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Implicit emotion regulation in the context of viewing artworks: ERP evidence in response to pleasant and unpleasant pictures.

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Abstract.

Presenting affective pictures as a work of art could change perceivers' judgment and strength in emotional reactions. Aesthetic theory states that perceivers of art emotionally distance themselves, allowing them to appreciate works of art depicting gruesome events. To examine whether implicit emotion regulation is induced by an art context, we assessed whether presenting pleasant and unpleasant IAPS pictures as either "works of art comprising paintings, digital renderings, and photographs of staged scenes" or "photographs depicting real events" modulated perceivers' Late Positive Potentials (LPP) and likability ratings. In line with previous research and aesthetic theory, participants evaluated the IAPS pictures as more likable when they were presented as works of art than when they were presented as photographs. Moreover, participants' late LPP amplitudes (600 – 900 ms post picture onset) in response to the pictures were attenuated in the art context condition. These results provide evidence for an implicit emotion regulation induced by the art context.

Keywords: Implicit emotion regulation; Affective pictures; Art context; ERP; Late Positive Potential

1. Introduction

Emotional content may be a prerequisite for creating art, but people will react differently to the emotional content of artworks than to the emotional content of photographs in newspapers or on websites. Scholars describe people's reaction to art as emotionally distanced (Beardsley, 1958; Bullough, 1912; Cupchik, 2002; Dawson, 1961; Kant, 1987; Stolnitz, 1961). Visitors of a museum can appreciate the skill of an artist or the emotions expressed in a painting that depicts a war scene graphically, but can be revolted by a photograph of a war scene denoting similar content at the same time. Enjoying a painting or becoming immersed in a work of art are affective responses to art. These affective responses can be measured by self-reported pleasantness and arousal ratings, and by psychophysiological measures such as skin conductance or EEG. Do human behavioral and autonomic responses to affective pictures differ when the same pictures are presented as artworks compared to when they are presented as real-life photographs?

Usually, the strength of emotional reactions depends both on situational factors (e.g., real versus fictional danger) and appraisal strategies of the individual (e.g., voluntary reinterpretation of emotional stimuli in neutral terms). Situational factors may interact with appraisal strategies as has been demonstrated in empirical research. In their classic and seminal study, Speisman, Lazarus, Mordkoff, and Davison (1964) demonstrated that the content of the soundtrack that accompanied a highly unpleasant film on subincision rites modulated the psychophysiological stress responses among viewers of the film. When the comment of the soundtrack induced defensive interpretations of the film's content, such as intellectualization or denial, participants' skin conductance levels were lower than when it induced a traumatic mode of observation. The different sound tracks can be considered situational factors that induced different types of cognitive appraisal in the participants, resulting in a more detached attitude towards the otherwise arousing stimuli materials. It should be noted that in the Speisman et al. (1964)

study, participants were not explicitly instructed to voluntarily reinterpret the film content. Hence their results also demonstrate that these changes in appraisal occur in an implicit manner.

In the present study, we examined whether an art context prompts implicit changes in the appraisal of pleasant and unpleasant pictures. These changes were investigated by measuring people's aesthetic evaluation of pictures presented as artworks and similar pictures presented as non-art pictures, and by measuring their brain electrical reactions to these pictures. We employed a counterbalanced design with two conditions, presenting pictures from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2005) as either artworks or photographs of real events.

1.1. Art experience, distancing, and emotion regulation

Art experience is thought to be qualitatively different from everyday experience (Marković, 2012). For one, art experience takes place in a certain context (e.g., a museum) and it is assumed that such a context cues our cognitive system on how to handle and respond to objects within this context. Moreover, it might trigger the anticipation of a positive emotional pleasurable experience (Cupchik, 1995; Leder, Belke, Oeberst, & Augustin, 2004). The necessity of a quick reaction and goal-oriented actions to objects might be suppressed (Cupchik & Winston, 1996), because one usually views art in a rather safe environment and the artworks pose no threat to health or survival (Dissanayake, 2007; Tooby & Cosmides, 2001). Through the lack of practical and motivational consequences, people can adopt an emotionally distanced (Bullough, 1912; Cupchik, 2002) or disinterested (Kant, 1790/1987; Stolnitz, 1961) perspective. In art perception, people go beyond mere object recognition (e.g., Cela-Conde et al., 2004; Kawabata & Zeki, 2004) and also tend to react to structural and stylistic properties of pictures presented as artworks (e.g., Cupchik, Vartanian, Crawley, & Mikulis, 2009; Kirk, Skov, Christensen, & Nygaard, 2009). The emotional distance to an artwork may thus be further enhanced

because art viewing may have the observer focus on the techniques employed in the art work rather than its emotional content (Markovic, 2012).

People are capable of enjoying artworks that depict gruesome acts and situations (e.g., paintings by Francis Bacon). The art context induces a reappraisal that can be conceived as a form of implicit emotion regulation. Such implicit emotion regulation strategies may not be retained for art alone. People are capable of using the same strategies for everyday objects and situations (cf., Dewey, 2005). Emotional cues guide our attention, in order to adequately react to our environment. However, not everything that emotionally grabs our attention on one occasion is something we should consider in another situation, which is why we employ emotion regulation strategies (Gross, 1998). For example, the sound of an explosion while watching a war movie on television will be responded to differently than the sound of an explosion when we walk on the street. In any case, the emotional appraisal of visual stimuli happens quickly which is why this process can adequately be captured by EEG.

