participant viewed the full set of paintings (67 pieces). After each artwork, 17 statements were presented with the request to rate how much the statement applies. The statements were presented in randomized order after each artwork in order to assure attention. Before the main study, participants were given three practice trials to confirm their comfort

with the procedure and were instructed to record their ratings as spontaneously and quickly as possible with reaction times recorded by the Eprime software.

3.2.4 Artwork ratings and reported emotions

The following 17 ratings were given in randomized order after each artwork with a scale from 1 = “not at all” to 7 = “very much”.

“This image makes me feel activated.”, “This image makes me feel excited.”, “This image makes me feel awe.”, “This image makes me feel moved.”, “This image makes me feel positive.”, “This image makes me feel thrilled.”, “This image makes me feel insight.”, “This image makes me feel chills.”, “This image makes me feel angry.”, “This image makes me feel confused.”, “This image makes me feel anxious.”, “This image makes me feel negative.”, “I like this image.”, “I understand this image.”, “The image is complex.”, “While I was looking at the image my emotions changed.”, “I would have liked to look at the image for a longer time.”.

After completing the ratings on the 67 artworks, subjects were asked to fill in the following surveys to control for confounding variables: Need for Affect (Appel, Gnambs & Maio, 2012), Need for Cognitive Closure (Schlink & Walther, 2007), Emotional Complexity (Kang & Shaver, 2004), Absorption Scale (Tellegen & Atkinson, 1974), Big Five (Rammstedt & John, 2006), Art Preference, Art Relation, Art Training, Art Frequency. The study ended with a debriefing and the offer to subscribe for the final research paper.

3.3 Results

The 113 subjects completed all ratings for the 67 artworks (17 ratings per artwork) and all other personality measures. The data of the included complete data sets by 113 participants did not show patterns of monotonous answers (e.g. using the same ratings) or inattentive answers (answering faster than 500ms). All data of participants and artworks was kept for the analysis. Post-test interviews and debriefing revealed that no participants were aware of viewing time as a possible independent variable or of a manipulation through artistic style or valence. As expected, results of the post-test survey regarding art interest and training suggest that participants were “lay” viewers with low professed art knowledge, almost no experience taking art history, art making and art interest (M = 18,31; SD = 7,3).

The main question of this study is whether participants report experiencing emotions towards artworks in a laboratory setting at all (H1: People report complex emotions in art studies in the lab). *Table 1* shows mean ratings, median and standard deviation for all 17 rating scales that followed each artwork depending on viewing time condition. Over 90% of all participants gave ratings above “1” (= “not at all”). This may lead to the assumption, that people

do report emotions towards art in a laboratory setting. To investigate further whether and how emotions towards art are evoked in the lab, first, descriptive data for the 17 parameters that were asked for, is presented. Between-subjects factor of time is presented for each question with the mean value, median and standard deviation in Table 1. Further investigation of within-subjects factors of art type (representative vs. abstract) and valence (positive vs. negative) is presented below in table 2-18 and figure 1-17.

We start with a closer look at the descriptive data. The questions for emotions (activation, excitement, awe, being moved, thrills, insight, chills, anger, confusion and anxiety are considered as emotions in this study) were answered with means between 1,68 as a mean value for insight at 100ms (M = 1,8; SD = 0,88) and 3,47 as a mean value for activation (M = 3,47; SD = 1,06) for 500ms and 6000ms conditions.

These are average ratings for both representative and abstract artwork and also for both artworks of positive and negative valence.

Table 1: Descriptive results

Emotion	**Viewing time: 100ms**			**Viewing time: 500ms**			**Viewing time: 6000ms**			**Viewing time: 30000ms**		
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Liking	3,57	3,37	0,95	3,78	3,82	1,00	3,78	3,71	1,00	3,63	3,82	0,95
Positive	2,85	2,69	0,83	3,13	3,07	0,86	3,13	2,68	0,86	3,13	3,09	0,79
Negative	2,61	2,47	0,84	2,54	2,00	1,13	2,54	1,76	1,13	2,68	2,29	0,83
Under-standing	3,07	2,94	0,88	3,21	3,01	1,11	3,21	2,88	1,11	3,32	3,29	0,91
Complexity	3,57	3,59	0,80	3,58	3,68	0,96	3,58	3,65	0,96	3,70	3,71	1,07
Emotional Change	3,23	3,01	1,26	3,32	3,38	1,15	3,32	3,03	1,15	3,37	3,44	1,04
Wanting to look longer	4,64	4,53	1,24	4,66	4,74	0,80	4,66	3,88	0,80	3,36	3,41	1,19
Activation	3,04	2,96	0,99	3,47	3,68	1,06	3,47	2,76	1,06	3,33	3,41	0,90
Excitement	2,54	2,31	1,00	2,88	2,82	0,88	2,88	2,38	0,88	2,77	2,79	0,87
Awe	2,14	1,91	0,89	2,57	2,56	1,06	2,57	1,71	1,06	2,55	2,24	1,12
Being moved	2,78	2,81	0,93	3,20	3,35	1,06	3,20	2,68	1,06	3,25	3,24	1,01
Thrills	2,75	2,28	0,91	2,76	2,71	1,08	2,76	2,03	1,08	2,97	2,91	0,87
Insight	1,68	1,28	0,88	1,85	1,53	0,85	1,85	1,50	0,85	1,83	1,71	0,65

Emotion	Viewing time: 100ms			Viewing time: 500ms			Viewing time: 6000ms			Viewing time: 30000ms		
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Chills	1,96	1,65	0,90	2,20	1,85	1,00	2,20	1,76	1,00	2,10	1,88	0,87
Anger	1,85	1,56	0,79	1,99	1,76	0,96	1,99	1,47	0,96	2,12	1,82	0,82
Confusion	2,81	2,75	0,89	2,80	2,74	1,11	2,80	2,91	1,11	3,06	2,88	0,97
Anxiety	2,19	1,88	0,83	2,21	1,76	1,06	2,21	1,47	1,06	2,12	1,76	0,78

Participants made a general appraisal of the artworks with ratings for liking, understanding, complexity, perceived emotional change, wanting to look for a longer time and basic positive/negative affect. As descriptive data shows, participants gave highest ratings on the question of whether they would have liked to look at the image for a longer time for the time conditions of 100ms (M = 4,64; SD = 1,24), 500ms (M = 4,66; SD = 0,8) and 6000ms (M = 4,66; SD = 0,8), whereas the mean value of in the 30000ms condition (M = 3,36; SD = 1,19) is not salient among the other ratings.

Another salient result is that the means for each question are the same for the 500ms and 6000ms condition. This applies to both emotional ratings as well as to general appraisal of the artwork and pertains when looking separately at representative and abstract artworks or art of positively and negatively valence. Differences of mean ratings in different time conditions seem to be relatively low, but present – with exception of the 500ms and 6000ms condition, which lead to the exact same mean ratings.

Below, an overview of the significant results is given in bullet points and brief explanations of the result giving insight into the pairwise comparison. Then, results of the repeated measures ANOVA are presented for each of the questions separately.

The 17 questions/statements are presented in the following sequence: First, general appraisal (liking, positive, negative, understanding, complexity, wanting to look longer) is reported, then “emotional change”, then emotional questions (activation, excitement, awe, being moved, thrills, insight, chills, anger, confusion and anxiety) are presented (tables 2-18).

A three-way repeated measures ANOVA was conducted to determine the effects of viewing time on the general appraisal and emotional response with regards to art type and valence of the artwork.

3.3.2 Results for general appraisal of the artworks and the question on perceived emotional change

Beside the significant main effect of the between subjects variable viewing time on the statement "I would have liked to look at the artwork for a longer time." ($F(3, 109) = 17.076$, $p < 0.001$), there was no further significant main effect of time for other statements on general appraisal (liking, emotional valence understanding, complexity) ($p > 0.05$).

- The significant effect of time on the rating for wanting to look for a longer time was driven by the difference between the 30000ms condition and the other three viewing time conditions (100ms, 500ms and 6000ms). There was no significant difference among the three viewing time durations of 100ms, 500ms and 6000ms.

But, there was a significant ($p < 0,05$) main effect of art type and valence for all statements on general appraisal, except for the statement on positive affect, where art type did not have a significant impact (while valence did).

Thus, it results indicate that:

- *Liking:* Representative art rated higher on the statement on liking than abstract art ($F(1, 112) = 7,942$, $p < 0,05$) and positively valenced artworks are rated higher on liking than negatively valenced artworks ($F(1, 112) = 59,798$, $p < 0,05$).
- *Emotional valence:* Positively valenced artworks were rated more positive ($F(1, 112) = 329,16$, $p < 0,05$) while negatively valenced artworks were rated more negative ($F(1, 112) = 334,216$, $p < 0,05$). Thus, the manipulation of valence worked. Representative artworks are rated higher for the statement on negative affect ($F(1, 112) = 69,414$, $p < 0,05$). This result is driven by the higher negative ratings on representative negatively valenced artworks.
- *Understanding:* Representative artworks are rated higher for the statement on understanding than abstract artworks ($F(1, 112) = 170,59$, $p < 0,05$); positively valenced artworks are rated higher on the statement about understanding than negatively valenced artworks ($F(1, 112) = 99,627$, $p < 0,05$).
- *Complexity:* Representative artworks are rated higher for the statement on complexity than abstract artworks ($F(1, 112) = 11,241$, $p < 0,05$); negatively valenced artworks are rated higher on the statement about complexity than negatively valenced artworks ($F(1, 112) = 63,373$, $p < 0,05$).

- *Wanting to look longer:* Representative artworks are rated higher for the statement on wanting to look longer than abstract artworks ($F(1, 112) = 41{,}949$, $p < 0{,}05$); positively valenced artworks are rated higher on the statement on wanting to look longer than negatively valenced artworks ($F(1, 112) = 13{,}306$, $p < 0{,}05$).
- *Emotional change:* Representative artworks are rated higher for the statement on emotional change than abstract artworks ($F(1, 112) = 104{,}028$, $p < 0{,}05$); negatively valenced artworks are rated higher on the statement on emotional change than positively valenced artworks ($F(1, 112) = 53{,}372$, $p < 0{,}05$).

There was a statistically significant ($p < 0{,}05$) two-way interaction of art type and valence that was supported by pairwise comparison for:

- *Positive affect:* The interaction of abstract and positive artworks were rated with more agreement for the statement “this image makes me feel positive” than other combinations of art type and valence ($F(1, 112) = 170{,}534$, $p < 0{,}05$).
- The same results as for positive affect apply for *negative affect* vice versa (representative artworks of negative valence were rated highest on the statement about feeling negative) ($F(1, 112) = 222{,}933$, $p < 0{,}05$).
- *Understanding:* The interaction of positive valence and representative art type led to higher ratings of understanding then negatively valenced or abstract artworks ($F(1, 112) = 15{,}485$, $p < 0{,}05$).
- *Complexity:* In the 500ms and 6000ms condition, artworks were rated as more complex when they were both negatively valenced and representative ($F(1, 112) = 14{,}58$, $p < 0{,}05$), while there was no such difference in the 100ms and 30000ms viewing time condition.
- *Emotional change:* The interaction of negative valence and representative art type led to higher ratings of emotional change then positively valenced or abstract artworks ($F(1, 112) = 5{,}942$, $p < 0{,}05$).

There was a statistically significant ($p < 0{,}05$) two-way interaction of time and art type that was supported by pairwise comparison for:

- *Negative affect:* only for the 30000ms viewing time condition, representative artworks were significantly higher rated for the statement about negative affect ($F(3, 109) = 4{,}093$, $p < 0{,}05$) than abstract artworks. There was no other significant ($p < 0{,}05$) two way interaction of time and art type for any of the other statements on general appraisal, that would have been supported by pairwise comparison.

There was a statistically significant ($p < 0,05$) two-way interaction of time and valence that was supported by pairwise comparison for:

- *Positive affect:* Led by the difference in positive affect between the 30000ms and the 100ms viewing time condition; positive artworks had significantly higher ratings in the 30000ms time condition while negatively valenced artworks were rated significantly less positive in the 30000ms versus 100ms viewing time condition ($F(3, 109) = 170,534$, $p < 0,05$). Also, there was no significant difference between the other time conditions. There was no such significant interaction for negative affect, as pairwise comparison indicates. There was no other significant ($p < 0,05$) two-way interaction of time and valence for any of the other statements on general appraisal, that would have been supported by pairwise comparison.

There was a statistically significant ($p < 0,05$) three-way interaction of time, art type and valence that was supported by pairwise comparison for:

- Positive affect ($F(3, 109) = 2,748$, $p < 0,05$); results indicate, that while in the 100ms condition positive affect is driven rather by valence, in the 30000ms viewing time condition positive affect decreases significantly for representative negative artworks and increases for abstract positive artworks. There was no other significant ($p < 0,05$) three way interaction of time, art type and valence for any of the other statements on general appraisal, that would have been supported by pairwise comparison.

This section is followed by table 2 and figures 1-7 to support these results and provide a better understanding of the data:

Table 2: Results or repeated measures ANOVA for general appraisal of the artworks and the question on perceived emotional change.

Variable	Value	F	df	Error df	Sig.	Partial Eta Squared	Observed power
1. Liking							
main effects							
time	3,594	0,736	3	109	0,533	0,02	0,203
art type	8,135	7,942	1	112	**0,006****	0,068	0,798
valence	59,964	59,798	1	112	**0,00****	0,354	1,00
interactions							
art type x time	3,286	1,069	3	109	0,365	0,029	0,83
valence x time	1,871	0,624	3	109	0,602	0,017	0,176
art type x valence	11,908	62,284	1	112	0,00*	0,364	1,00
art type x valence x time	0,209	0,365	3	109	0,779	0,01	0,12

Bonferroni corrected alpha values are also $p < 0,05$.

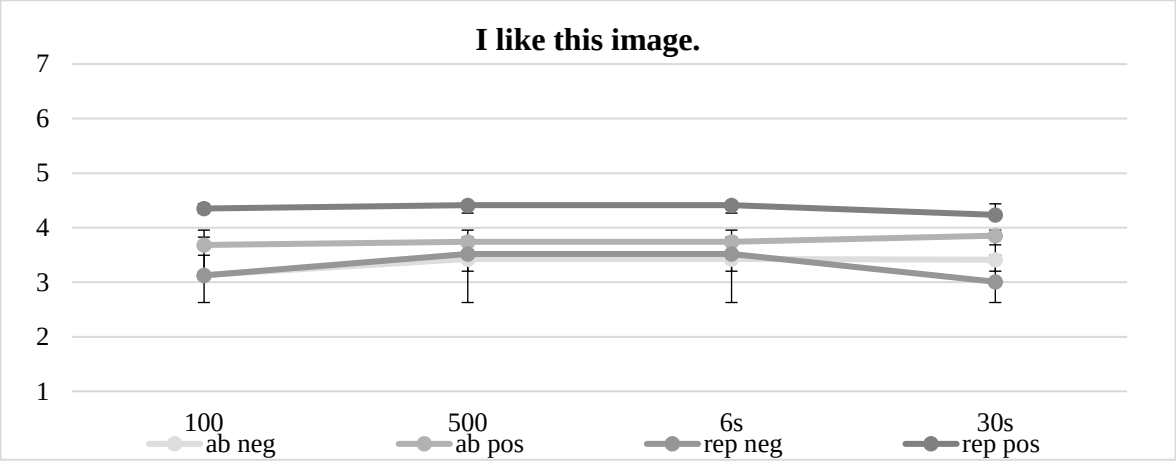

Figure 1: Average ratings on the statement "I like this image." for all four time conditions and all four art types, including standard deviations.

2. Positive affect							
main effects							
time	6,536	1,531	3	109	0,211	0,04	0,394
art type	0,002	0,003	1	112	0,956	0,00	0,05
valence	229,787	329,16	1	112	**0,00****	0,751	1,00
interactions							
art type x time	3,304	2,175	3	109	0,095	0,056	0,54
valence x time	5,524	2,637	3	109	0,053*	0,068	0,631
art type x valence	28,729	170,534	1	112	**0,00****	0,61	1,00
art type x valence x time	1,389	2,748	3	109	**0,046****	0,07	0,651

Bonferroni corrected alpha values are also $p < 0,05$.

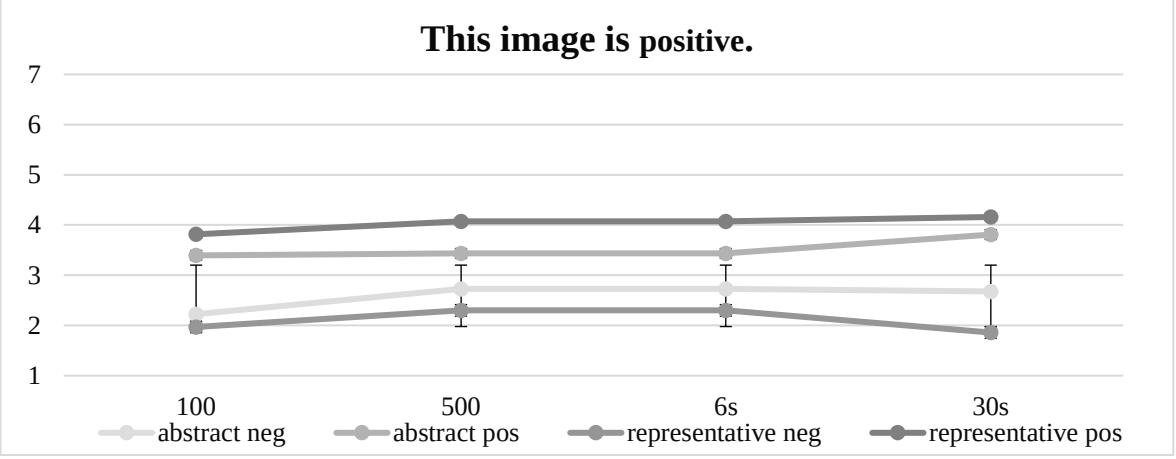

Figure 2: Average ratings on the statement "This image makes me feel positive." for all four time conditions and all four art types, including standard deviations.

3. Negative affect							
main effects							
time	1,516	0,185	3	109	0,906	0,005	0,083
art type	26,079	69,414	1	112	**0,00****	0,389	1,00
valence	262,925	334,216	1	112	**0,00****	0,754	1,00
interactions							
art type x time	4,613	4,093	3	109	0,009*	0,101	0,835
valence x time	5,097	2,160	3	109	0,097	0,056	0,537
art type x valence	45,718	222,933	1	112	**0,00****	0,672	1,00
art type x valence x time	2,291	3,724	3	109	0,014*	0,093	0,7
Bonferroni corrected alpha values are also $p < 0,05$.							

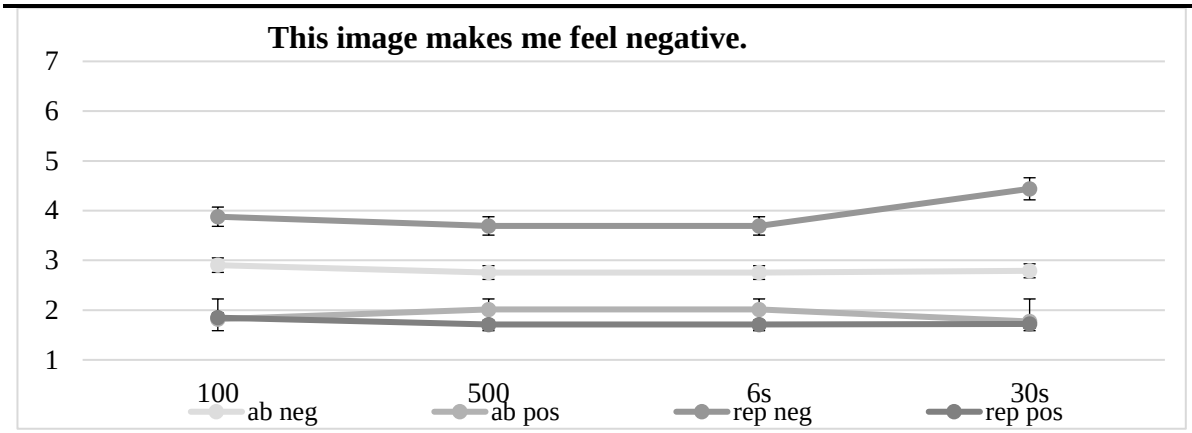

Figure 3: Average ratings on the statement "This image makes me feel negative." for all four time conditions and all four art types, including standard deviations.

4. Understanding							
main effects							
time	3,996	0,453	3	109	0,716	0,012	0,139
art type	110,39	170,59	1	112	**0,00****	0,61	1,00
valence	26,897	99,627	1	112	**0,00****	0,478	1,00
interactions							
art type x time	0,803	0,414	3	109	0,743	0,011	0,13
valence x time	0,059	0,073	3	109	0,974	0,002	0,063
art type x valence	1,838	15,485	1	112	**0,00****	0,124	0,974
art type x valence x time	0,006	0,016	3	109	0,997	0,00	0,053
Bonferroni corrected alpha values are also $p < 0,05$.							

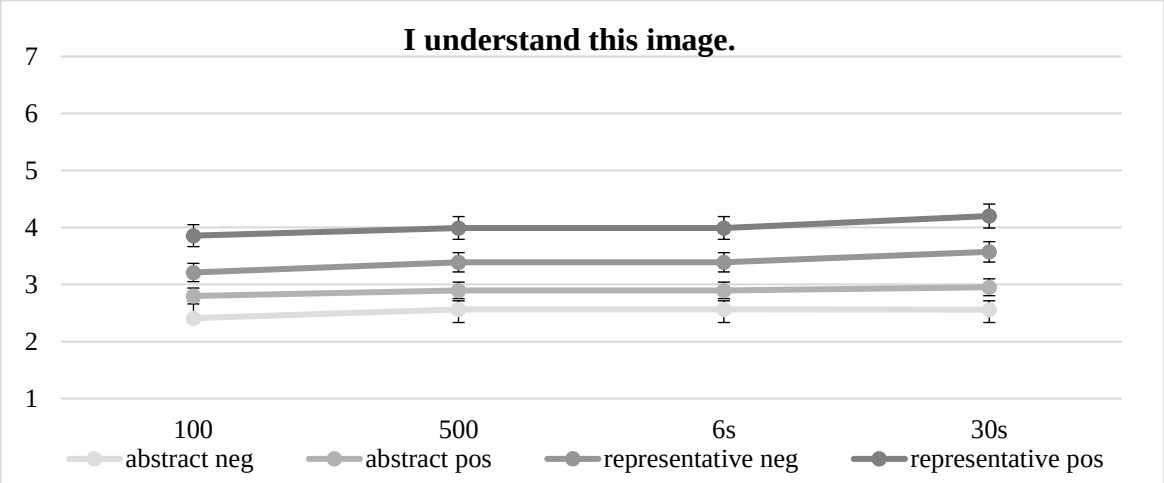

Figure 4: Average ratings on the statement "I understand this image." for all four time conditions and all four art types, including standard deviations.

5. Complexity							
main effects							
time	4,052	0,565	3	109	0,639	0,015	0,163
art type	11,416	11,241	1	112	**0,001***	0,093	0,914
valence	9,677	63,373	1	112	**0,00****	0,368	1,00
interactions							
art type x time	6,546	2,149	3	109	0,098	0,056	0,534
valence x time	0,505	1,102	3	109	0,352	0,029	0,291
art type x valence	1,711	14,58	1	112	**0,00****	0,118	0,966
art type x valence x time	0,167	0,474	3	109	0,701	0,013	0,143

Bonferroni corrected alpha values are also $p < 0,05$.

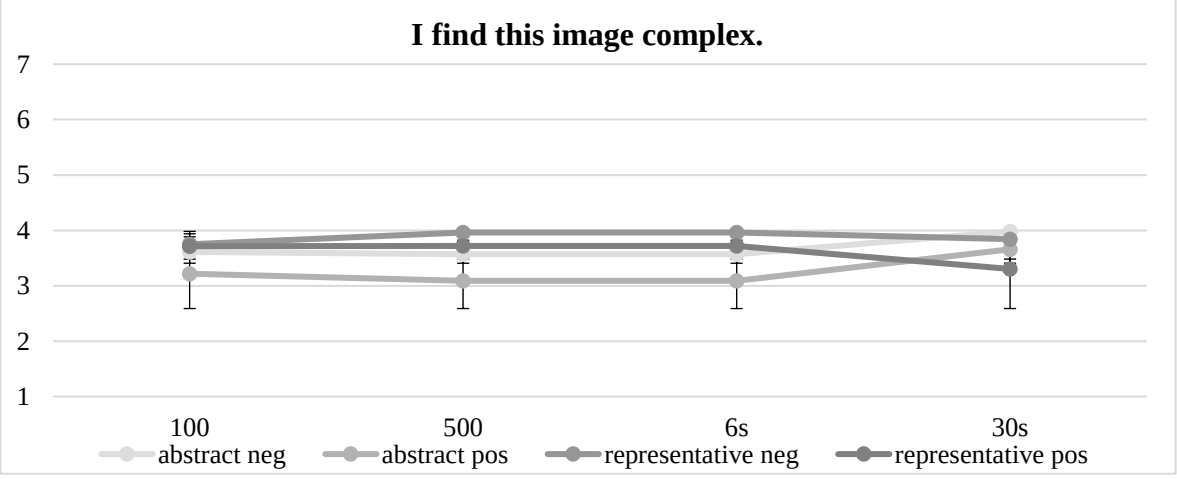

Figure 5: Average ratings on the statement "I find this image complex." for all four time conditions and all four art types, including standard deviations.

6. Emotional change							
main effects							
time	1,345	0,1	3	109	0,96	0,003	0,068
art type	41,976	104,028	1	112	**0,00****	0,488	1,00
valence	14,01	53,372	1	112	**0,00****	0,329	1,00

interactions							
art type x time	0,02	0,017	3	109	0,997	0,00	0,053
valence x time	0,142	0,18	3	109	0,91	0,005	0,083
art type x valence	5,942	5,942	1	112	**0,00****	0,264	1,00
art type x valence x time	0,023	0,008	3	109	0,985	0,001	0,059

Bonferroni corrected alpha values are also p < 0,05.

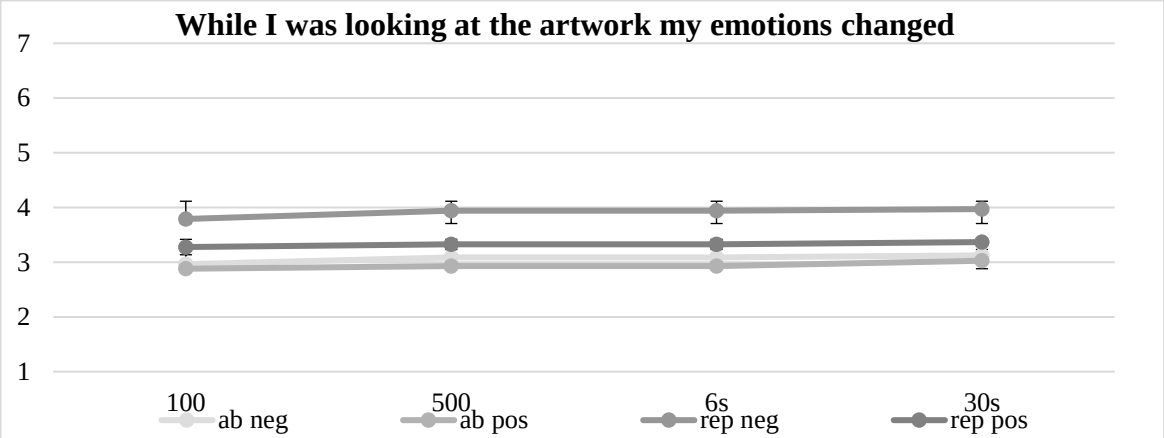

Figure 6: Average ratings on the statement "While I was looking at the artwork my emotions changed." for all four time conditions and all four art types, including standard deviations.

7. Wanting to look longer

main effects							
time	155,323	17,076	3	109	**0,00****	0,962	1,00
art type	47,096	41,949	1	112	**0,00****	0,278	1,00
valence	10,598	13,306	1	112	**0,00****	0,109	0,951
interactions							
art type x time	6,4	1,9	3	109	0,134	0,05	0,48
valence x time	3,551	1,486	3	109	0,222	0,039	0,384
art type x valence	1,732	6,986	1	112	**0,009***	0,006	0,087
art type x valence x time	0,152	0,204	3	109	0,894	0,006	0,087

Bonferroni corrected alpha values are also p < 0,05.

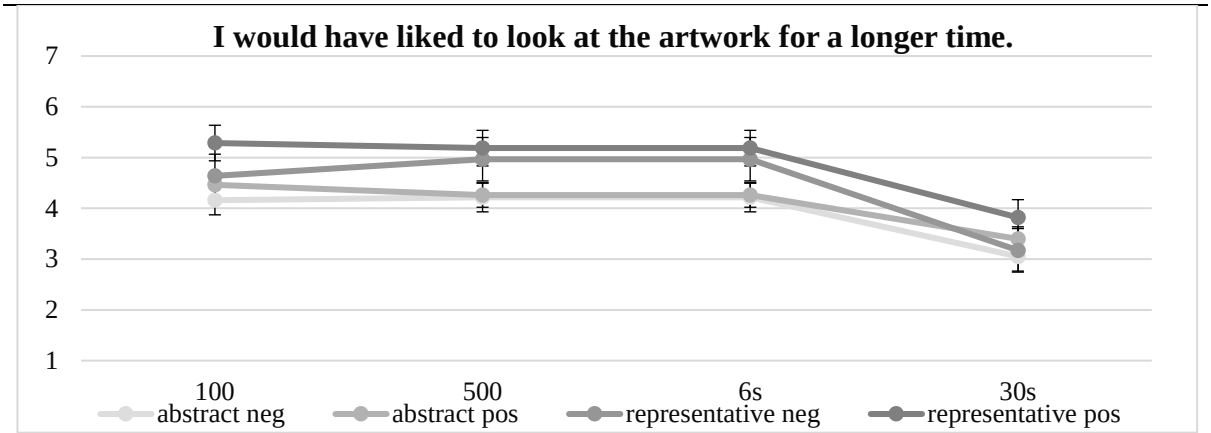

Figure 7: Average ratings on the statement "While I was looking at the artwork my emotions changed" for all four time conditions and all four art types, including standard

3.2.3 Results for the statements on more complex emotions

All significant ($p > 0,05$) results for the statements on complex emotional responses are presented below with descriptions of the results and pairwise comparison. An overview on all results for the repeated measures ANOVA is presented below in tables 9-18 and figures 8-17.

- *Activation:* Main effect of art type ($F(1, 112) = 29,867$, $p < 0,05$); representative artworks were rated significantly higher on the statement "this image makes me feel activated" than abstract artworks.
- *Excitement:* Main effect of valence ($F(1, 112) = 93,050$, $p < 0,05$); positively valenced artworks were rated significantly higher on the statement "this image makes me feel excited" than negatively valenced artworks. Two-way interaction of art type and valence ($F(1, 112) = 63,312$, $p < 0,05$); results indicate, that while representative, positively valenced artworks are rated highest in excitement, artworks with abstract art type and negative valence are rated lower.
- *Awe:* Main effect of art type ($F(1, 112) = 113,081$, $p < 0,05$); representative artworks were rated significantly higher on the statement "this image makes me feel awe" than abstract artworks. Main effect of valence ($F(1, 112) = 38,066$, $p < 0,05$); negatively valenced artworks were rated significantly higher on the statement than positively valenced artworks. Two-way interaction of art type and valence ($F(1, 112) = 15,972$, $p < 0,05$); results indicate, that the combination of negative valence and representative art type lead to higher ratings on awe.
- *Being moved:* Main effect of art type ($F(1, 112) = 108,859$, $p < 0,05$); representative artworks were rated significantly higher on the statement "this image makes me feel moved" than abstract artworks.
- *Thrills:* Main effect of art type ($F(1, 112) = 46,357$, $p < 0,05$); representative artworks were rated significantly higher on the statement "this image makes me feel thrilled" than abstract artworks. Main effect of valence ($F(1, 112) = 76,880$, $p < 0,05$); negatively valenced artworks were rated significantly higher on the statement than positively valenced artworks in the 500ms, 6000ms and 30000ms viewing time condition, while this was not the case in the 100ms condition. Two-way interaction of art type and valence ($F(1, 112) = 31,379$, $p < 0,05$); results indicate, that the combination of negative valence and representative art type lead to higher ratings on feeling thrilled.
- *Insight:* Main effect of art type ($F(1, 112) = 19,213$, $p < 0,05$); representative artworks were rated significantly higher on the statement "this image makes me feel insight" than abstract

artworks. Main effect of valence ($F(1, 112) = 4{,}407$, $p < 0{,}05$); positively valenced artworks were rated significantly higher on the statement than negatively valenced artworks.

- *Chills:* Main effect of art type ($F(1, 112) = 120{,}19$, $p < 0{,}05$); representative artworks were rated significantly higher on the statement "this image makes me feel chills" than abstract artworks. Main effect of valence ($F(1, 112) = 92{,}471$, $p < 0{,}05$); negatively valenced artworks were rated significantly higher on the statement than positively valenced artworks. Two-way interaction of art type and valence ($F(1, 112) = 101{,}544$, $p < 0{,}05$); results indicate, that the significant two-way interaction is driven by the higher ratings on artworks of representative art type and negative valence compared to the other three combinations of art type and valence.
- *Anger:* Main effect of art type ($F(1, 112) = 22{,}883$, $p < 0{,}05$); representative artworks were rated significantly higher on the statement "this image makes me feel angry" than abstract artworks. This effect seems to be driven only by artworks of representative art type and negative valence. Main effect of valence ($F(1, 112) = 136{,}231$, $p < 0{,}05$); negatively valenced artworks were rated significantly higher on the statement than positively valenced artworks. Three-way interaction of time ($F(3, 109) = 3{,}963$, $p < 0{,}05$), art type and valence; results indicate, that the significant interaction is driven by the difference between representative, negatively valenced artworks compared to the three other art type and valence combinations. The interaction of time only plays a significant role in the 30000ms viewing time condition for representative, negative artworks compared to the 100ms viewing time condition.
- *Confusion:* Main effect of valence ($F(1, 112) = 240{,}108$, $p < 0{,}05$); negatively valenced artworks were rated significantly higher on the statement "this image makes me feel confused" than positively valenced artworks. Two-way interaction of art type and valence ($F(1, 112) = 41{,}897$, $p < 0{,}05$); results indicate, that abstract art type leads to higher ratings on confusion in general, but representative, negatively valenced artworks lead to the highest ratings on confusion, while representative positive artworks are rated lowest for confusion.
- *Anxiety:* Main effect of art type ($F(1, 112) = 144{,}951$, $p < 0{,}05$); representative artworks were rated significantly higher on the statement "this image makes me feel anxiety" than abstract artworks (this result is only driven by representative, negative artworks). Main effect of valence ($F(1, 112) = 293{,}115$, $p < 0{,}05$); negatively valenced artworks were rated significantly higher on the statement than positively valenced artworks. Despite significant results for the repeated measures ANOVA, pairwise comparison does not support the significant interaction of art type and viewing time.

This section is followed by table 3 and figures 8-17 to support these results and provide a better understanding of the data:

Table 3: Results of repeated measures ANOVA for the statements on more complex emotions.

Variable	Value	F	df	Error df	Sig.	Partial Eta Squared	Observed power
8. Activation							
main effects							
time	14,344	1,609	3	109	0,191	0,042	0,413
art type	15,073	29,867	1	112	**0,00****	0,215	1,00
valence	1,298	3,447	1	112	0,066	0,031	0,452
interactions							
art type x time	0,079	0,052	3	109	0,984	0,001	0,059
valence x time	2,15	1,903	3	109	0,133	0,05	0,481
art type x valence	0,461	3,496	1	112	0,064	0,031	0,458
art type x valence x time	0,338	0,853	3	109	0,468	0,023	0,231
Bonferroni corrected alpha values are also $p < 0,05$.							

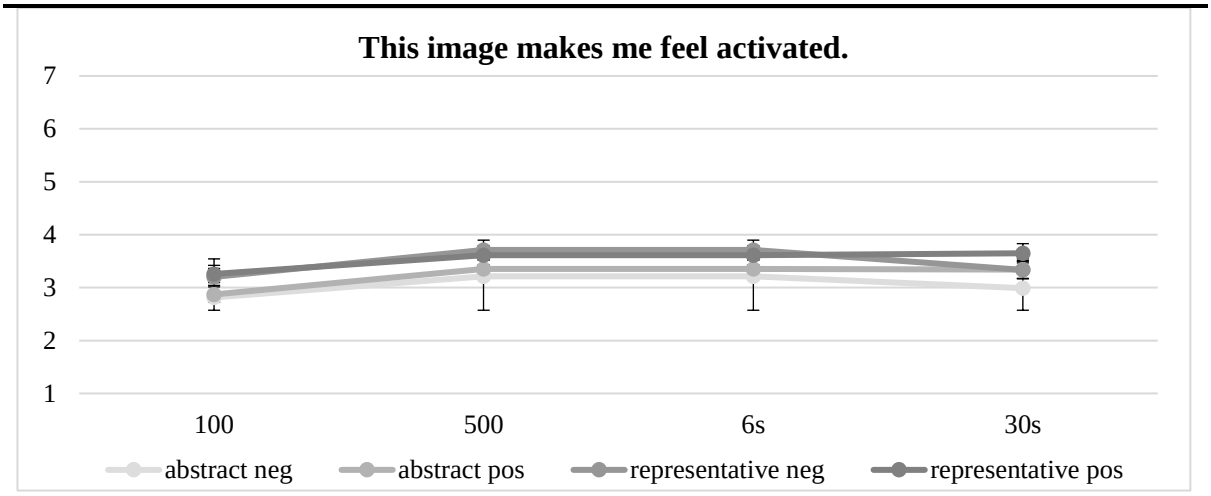

Figure 8: Average ratings on the statement "This image makes me feel activated." for all four time conditions and all four art types, including standard deviations.

9. Excitement							
main effects							
time	8,437	1,399	3	109	0,247	0,037	0,363
art type	1,899	3,048	1	112	0,084	0,027	0,409
valence	51,222	93,050	1	112	**0,00****	0,461	1,00
interactions							
art type x time	1,724	0,922	3	109	0,433	0,025	0,247
valence x time	0,777	0,47	3	109	0,704	0,013	0,142
art type x valence	8,991	63,312	1	112	**0,00****	0,367	1,00
art type x valence x time	0,565	1,327	3	109	0,269	0,035	0,345
Bonferroni corrected alpha values are also $p < 0,05$.							

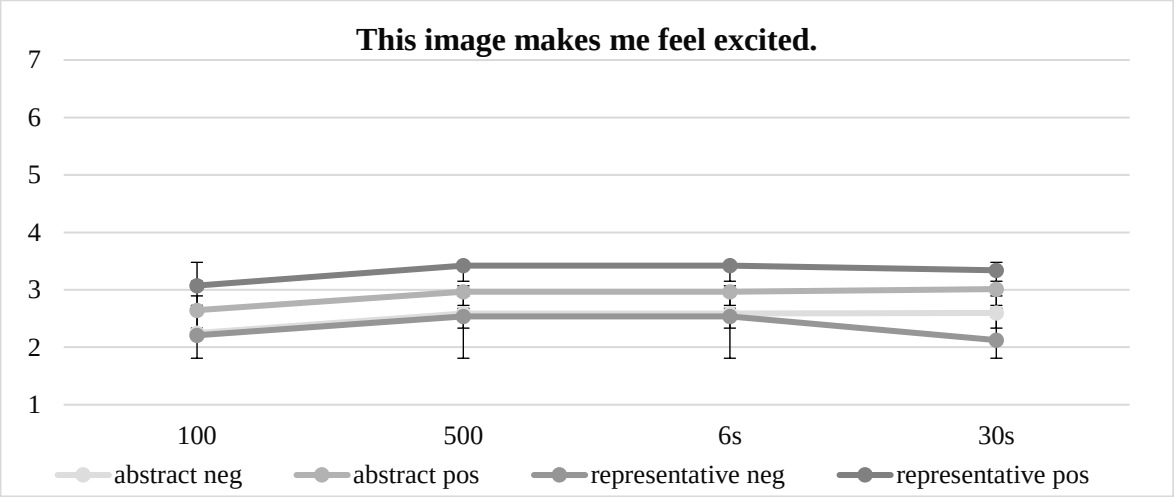

Figure 9: Average ratings on the statement "This image makes me feel excited." for all four time conditions and all four art types, including standard deviations.

10. Awe

main effects							
time	16,364	1,625	3	109	0,188	0,043	0,417
art type	42,852	113,081	1	112	**0,00****	0,509	1,00
valence	20,283	38,066	1	112	**0,00****	0,259	1,00
interactions							
art type x time	0,539	0,474	3	109	0,701	0,013	0,143
valence x time	1,454	0,909	3	109	0,439	0,024	0,244
art type x valence	1,935	15,972	1	112	**0,00****	0,128	0,977
art type x valence x time	0,180	0,494	3	109	0,687	0,013	0,148

Bonferroni corrected alpha values are also $p < 0,05$.

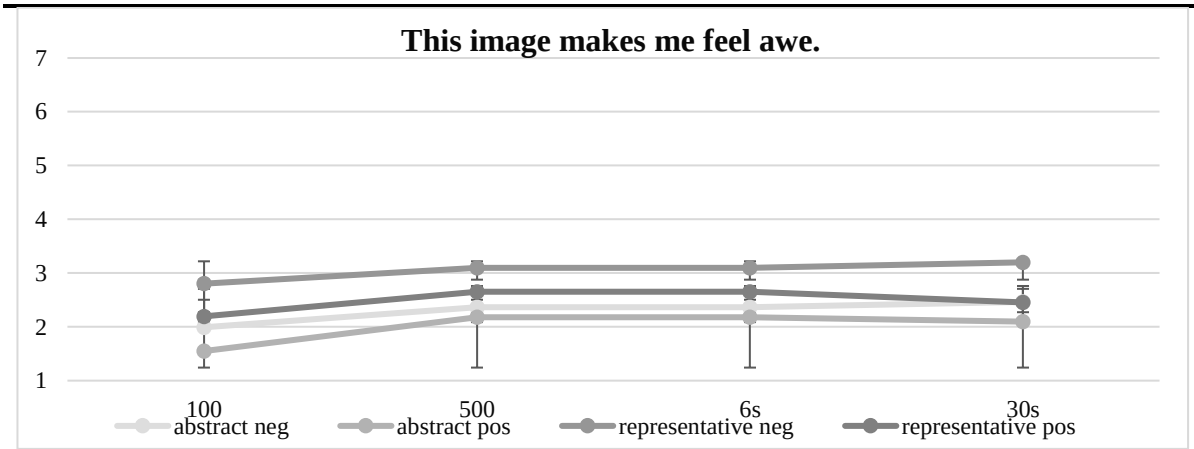

Figure 10: Average ratings on the statement "This image makes me feel awe." for all four time conditions and all four art types, including standard deviations.

11. Being moved

main effects							
time	17,223	1,756	3	109	0,16	0,046	0,447
art type	44,546	108,859	1	112	**0,00****	0,50	1,00
valence	1,109	3,344	1	112	0,07	0,03	0,441

interactions							
art type x time	0,046	0,038	3	109	0,99	0,001	0,056
valence x time	0,628	0,632	3	109	0,596	0,017	0,179
art type x valence	5,018	48,134	1	112	0,00*	0,306	1,00
art type x valence x time	0,761	2,434	3	109	0,069	0,063	0,593

Bonferroni corrected alpha values are also $p < 0,05$.

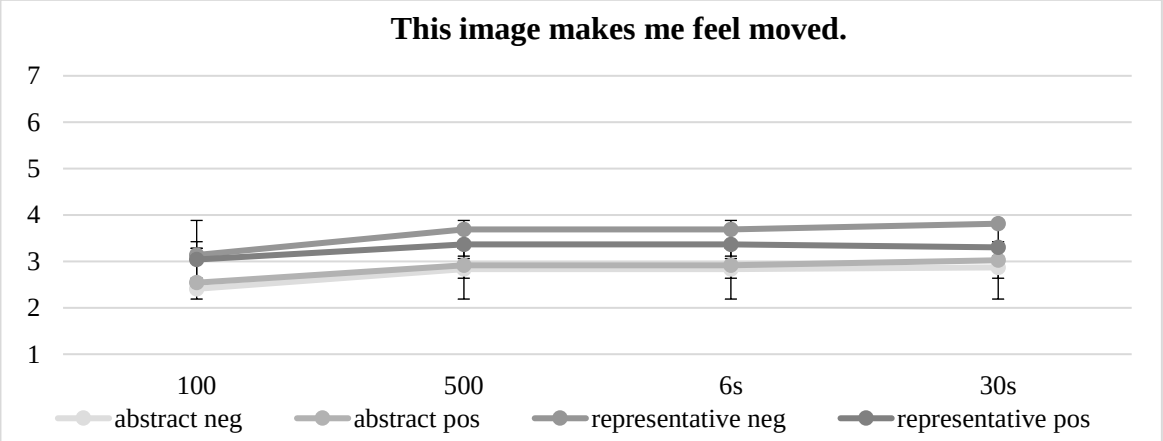

Figure 11: Average ratings on the statement "This image makes me feel moved." for all four time conditions and all four art types, including standard deviations.

12. Thrills							
main effects							
time	12,452	1,529	3	109	0,211	0,04	0,394
art type	17,305	46,357	1	112	**0,00****	0,298	1,00
valence	48,894	76,880	1	112	**0,00****	0,414	1,00
interactions							
art type x time	0,246	0,220	3	109	0,883	0,006	0,09
valence x time	0,587	0,308	3	109	0,820	0,008	0,108
art type x valence	6,671	31,379	1	112	**0,00****	0,224	1,00
art type x valence x time	0,087	0,136	3	109	0,938	0,004	0,074

Bonferroni corrected alpha values are also $p < 0,05$.

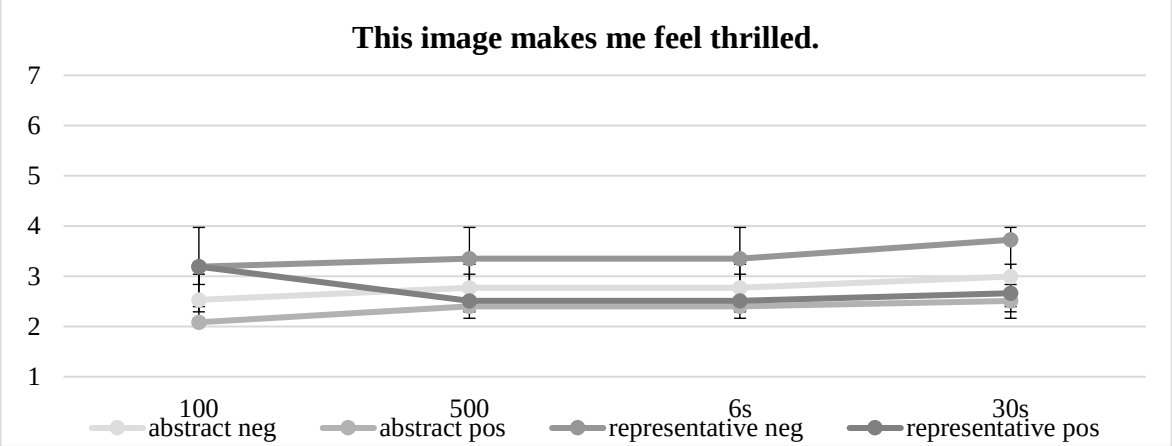

Figure 12: Average ratings on the statement "This image makes me feel thrilled." for all four time conditions and all four art types, including standard deviations.

13. Insight							
main effects							
time	2,524	0,378	3	109	0,769	0,01	0,122
art type	3,895	19,213	1	112	**0,00****	0,150	0,991
valence	0,513	4,407	1	112	**0,00****	0,036	0,514
interactions							
art type x time	0,001	0,001	3	109	1,00	0,00	0,05
valence x time	0,405	1,065	3	109	0,367	0,028	0,282
art type x valence	0,10	1,574	1	112	0,212	0,014	0,237
art type x valence x time	0,052	0,273	3	109	0,845	0,007	0,101

Bonferroni corrected alpha values are also $p < 0,05$.

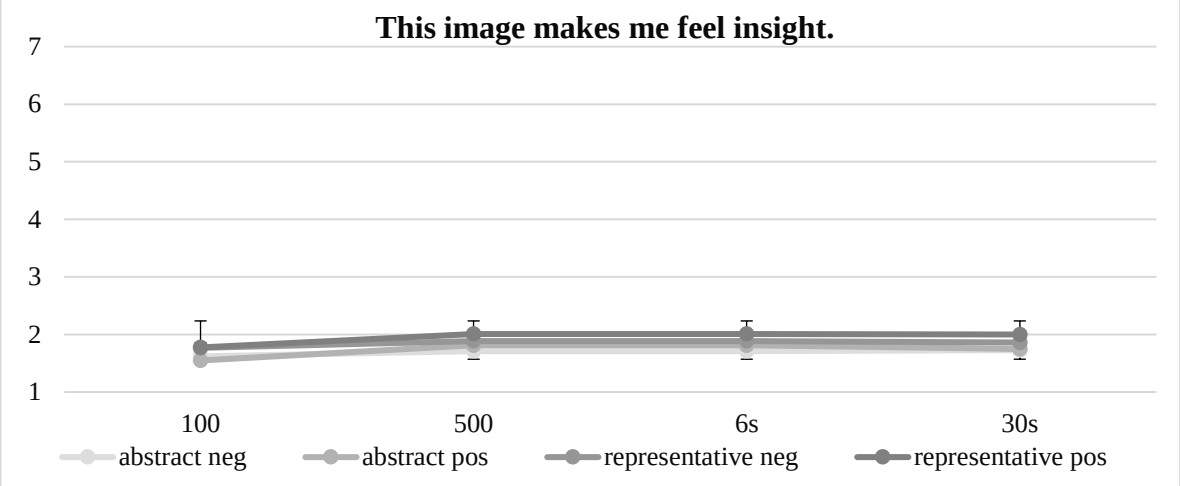

Figure 13: Average ratings on the statement "This image makes me feel insight." for all four time conditions and all four art types, including standard deviations.

14. Chills							
main effects							
time	4,197	0,488	3	109	0,691	0,013	0,146
art type	39,158	120,19	1	112	**0,00****	0,524	1,00
valence	42,768	92,471	1	112	**0,00****	0,459	1,00
interactions							
art type x time	0,384	0,393	3	109	0,758	0,011	0,126
valence x time	0,776	0,559	3	109	0,643	0,015	0,162
art type x valence	15, 689	101,544	1	112	**0,00****	0,482	1,00
art type x valence x time	1,128	2,433	3	109	0,069	0,063	0,592

Bonferroni corrected alpha values are also $p < 0,05$.

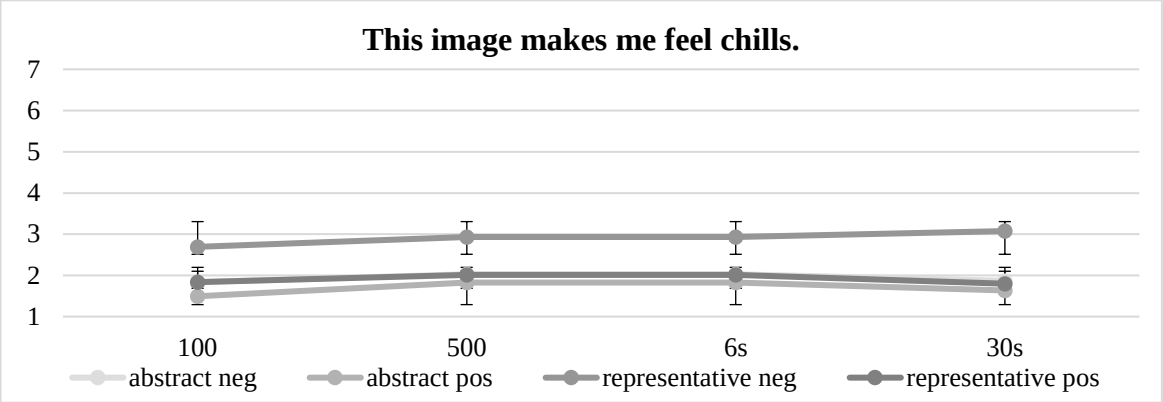

Figure 14: Average ratings on the statement "This image makes me feel chills." for all four time conditions and all four art types, including standard deviations.

15. Anger

main effects							
time	4,281	0,582	3	109	0,628	0,016	0,167
art type	5,668	22,883	1	112	**0,00****	0,174	0,997
valence	56,998	136,231	1	112	**0,00****	0,556	1,00
interactions							
art type x time	5,041	6,783	3	109	**0,00****	0,157	0,973
valence x time	6,094	4,855	3	109	**0,003****	0,118	0,897
art type x valence	14,873	103,494	1	112	**0,00****	0,487	1,00
art type x valence x time	1,708	3,963	3	109	**0,01****	0,098	0,822

Bonferroni corrected alpha values are also $p < 0,05$.

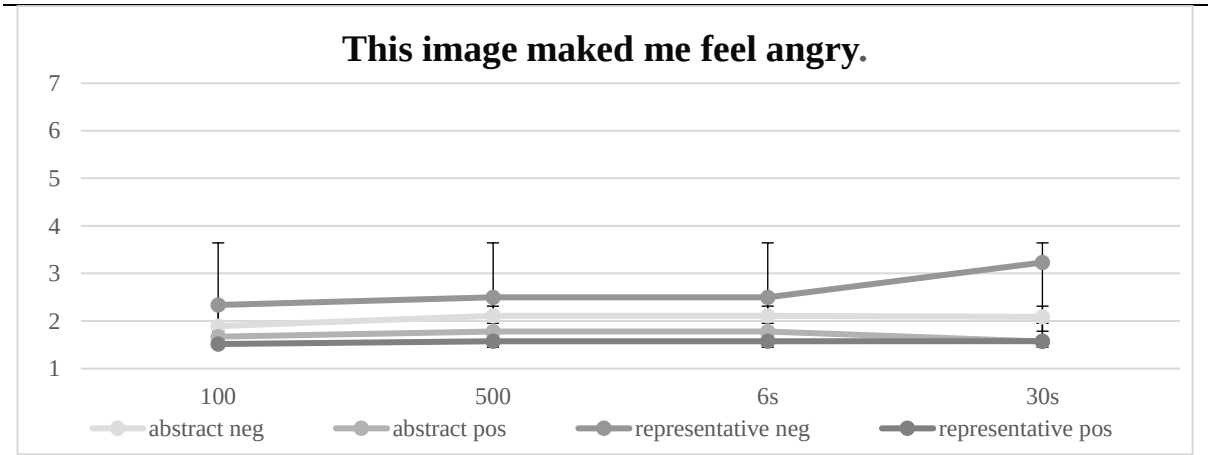

Figure 15: Average ratings on the statement "This image makes me feel angry." for all four time conditions and all four art types, including standard deviations.

16. Confusion

main effects							
time	5,886	0,596	3	109	0,619	0,016	0,17
art type	0,531	1,695	1	112	0,196	0,015	0,252
valence	103,711	240,108	1	112	**0,00****	0,688	1,00

interactions							
art type x time	1,387	1,474	3	109	0,226	0,039	0,381
valence x time	0,485	0,375	3	109	0,771	0,01	0,122
art type x valence	7,857	41,897	1	112	**0,00****	0,278	1,00
art type x valence x time	0,659	1,171	3	109	0,324	0,031	0,307

Bonferroni corrected alpha values are also $p < 0,05$.

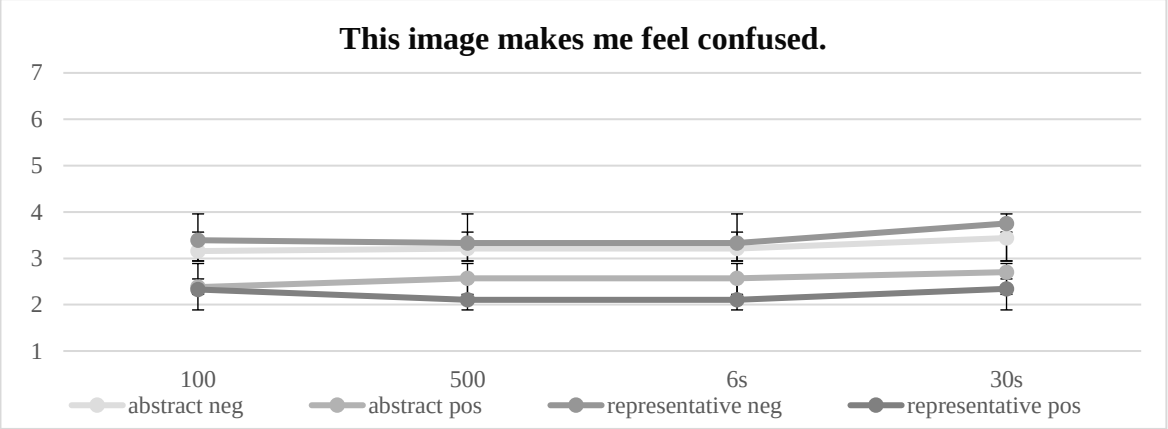

Figure 16: Average ratings on the statement "This image makes me feel confused." for all four time conditions and all four art types, including standard deviations.

17. Anxiety

main effects							
time	0,575	0,068	3	109	0,977	0,002	0,062
art type	30,51	144,951	1	112	**0,00****	0,571	1,00
valence	167,387	293,115	1	112	**0,00****	0,729	1,00
interactions							
art type x time	2,282	3,614	3	109	0,016*	0,09	0,782
valence x time	1,369	0,799	3	109	0,497	0,022	0,218
art type x valence	26,848	186,603	1	112	0,103	0,055	0,527
art type x valence x time	0,913	2,115	3	109	0,103	0,055	0,527

Bonferroni corrected alpha values are also $p < 0,05$.

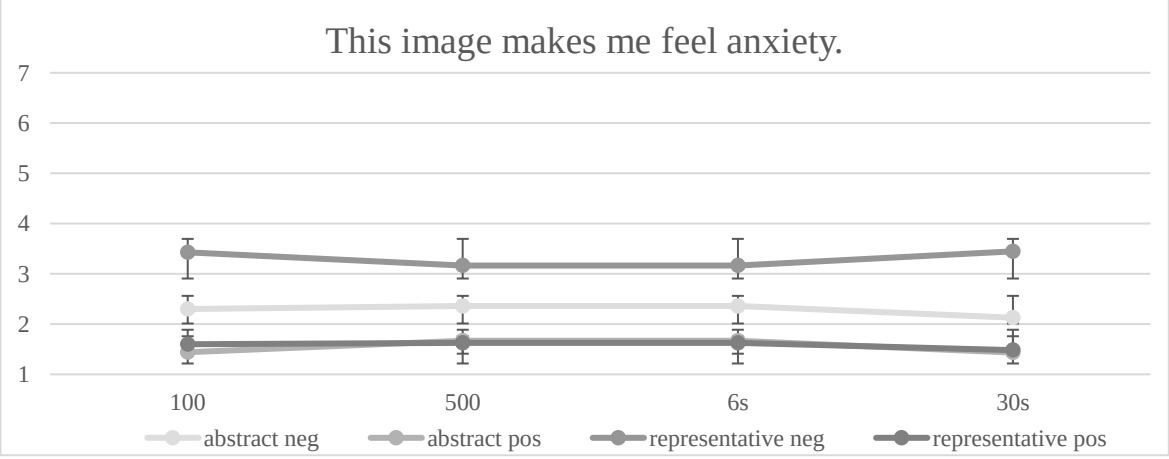

Figure 17: Average ratings on the statement "This image makes me feel anxiety." for all four time conditions and all four art types, including standard deviations.

4 Discussion

This discussion is divided in sections according to the leading hypotheses of the study for the aim of presenting an overview of the conclusions based on the results, connecting it to literature on the topics and offer some suggestions of how to approach unanswered topics in the future.

4.1 Do people report emotions towards art in the laboratory?

This study aimed to explore whether emotions – at all – can be evoked by art in laboratory settings (H1). We looked at the emotions activation (which was considered as an emotion for the purpose of this study), excitement, awe, being moved, thrills, chills, anger, confusion and anxiety. While research on empirical aesthetics frequently studies emotional responses towards artworks (e.g. Melcher & Bacci, 2013, Pelowski & Akiba, 2011, Pelowski, 2015, Pelowski et al., 2017, Gerger, Pelowski & Leder, 2018, Silvia, 2009) there are also doubts that aesthetic emotions could be studied in the laboratory (Konecni, 2008). These doubts arise not only due to the possibly limiting laboratory setting, but also, because there is not much research on the topic of complex, possibly transformative emotional responses towards artworks such as being moved, awe, thrills or feeling like crying (Pelowski, 2015, Konecni, 2008), especially in the lab. Thus, it was of fundamental interest whether ratings of perceived complex emotions (see above) would be reported.

This seems to be the case, as participants gave ratings on all emotional questions, both on more basic emotional questions such as on activation (which is regarded as an emotion in thus study), excitement, anger or confusion, as well as on complex and possibly transforming emotions such as being moved, awe, thrills and chills. The fact, that different art types and artworks of different valence seem to evoke (in part) statistically different ratings (art appraisal and emotional response), supports this finding.

Nevertheless, this is only an indication that emotions (both more general and more complex) can be evoked by art in laboratory settings. Further research may compare the emotional responses with a set of same paintings in the museum and the lab (with a study design similar to Brieber, Nadal and Leder (2015) but extended to ratings of more complex emotions) to see, whether ratings are similar or lower (as Brieber et al., 2015 might suggest). Also, it might be interesting to choose a more qualitative approach, in which participants would be presented with a set of emotions (in order to “prime” them with possible reactions towards art) and then ask for perceived emotions. In this case, it could be eliminated that participants only give a rating for a certain emotion, because they have to.

4.2 Does viewing duration influence emotional response and general appraisal towards artwork in the laboratory?

As results indicate that aesthetic emotions are evoked in the lab, we also examined, whether emotional response (activation, excitement, awe, feeling moved, thrills, insight, chills, anger, confusion, anxiety), general appraisal of an artwork (such as liking, understanding, complexity, basic positive/negative affect) as well as perceived emotional change is influenced by the viewing duration (100ms, 500ms, 6000ms and 30000ms, as the independent between-subjects variable).

We expected that participants would like and understand artworks more (Leder et al., 2004, Brieber et al., 2014, Bachmann & Vipper, 1983), that they would report stronger positive and negative emotional affect and lower complexity (Berlyne & Lawrence, 1964, Berlyne & Lewis, 1963) with longer viewing durations. Additionally, we expected participants to give higher ratings on their perceived emotions due to longer elaboration and top-down processes (Pelowski et al., 2014). Specifically, we assumed that based on Leder and Nadal (2014) and Pelowski et al. (2017) viewing time durations of 100ms and 500ms would be enough for a more bottom-up driven processing, that 6000ms would be enough to form a first aesthetic judgement and emotion and 30000ms may evoke more complex emotions such as being moved, thrills, chills, insight.

Results do not support the expectations. There was no significant ($p < 0,05$) main effect of time for any of the questions for the general appraisal or emotional response. Only the statement “I would have liked to look at the image for a longer time”, which is neither an appraisal of the artwork nor an emotion, evoked statistically significant responses for viewing time. The result was led solely by the difference in ratings for all artwork types in the 30000ms condition compared to the viewing time condition of 100ms, 500ms and 6000ms. The result for wanting to look longer indicates, that people seem to no longer want to look at an artwork after 30000ms, which corresponds to the findings by Smith et al. (2017).

As literature indicates that artworks of different style (e.g. representative versus abstract) and different valence (positive versus negative) may lead to different appraisal and emotional response (e.g. Leder, Gerger, Dressler & Schabmann, 2010, Schepman, Rodway, Pullen & Kirkham, 2015), we controlled for art type (representative and abstract) and valence (which was pre-rated for each artwork), leading to four art categories: abstract and negative artworks (“abs neg”), abstract and positive artworks (“abs pos”), representative negative artworks (“rep neg”) and representative positive artworks (“rep pos”). With these control

variables we found some statistically significant interactional effects of time with either valence or art type.

For the general appraisals, results indicate that participants reported more positive feeling for positively valenced artworks and less positive feeling for negatively valenced artworks in the 30000ms condition compared to the 100ms condition. Interestingly, for the statement on negative feeling, not valence contributed to significant differences for different viewing time conditions, but art type; representative artworks were rated more negative for the 30000ms condition comparted to the 100ms condition (this was led by the relatively high ratings for negative affect for "rep neg"-artworks). While this results are in line with expectations, it was surprising that there was no significant difference for the other viewing time conditions. Moreover, it was surprising that results for the 500ms condition and the 6000ms condition were exactly the same for all viewing time conditions and art categories. Also, there was to interactional effect of time and art type/valence for liking, understanding, complexity, or perceived emotional change.

Although statistical analysis does not support a main effect of time for these appraisals, descriptive data and graphs (see result section) indicate some changes that seem to be indicated by viewing time condition, although they are not significant in this exploratory study design. E.g. it might be interesting to look at the appraisal for complexity in the future, as here, descriptive data indicates that representative artworks are perceived as more complex with shorter presentation times (100ms, 500ms, 6000ms), while abstract artworks are perceived as more complex at 30000ms viewing time. Though results are not statistically significant here, it might be interesting to look at the perception of complexity in future research with time as a within subjects variable for example. As Commare et al. (2018) suggest, specifically complexity might be interesting to investigate further with regard to art expertise. Here, although not significant, descriptive data suggests that abstract and representative data might be processed differently, which may be due to the difference of visual complexity versus semantic complexity – it would be interesting to shed light on this in future research.

For emotional responses, results do not support that there are interactional effects of viewing time when controlled for art type/valence, except for the statistically significant three-way interaction (and also significant two-way interactions) of time, art type and valence for the statement "This image makes me feel angry.". For anger, results indicate that ratings for "rep neg" artworks differ significantly from the other three art categories in the 30000ms viewing time condition compared to the 100ms condition. For all other emotional responses, results do not indicate significant effects of viewing time.

Thus, the hypotheses H 2.1 (People have a low emotional response at 100ms and 500ms), H 2.2 (People have stronger emotions with 30000ms viewing time compared to 6000ms or less), H 2.3 (People experience more changes of emotions when looking at artworks for a longer duration), H 3 (Viewing duration influences the aesthetic experience), H 3.1 (Artworks are better understood when looked at for a longer duration), H 3.2 (Artworks are perceived as less complex when looked at for a longer duration), H 4 (Viewing duration and reported liking interacts with type of art), H 4.1 (Longer viewing durations lead to higher ratings of liking for both representational and abstract artworks) and H 4.2 (Difference of liking between long and short presentation time is greater for abstract art then for representational art) cannot be supported by the findings of this study.

But – why is that? First, to rate 17 questions after each artwork takes up some time in which the current artwork might be recalled. This might be the reason why viewing duration does not have the expected effect as in this case, images would have been rated not only based on the time of viewing, but based on the overall appraisal/emotion throughout the viewing time and subliminal recollection. We tried to minimize this effect by presenting the 17 statements in randomized order and by instructing the participants to rate only on the basis of the experiences throughout the viewing time, but subconscious recollection of the artwork might still play a role. Further, it might be interesting to use viewing time as a within subjects variable in future research by providing participants with some sort of a remote control/turntable to report in-time emotional reactions and possibly also emotional changes. This would show, whether participants experience emotional changes but later on may not be able to recollect them. Also, it is possible that deliberately chosen viewing times would show how and when (possibly complex) emotions are formed towards artworks in a laboratory setting. If participants had the choice to look at the artwork for as long as they like, the setting would be more realistic (because people also choose how long they want to look at an artwork in a museum for example), but experimental control would be very difficult.

Second, it might be, that the amount of artworks and the set of questions after each artwork was too long and led to effects of fatigue and possibly anger. It took some participants over 90 minutes to complete the experiment in the 30000ms condition, which might have been too long to concentrate and truly appreciate each artwork. This might not only be the reason for the lack of effects of time, but also for the significant results for anger. Thus, for future research it might be expedient to randomize the ratings in a way that each participant answers different questions after each artwork, that the question set consists of fewer statements or fewer artworks are presented.

The fact, that all ratings for the 500ms and the 60000ms viewing time condition (means, SD, all results of repeated measures ANOVA) were exactly the same for each of the questions across all art types, valence and viewing time conditions also suggests, that the manipulation of viewing time did not work as expected, as most previous studies do find differences between these two time conditions (Leder & Nadal, 2014, Pelowski et al., 2017). Further, it makes it interesting to investigate what happens on a cognitive level throughout the time span between 500ms and 6000ms and how and why descriptive data indicates some changes afterwards. There might be stronger effects of viewing time than the results of this study indicate, as the above noted limitations to the study might have interfered with the effects of time.

4.3 Other findings of this study that were not part of the research questions

Regarding the emotional responses, there was also no main effect of time, but there were some main effects of art type and/or valence, that mainly support that the manipulation worked: For activation, awe, being moved, thrills, insight, chills and anger there was a significant main effect of art type with representative artworks leading to higher ratings on all of these emotional questions then abstract artworks. For excitement and insight there was a significant main effect of valence with positively valenced artworks leading to higher ratings. For awe, thrills, chills, anger and confusion there was also a significant main effect of valence with negatively valenced artworks leading to higher ratings. While there was an interactional effect of art type and valence for some of the emotional responses (excitement, awe, thrills, chills, anger, confusion), these results are not subject of the research questions of this study, but please view the results for analysis of art type and valence interactions.

4.4 Conclusion

Especially with the context of the VIMAP model by Pelowski et al. (2017), it might be interesting to systematically investigate on the cognitive loops that take place during art processing, in order to understand how aesthetic emotions are formed. As the research on complex and possibly transformative emotions towards artworks is rather young and also there are only few studies that work with longer viewing durations (such as the 30000ms viewing time condition in this study), further research may give some insights into the complex processing of artworks. This study may serve as an exploratory approach and indication, that complex emotions seem to be possibly evoked in a laboratory setting. Also, that abstract and representational artworks are processed differently, just as artworks of negative and positive valence. Also, time seems to have some effect on the emotional response as descriptive data suggests, although statistically there are almost no significant effects of time.

5 References

Appel, M., Gnambs, T., & Maio, G. R. (2012). A short measure of the need for affect. *Journal of personality assessment, 94*(4), 418-426.

Augustin, M. D., Defranceschi, B., Fuchs, H. K., Carbon, C. C., & Hutzler, F. (2011). The neural time course of art perception: An ERP study on the processing of style versus content in art. *Neuropsychologia, 49*(7), 2071-2081.

Augustin, M. D., Leder, H., Hutzler, F., & Carbon, C. C. (2008). Style follows content: On the microgenesis of art perception. *Acta psychologica, 128*(1), 127-138.

Bachmann, T., & Vipper, K. (1983). Perceptual rating of paintings from different artistic styles as a function of semantic differential scales and exposure time. *Archiv für Psychologie.*

Baron, Sandra Anna (2014) Die Interaktion zwischen Kunsterleben und Betrachtungszeit. Diplomarbeit, Universität Wien. Fakultät für Psychologie. Unveröffentlicht

BetreuerIn: Leder, Helmut

Belke, B., Leder, H., & Augustin, D. (2006). Mastering style. Effects of explicit style-related information, art knowledge and affective state on appreciation of abstract paintings. *Psychology Science, 48*(2), 115.

Bergeron, V., & Lopes, D. M. (2012). Aesthetic theory and aesthetic science. *Aesthetic science: Connecting minds, brains, and experience,* 63-79.

Berlyne, D. E. (1960). Conflict, arousal, and curiosity.

Berlyne, D. E. (1974). Studies in the new experimental aesthetics: Steps toward an objective psychology of aesthetic appreciation. *Hemisphere.*

Berlyne, D. E., & Lewis, J. L. (1963). Effects of heightened arousal on human exploratory behaviour. *Canadian Journal of Psychology/Revue canadienne de psychologie, 17*(4), 398.

Berlyne, D. E., & Lawrence, G. H. (1964). Effects of complexity and incongruity variables on GSR, investigatory behavior, and verbally expressed preference. *The Journal of General Psychology, 71*(1), 21-45.

Brieber, D., Nadal, M., Leder, H., & Rosenberg, R. (2014). Art in time and space: Context modulates the relation between art experience and viewing time. *PloS one, 9*(6), e99019.

Brieber, D., Nadal, M., & Leder, H. (2015). In the white cube: Museum context enhances the valuation and memory of art. *Acta psychologica, 154*, 36-42.

Brinkmann, H., Commare, L., Leder, H., & Rosenberg, R. (2014). Abstract art as a universal language?. *Leonardo, 47*(3), 256-257.

Carbon, C. C., & Leder, H. (2005). When feature information comes first! Early processing of inverted faces. *Perception, 34*(9), 1117-1134.

Chatterjee, A. (2004). Prospects for a cognitive neuroscience of visual aesthetics.

Chatterjee, A. (2009). Prospects for a neuropsychology of art. *Neuroaesthetics*, 131-143.

Chatterjee, A., Widick, P., Sternschein, R., Smith, W. B., & Bromberger, B. (2010). The assessment of art attributes. *Empirical Studies of the Arts, 28*(2), 207-222.

Chatterjee, A., & Vartanian, O. (2014). Neuroaesthetics. *Trends in cognitive sciences, 18*(7), 370-375.

Commare, L., Rosenberg, R., & Leder, H. (2018). More than the sum of its parts: Perceiving complexity in painting. *Psychology of Aesthetics, Creativity, and the Arts, 12*(4), 380.

Cooper, J. M., & Silvia, P. J. (2009). Opposing art: Rejection as an action tendency of hostile aesthetic emotions. *Empirical Studies of the Arts, 27*(1), 109-126.

Cupchik, G. C., & Berlyne, D. E. (1979). The perception of collative properties in visual stimuli. *Scandinavian Journal of Psychology, 20*(1), 93-104.

Cupchik, G. C., & Gebotys, R. J. (1988). The search for meaning in art: Interpretive styles and judgments of quality. *Visual Arts Research*, 38-50.

Fechner, G. T. (1871). Zur experimentalen aesthetik (Vol. 1). S. Hirzel.

Fechner, G. T. (1876). Vorschule der aesthetik (Vol. 1). Breitkopf & Härtel.

Fernie, E. (Ed.). (1995). Art history and its methods: A critical anthology (p. 223). London: Phaidon.

Furnham, A., & Walker, J. (2001). Personality and judgements of abstract, pop art, and representational paintings. *European Journal of Personality, 15*(1), 57-72.

Geday, J., Kupers, R., & Gjedde, A. (2007). As time goes by: Temporal constraints on emotional activation of inferior medial prefrontal cortex. *Cerebral Cortex, 17*(12), 2753-2759.

Gerger, G., Leder, H., & Kremer, A. (2014). Context effects on emotional and aesthetic evaluations of artworks and IAPS pictures. *Acta Psychologica, 151*, 174-183.

Gerger, G., Pelowski, M., & Leder, H. (2018). Empathy, Einfühlung, and aesthetic experience: The effect of emotion contagion on appreciation of representational and abstract art using fEMG and SCR. *Cognitive Processing, 19*(2), 147-165.

Glaholt, M. G., & Reingold, E. M. (2009). Stimulus exposure and gaze bias: A further test of the gaze cascade model. *Attention, Perception, & Psychophysics, 71*(3), 445-450.

Goffaux, V., Jacques, C., Mouraux, A., Oliva, A., Schyns, P., & Rossion, B. (2005). Diagnostic colours contribute to the early stages of scene categorization: Behavioural and neurophysiological evidence. *Visual Cognition, 12(*6), 878-892.

Graf, L. K., & Landwehr, J. R. (2015). A dual-process perspective on fluency-based aesthetics: The pleasure-interest model of aesthetic liking. *Personality and Social Psychology Review, 19*(4), 395-410.

Grewe, O., Kopiez, R., & Altenmüüller, E. (2009). The chill parameter: Goose bumps and shivers as promising measures in emotion research. Music Perception: *An Interdisciplinary Journal, 27*(1), 61-74.

Haftmann, W. (1960). Rede zur Eröffnung der II. documenta am 11. Juli 1959 in Kassel. Stadt Bochum.

Hanich, J., Wagner, V., Shah, M., Jacobsen, T., & Menninghaus, W. (2014). Why we like to watch sad films. The pleasure of being moved in aesthetic experiences. *Psychology of Aesthetics, Creativity, and the Arts, 8*(2), 130.

Heidenreich, S. M., & Turano, K. A. (2011). Where does one look when viewing artwork in a museum?. *Empirical Studies of the Arts, 29*(1), 51-72.

Hekkert, P., & Van Wieringen, P. C. (1996). Beauty in the eye of expert and nonexpert beholders: A study in the appraisal of art. *The American Journal of Psychology, 109*(3), 389.

Isham, E. A., & Geng, J. J. (2013). Looking time predicts choice but not aesthetic value. *PloS one, 8*(8), e71698.

Izard, C. E. (1977). Anger, disgust, and contempt and their relationship to hostility and aggression. *In Human emotions* (pp. 329-354). Springer, Boston, MA.

James, W. (1890). Attention. The principles of psychology, 1, 402-458.

Kang, S. M., & Shaver, P. R. (2004). Individual differences in emotional complexity: Their psychological implications. *Journal of personality, 72*(4), 687-726.

Kleinke, C. L., Gitlin, K. S., & Segal, H. A. (1973). Effect of perceived looking time on evaluation of paintings. *Perceptual and motor skills, 37*(2), 421-422.

Konecni, V. J. (2005). The aesthetic trinity: Awe, being moved, thrills. *Bulletin of Psychology and the Arts, 5*(2), 27-44.

Konečni, V. J. (2008). Does music induce emotion? A theoretical and methodological analysis. *Psychology of Aesthetics, Creativity, and the Arts, 2*(2), 115.

Kreitler, H., & Kreitler, S. (1972). Does extrasensory perception affect psychological experiments?. *The Journal of Parapsychology, 36*(1), 1.

Kreitler, H., & Kreitler, S. (1980). Psychologie der Kunst (C. Krzepicki & R. Krzepicki, Übers.). Stuttgart: Kohlhammer.(Original erschienen 1972: Psychology of the arts).

Krosnick, J. A. (2018). Questionnaire design. In *The Palgrave handbook of survey research* (pp. 439-455). Palgrave Macmillan, Cham.

Kuchinke, L., Trapp, S., Jacobs, A. M., & Leder, H. (2009). Pupillary responses in art appreciation: Effects of aesthetic emotions. *Psychology of Aesthetics, Creativity, and the Arts, 3*(3), 156.

Lang, P. J., Bradley, M. M., Fitzsimmons, J. R., Cuthbert, B. N., Scott, J. D., Moulder, B., & Nangia, V. (1998). Emotional arousal and activation of the visual cortex: an fMRI analysis. *Psychophysiology, 35*(2), 199-210.

Lasher, M. D., Carroll, J. M., & Bever, T. G. (1983). The cognitive basis of aesthetic experience. *Leonardo,* 196-199.

Latif, N., Gehmacher, A., Castelhano, M. S., & Munhall, K. G. (2014). The art of gaze guidance. *Journal of experimental psychology: human perception and performance, 40*(1), 33.

Leder, H., Belke, B., Oeberst, A., & Augustin, D. (2004). A model of aesthetic appreciation and aesthetic judgments. *British journal of psychology, 95*(4), 489-508.

Leder, H., Gerger, G., Brieber, D., & Schwarz, N. (2014). What makes an art expert? Emotion and evaluation in art appreciation. *Emotion & Cognition*.

Leder, H., Gerger, G., Dressler, S. G., & Schabmann, A. (2012). How art is appreciated. *Psychology of Aesthetics, Creativity, and the Arts, 6*(1), 2.

Leder, H., & Nadal, M. (2014). Ten years of a model of aesthetic appreciation and aesthetic judgments: The aesthetic episode–Developments and challenges in empirical aesthetics. *British Journal of Psychology, 105*(4), 443-464.

Leder, H., Tinio, P. P., Fuchs, I. M., & Bohrn, I. (2010). When attractiveness demands longer looks: The effects of situation and gender. *The Quarterly journal of experimental psychology, 63*(9), 1858-1871.

Lengger, P. G., Fischmeister, F. P. S., Leder, H., & Bauer, H. (2007). Functional neuroanatomy of the perception of modern art: A DC–EEG study on the influence of stylistic information on aesthetic experience. *Brain research, 1158*, 93-102.

Lipps, T. (1903). Ästhetik: Psychologie des Schönen und der Kunst. T. 1, *Grundlegung der Ästhetik.* Voss.

Locher, P., Krupinski, E. A., Mello-Thoms, C., & Nodine, C. F. (2008). Visual interest in pictorial art during an aesthetic experience. *Spatial vision, 21*(1-2), 55-78.

Maio, G. R., & Esses, V. M. (2001). The need for affect: Individual differences in the motivation to approach or avoid emotions. *Journal of personality, 69*(4), 583-614.

Marin, M. M., & Leder, H. (2016). Effects of presentation duration on measures of complexity in affective environmental scenes and representational paintings. *Acta psychologica, 163*, 38-58.

Martindale, C., Moore, K., & West, A. (1988). Relationship of preference judgments to typicality, novelty, and mere exposure. *Empirical Studies of the Arts, 6*(1), 79-96.

Melcher, D., & Bacci, F. (2013). Perception of emotion in abstract artworks: a multidisciplinary approach. *In Progress in brain research* (Vol. 204, pp. 191-216). Elsevier.

Menninghaus, W., Wagner, V., Hanich, J., Wassiliwizky, E., Kuehnast, M., & Jacobsen, T. (2015). Towards a psychological construct of being moved. *PloS one, 10*(6), e0128451.

Munar, E., Nadal, M., Rosselló, J., Flexas, A., Moratti, S., Maestú, F., ... & Cela-Conde, C. J. (2012). Lateral orbitofrontal cortex involvement in initial negative aesthetic impression formation. *PLoS One, 7*(6), e38152.

Noguchi, Y., & Murota, M. (2013). Temporal dynamics of neural activity in an integration of visual and contextual information in an esthetic preference task. *Neuropsychologia, 51*(6), 1077-1084.

O'Hare, D., & Gordon, I. (1977). Dimensions of the perception of art: Verbal scales and similarity judgements. *Scandinavian Journal of Psychology, 18*(1), 66-70.

Panksepp, J. (1995). The emotional sources of" chills" induced by music. Music Perception: *An Interdisciplinary Journal, 13*(2), 171-207.

Pelowski, M., & Akiba, F. (2011). A model of art perception, evaluation and emotion in transformative aesthetic experience. *New Ideas in Psychology, 29*(2), 80-97

Pelowski, M., Gerger, G., Chetouani, Y., Markey, P. S., & Leder, H. (2017). But is it really art? The classification of images as "Art"/"Not Art" and correlation with appraisal and viewer interpersonal differences. *Frontiers in psychology, 8*, 1729.

Pelowski, M., Liu, T., Palacios, V., & Akiba, F. (2014). When a Body Meets a Body: An Exploration of the Negative Impact of Social Interactions on Museum Experiences of Art. *International Journal of Education & the Arts, 15*(14), n14.

Pelowski, M. J. (2015). Tears and transformation: Feeling like crying as an indicator of insightful or "aesthetic" experience with art. *Frontiers in Psychology, 6*, 1006.

Pelowski, M., Markey, P. S., Forster, M., Gerger, G., & Leder, H. (2017). Move me, astonish me… delight my eyes and brain: The Vienna integrated model of top-down and bottom-up processes in art perception (VIMAP) and corresponding affective, evaluative, and neurophysiological correlates. *Physics of Life Reviews, 21*, 80-125.

Ramachandran, V. S., & Hirstein, W. (1999). The science of art: A neurological theory of aesthetic experience. *Journal of consciousness Studies, 6*(6-7), 15-51.

Rammstedt, B., & John, O. P. (2007). Measuring personality in one minute or less: A 10-item short version of the Big Five Inventory in English and German. *Journal of research in Personality, 41*(1), 203-212.

Roets, A., & Van Hiel, A. (2011). Item selection and validation of a brief, 15-item version of the Need for Closure Scale. *Personality and Individual Differences, 50*(1), 90-94.

Rozin, P., & Cohen, A. B. (2003). High frequency of facial expressions corresponding to confusion, concentration, and worry in an analysis of naturally occurring facial expressions of Americans. *Emotion, 3*(1), 68.

Ryan, V. L. (2001). The physiological sublime: Burke's critique of reason. *Journal of the History of Ideas, 62*(2), 265-279.

Schepman, A., Rodway, P., Pullen, S. J., & Kirkham, J. (2015). Shared liking and association valence for representational art but not abstract art. *Journal of vision, 15*(5), 11-11.

Schlink, S., & Walther, E. (2007). Kurz und gut: Eine deutsche Kurzskala zur Erfassung des Bedürfnisses nach kognitiver Geschlossenheit. *Zeitschrift für Sozialpsychologie, 38*(3), 153-161.

Silvia, P. J. (2005). Cognitive appraisals and interest in visual art: Exploring an appraisal theory of aesthetic emotions. *Empirical studies of the arts, 23*(2), 119-133.

Silvia, P. J. (2006). Artistic training and interest in visual art: Applying the appraisal model of aesthetic emotions. *Empirical studies of the arts, 24*(2), 139-161.

Silvia, P. J. (2009). Looking past pleasure: anger, confusion, disgust, pride, surprise, and other unusual aesthetic emotions. *Psychology of Aesthetics, Creativity, and the Arts, 3*(1), 48.

Silvia, P. J. (2010). Confusion and interest: The role of knowledge emotions in aesthetic experience. *Psychology of Aesthetics, Creativity, and the Arts, 4*(2), 75.

Silvia, P. J., & Nusbaum, E. C. (2011). On personality and piloerection: Individual differences in aesthetic chills and other unusual aesthetic experiences. *Psychology of Aesthetics, Creativity, and the Arts, 5*(3), 208.

Smith, L. F., Bousquet, S. G., Chang, G., & Smith, J. K. (2006). Effects of time and information on perception of art. *Empirical Studies of the Arts, 24*(2), 229-242.

Smith, J. K., & Smith, L. F. (2001). Spending time on art. *Empirical Studies of the Arts, 19*(2), 229-236.

Smith, L. F., Smith, J. K., & Tinio, P. P. (2017). Time spent viewing art and reading labels. *Psychology of Aesthetics, Creativity, and the Arts, 11*(1), 77.

Tellegen, A., & Atkinson, G. (1974). Openness to absorbing and self-altering experiences (" absorption"), a trait related to hypnotic susceptibility. *Journal of abnormal psychology, 83*(3), 268.

Tinio, P. P. (2013). From artistic creation to aesthetic reception: The mirror model of art. *Psychology of Aesthetics, Creativity, and the Arts, 7*(3), 265.

Torralba, A., & Oliva, A. (2003). Statistics of natural image categories. *Network: computation in neural systems, 14*(3), 391-412.

Tröndle, M., Wintzerith, S., Wäspe, R., & Tschacher, W. (2012). A museum for the twenty-first century: The influence of 'sociality'on art reception in museum space. *Museum Management and Curatorship, 27*(5), 461-486.

Wertheimer, M. (1923). Laws of organization in perceptual forms. *A source book of Gestalt Psychology.*

Appendix

Abstract

Psychological research of empirical aesthetics rarely looks at complex, possibly transforming, emotional responses towards artworks in laboratory settings. Furthermore, research rarely looks at the responses towards artworks that are evoked by naturalistic viewing durations (as in museums). Thus, the present study aimed to explore whether complex emotions (such as activation, excitement, awe, being moved, thrills, insight, chills, anger, confusion, anxiety) can be evoked in the laboratory setting at all. And, if so, whether these emotions and general appraisal (liking, emotional valence, understanding, complexity, emotional change, wanting to look longer) changes depending on viewing duration (between subjects variable). We chose viewing durations of 100ms, 500ms, 6000ms and 30000ms due to the model of art processing by Leder and Nadal (2014) and museum studies (Smith, Smith & Tinio, 2017). As previous research suggests that abstract and representative artworks might be processed differently and positive and negative valence of an artwork may also play a role, we controlled for these variables (within subjects). Results suggest, that complex emotions can be evoked in a laboratory setting. But, results also indicate that naturalistic viewing time seems to have only little (if any) impact on the art experience with most emotions staying almost constant after the viewing time of 500ms.

Keywords: Empirical aesthetics, aesthetic judgement, aesthetic emotion, viewing time

Zusammenfassung

Die psychologische Forschung im Bereich der empirischen Ästhetik betrachtet selten komplexe, möglicherweise transformierende, emotionale Reaktionen auf Kunstwerke im Labor. Darüber hinaus werden die Reaktionen selten in Bezug auf naturalistische Betrachtungszeiten (z.B. wie in Museen) erhoben. Deshalb zielte die vorliegende Studie darauf

ab, zu untersuchen, ob komplexe ästhetische Emotionen (wie Aktivierung, Erregung, Furcht, sich bewegt fühlen, thrills, Einsicht, Gänsehaut, Wut, Verwirrung, Angst) im Laborumfeld überhaupt hervorgerufen werden können. Für den Fall, dass diese komplexen Emotionen im Laborsetting hervorgerufen werden können, sollte im Weiteren untersucht werden, ob sich diese Emotionen und das ästhetische Urteil (Gefallen, positive/negative emotionale Valenz, Verstehen, Komplexität, emotionale Veränderung, der Wunsch, länger zu schauen) je nach Betrachtungsdauer (Zwischengruppenvariable) ändern. Wir wählten Betrachtungszeiten von 100ms, 500ms, 6000ms und 30000ms aufgrund des Modells der Kunstverarbeitung von Leder und Nadal (2014) und Museumsstudien (Smith, Smith & Tinio, 2017). Da frühere Untersuchungen darauf hindeuten, dass abstrakte und repräsentative Kunstwerke unterschiedlich verarbeitet werden und auch die positive und negative Valenz eines Kunstwerks eine Rolle spielen kann, haben wir für diese Variablen (Innergruppenvariable) kontrolliert. Die Ergebnisse deuten darauf hin, dass komplexe Emotionen im Labor hervorgerufen werden können. Allerdings deuten die Ergebnisse auch darauf hin, dass die naturalistischen Betrachtungszeiten nur einen geringen (wenn überhaupt) Einfluss auf das Kunsterlebnis zu haben scheinen. Die meisten Emotionen scheinen ab einer Betrachtungszeit von 500ms nahezu konstant zu bleiben.

Stichwörter: Empirische Ästhetik, ästhetisches Urteil, ästhetische Emotion, Betrachtungszeit

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Set of statements to rate aesthetic appraisal and emotion

All items were presented in randomized order one after the other, after each image presentation.

All Items with German translation below:

1. This image makes me feel confused.

   Durch das Bild fühle ich mich verwirrt.

2. I would have liked to look at the image for a longer time.

   Ich hätte das Bild gerne länger betrachtet.

3. This image makes me feel activated.

   Durch das Bild fühle ich mich aktiviert.

4. This image makes me feel excited.

   Durch das Bild fühle ich mich begeistert.

5. This image makes me feel angry.

   Durch das Bild fühle ich mich verärgert.

6. This image makes me feel awe.

   Durch das Bild fühle ich mich ehrfürchtig.

7. This image makes me feel moved.

   Durch das Bild fühle ich mich bewegt.

8. This image makes me feel positive.

   Durch das Bild fühle ich mich positiv.

9. This image makes me feel negative.

   Durch das Bild fühle ich mich negativ.

10. I like this image.

    Das Bild gefällt mir.

11. I understand this image.

    Ich verstehe das Bild.

12. This image makes me feel thrilled.

    Durch das Bild fühle ich mich thrilled.

13. While I was looking at the image my emotions changed.

    Während der Betrachtung des Kunstwerkes haben sich meine Emotionen verändert.

14. I find this image complex.

    Das Bild ist komplex.

15. This image makes me feel anxiety.

Durch das Bild fühle ich mich ängstlich.

16. This image makes me feel insight.

Durch das Bild fühle ich plötzliche Einsicht.

17. This image makes me feel chills.

Durch das Bild fühle ich Gänsehaut.

Procedure: exemplary for 100ms viewing time condition.

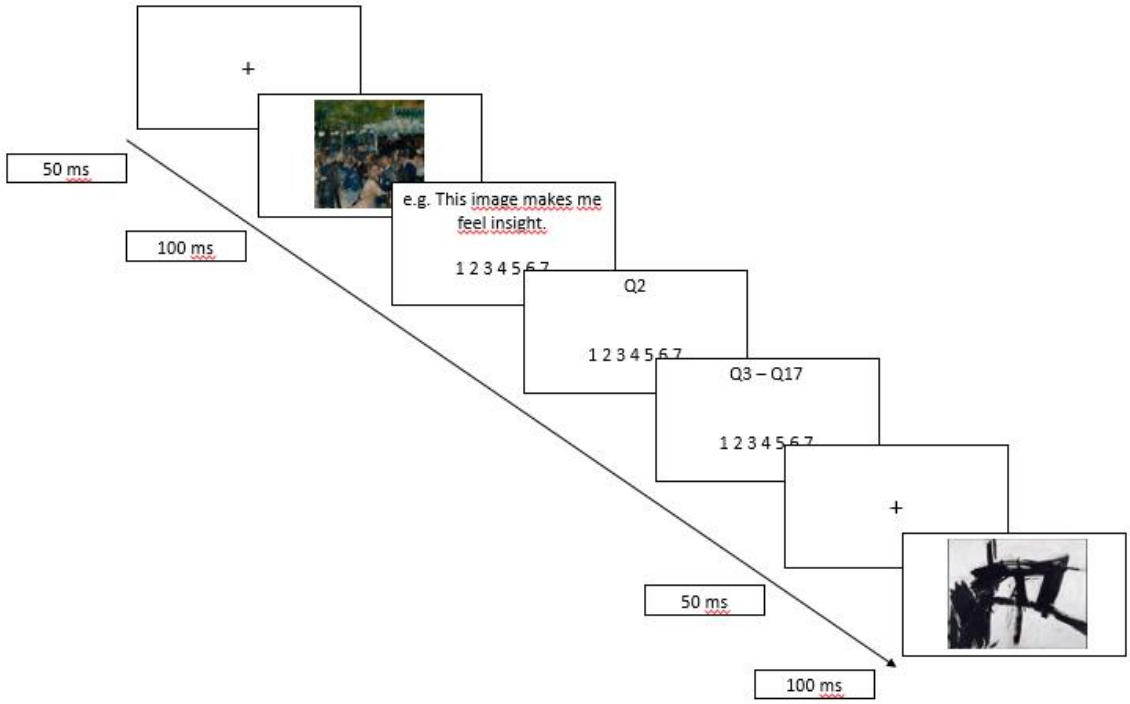


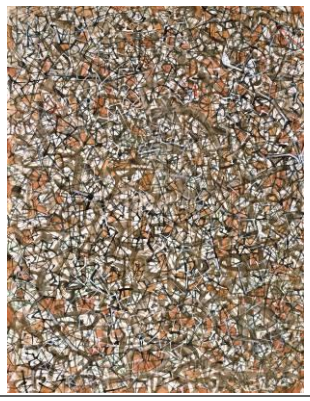
Figure 18: Example of the procedure for the 100ms viewing condition.

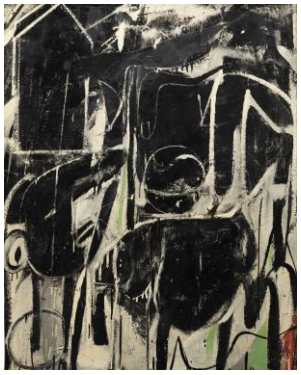
Artworks used in this study

Table 4: Artworks that were used as stimuli in this study. Differentiation into the four groups accourding to the VAPS.

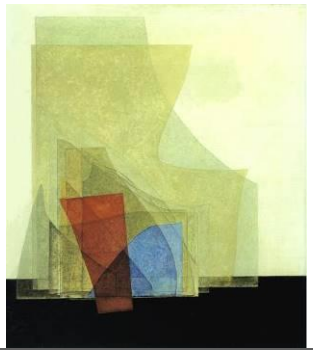
Abstract artworks with negative Valence	
	*Leger, Fernand* *Mechanical Element*

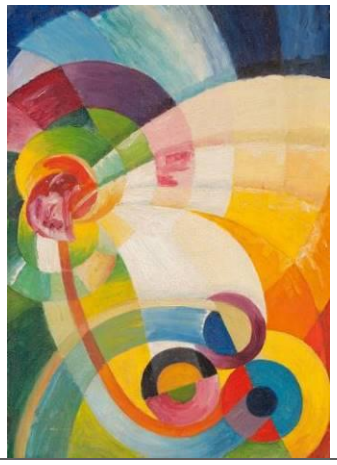
	*Mondrian, Piet* *Apfelbaum*
	*Balla, Giacomo* *Speeding Automobile*
	*Balla, Giacomo* *Swifts, Paths of Movement and Dynamic Sequences*
	*Matta, Roberto* *Years of Fear*

	*Malewitsch,* *Kasimir, Supremus Nr. 50*
	*Kline, Franz* *Mahoning*
	*Franz Kline.* *American*
	*Tobey, Mark* *Advance of History*

	*Kooning de, Willem* *Black Friday*
	*Kooning de, Willem* *Composition*
	*Götz, Karl Otto* *Brien Elven*
	*Wols* *Untitled*

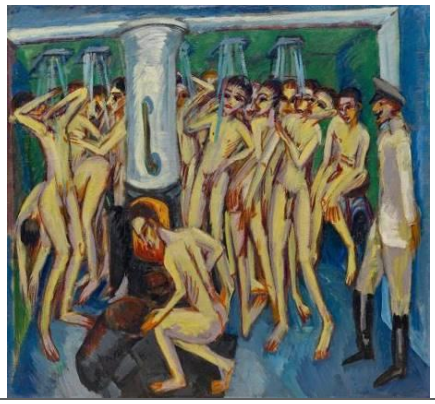
	*Wols* *Untitled*
	*Soulages, Pierre* *Painting*
	*Poliakoff, Serge* *Composition rouge et bleue*
	*de Stael, Nicolas* *Composition*

Abstract artworks with positive valence	
	*Feininger, Lyonell* *Glasscherbenbild*
	*Mathieu, Georges* *Rêve de flamme*
	*Malewitsch, Kasimir* *Black Square, Blue Triangle*
	*O`Keeffe, Georgia* *White Bird of Paradise*

	*Götz, Karl Otto* *Giverny VII*
	*O`Keeffe, Georgia* *Abstraction Blue*
	*O`Keeffe, Georgia* *Lake George, Coat and Red*
	*Kupka, František* *Untitled*

	*Kupka, František* *The Coloroud One*
	*Delaunay, Robert* *Simultanous Windows*
	*Morgner, Wilhelm* *Astral Komposition*
	*Delaunay, Robert* *Une fenêtre*

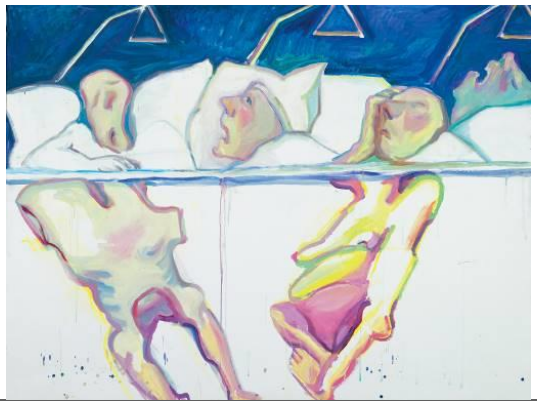
	*Kandinsky, Wassily* *Untitled*
	*Freundlich, Otto* *Komposition*
	*Boccioni, Umberto* *Dynamik eines Fußball-Spielers (Dinamismo di un Foot-baller)*
	*Severini, Gino* *Ballerina bow sea*

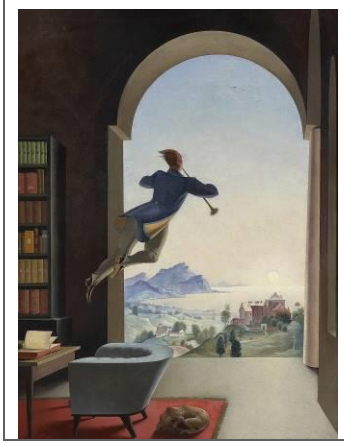
	*Hofmann, Hans* *The Gate*
Representative artworks with negative valence	
	*Beckmann, Max* *The Night*
	*Kirchner, Ernst Ludwig* *Artillerymen*

	*Brugghen ter, Hendrick* *Saint Sebastian Tended by Irene*
	*Beckmann, Max* *The Prisoners*
	*de Goya, Francisco* *Saturn verschlingt seinen Sohn*
	*Beckmann, Max* *Scene from the Destruction of Messina*

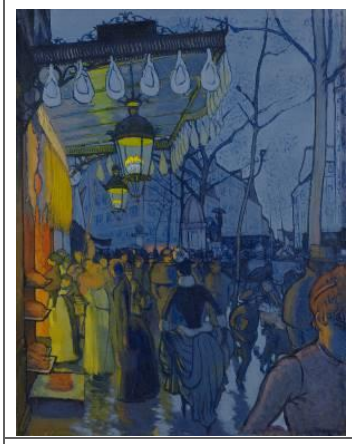
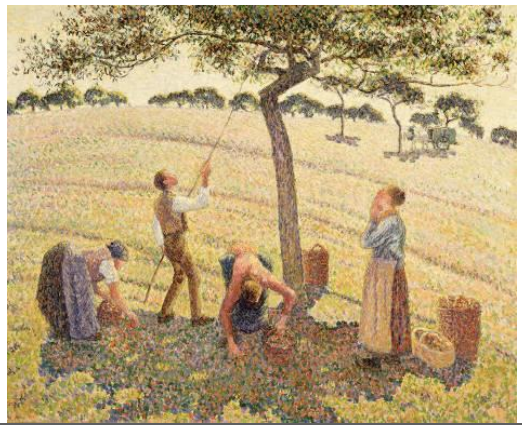
	*Luce, Maximilien Jules* *A Street in Paris in May 1871*
	*de Ribera, José* *Apolo y Marsias*
	*de Goya, Francisco* *Die Erschießung der Aufständischen*
	*de Ribera, Jusepe* *Martyrium des Heiligen Philippus*

	*Gentileschi, Artemisia* *Judith Beheading Holofernes*
	*Caravaggio* *David , 1600*
	*Dix, Otto* *The Seven Deadly Sins*
	*Baselitz, Georg* *Acker*

	*Lassnig, Maria* *Hospital*
	*Dix, Otto* *Die Operation*
	*Goncharova, Natalia* *Die Ermordung von Jean-Paul Marat*

Representative artworks with positive valence	
	*Tizian* *Venus of Urbino*
	*Boucher, François* *The Bird Catchers*
	*Sedlacek, Franz* *Evening Song*

	*Correggio da, Antonio* *Leda and the Swan*
	*Renoir, Pierre-Auguste* *Dance at the Moulin de la Galette*
	*Renoir, Pierre-Auguste* *Luncheon of the Boating Party*
	*Marc, Franz* *Yellow Cow*

	*Anquetin, Louis* *Avenue de Clichy – Five O'Clock in the Evening*
	*Pissarro, Camille* *Apple Picking at Eragny-sur-Epte*
	*Cross, Henri Edmond* *Flight of the Nymphs*
	*Slevogt, Max* *The Dancer Marietta di Rigardo*

	*Sloan, John* *Sunday, Women Drying Their Hair*
	*Manet, Édouard* *Luncheon on the Grass*
	*Repin, Ilja* *Die Saporoger Kosaken schreiben dem türkischen Sultan einen Brief*
	*Liebermann, Max* *On the Shores of the Alster, Hamburg*

	*Vallotton, Félix* *The Visit*
	*Macke, August* *Zoological Garden I*