Several studies have demonstrated that the art context as such brings about changes in emotional and cognitive processing. In one study, participants' low positive feelings for disgust images became more positive when these images were framed as art photographs instead of documentary photographs (Wagner, Menninghaus, Hanich, & Jacobsen, 2014). In another study, participants judged negative stimuli as aesthetically more positive when these pictures were presented as artworks, than when the same stimuli were presented as non-art pictures (Gerger, Leder, & Kremer, 2014).

1.2. LPP and emotion regulation

In EEG research on emotion, the late positive potential (LPP) is a reliable event-related potential (ERP) that indexes sustained engagement of attentional resources by motivational systems (Moran, Jendrusina, & Moser, 2013). The LPP is a slow and positive deviation that develops approximately 300 ms after stimulus onset and lasts for hundreds of milliseconds to seconds, depending on the duration of

the emotional stimuli (Cuthbert, Schupp, Bradley, Birbaumer, & Lang, 2000). The amplitude of the LPP is larger to emotionally intense and arousing pictures than to neutral pictures (Cuthbert et al., 2000; Schupp, Junghöfer, Weike, & Hamm, 2003). Importantly, people are capable of actively attenuating their emotional response. Specifically, when participants were asked to reinterpret negative images in neutral terms, their resulting LPP amplitudes decreased, reflecting the reductions in self-reported emotional intensity as a consequence of emotion regulation (Hajcak & Nieuwenhuis, 2006; Thiruchselvam, Blechert, Sheppes, Rydstrom, & Gross, 2011).

Aside from voluntary emotion regulation, the situational context can have an involuntary and automatic regulation effect. For instance, the LPP amplitudes, unpleasantness ratings, and arousal ratings were reduced when unpleasant IAPS pictures were described beforehand in neutral terms to the participants (Foti & Hajcak, 2008). Also, when unpleasant pictures were presented as fictitious (i.e., pictures from a movie scene), participants' LPP amplitudes were attenuated in comparison to pictures that were presented as real scenes (Mocaiber et al., 2010). Together, these results are indicative for context related and involuntary emotion regulation of which the perceiver might not be aware.

1.3. Research aims

The current study involved an orthogonal design to investigate the effect of art context on LPP amplitudes in response to positively and negatively valenced pictures, and on the self-reported likeability, valence, and arousal ratings for these pictures. For that reason, we presented pleasant and unpleasant IAPS pictures, which were edited to increase their aesthetic quality (see Method), as either works of art or photographs of real events.

Because distancing can be conceived as a form of implicit emotion regulation, we hypothesized that, as a result of distancing, LPP amplitudes would be attenuated in the artwork compared to the photograph condition. Because the LPP is clearly enhanced for both pleasant and unpleasant stimuli,

compared to neutral stimuli, the LPP is assumed to be less sensitive to valence than to arousal (Leite et al., 2012; Schupp et al., 2000). However, some LPP valence effects have been reported. As attention to, and processing of, aversive stimuli may have important survival value, it can be expected that unpleasant compared to pleasant stimuli elicit larger LPP amplitudes. Larger LPP amplitudes in response to unpleasant versus pleasant pictures have been reported by a number of studies (e.g., Foti, Hajcak, & Dien, 2009; Schupp et al., 2000). In the present study, we might therefore expect larger LPP amplitudes in response to unpleasant compared to pleasant pictures.

LPP studies have demonstrated emotion down-regulation effects for both pleasant stimuli (e.g., Delgado, Gillis, & Phelps, 2008) and unpleasant stimuli (e.g., Foti & Hajcak, 2008; Hajcak & Nieuwenhuis, 2006) . For the present research, we therefore expected no specific interaction of valence and context. That is, the implicit emotion regulation effect as a consequence of the art context and as reflected in the LPP will be comparable for pleasant and unpleasant pictures (i.e., a comparable reduction in arousal). Because reappraisal, as a form of emotion regulation, is thought to influence emotion processing in a relatively later stage (Thiruchselvam et al., 2011), we expected attenuated amplitudes in the art condition for the later part of the LPP in particular.

We further expected increased likeability ratings for images presented as artworks, because the aesthetic context would elicit an additional subjective satisfying reaction to the pictures' form and style (Cupchik, Vartanian, Crawley, & Mikulis, 2009; Jacobsen, Schubotz, Höfel, & von Cramon, 2006). As Gerger et al. (2014) and Wagner et al. (2014) found more positive judgments for unpleasant stimuli only, we expected that the increased likeability in the art context will be more evident for unpleasant than for pleasant stimuli. Further, we expected decreased arousal ratings and more positive valence ratings for pictures presented as artworks.

2. Method

2.1. Participants

Participants were 24 students (10 men, 14 women) from the Erasmus University Rotterdam. Ages ranged from 19 to 26 years, with a mean age of 21.08 years. One of them was left-handed, the others were right-handed by self-report. As we did not expect any brain laterality effects for the ERP measures, the left-handed participant was not excluded from the present study. All students received course credits for participation. The departmental ethics committee approved the study and the participants provided written informed consent.

2.2. Stimuli and procedure

Stimuli consisted of 100 pictures of the International Affective Picture System (IAPS, Lang, Bradley, & Cuthbert, 2005). IAPS is widely used in emotion research. It is a standardized set of about 1000 photographs that depict people, objects, and events representing all types of human emotional experience (see for a detailed description, Bradley & Lang, 2007). Each picture has been rated by a large group of men and women on the extent to which it elicits feelings of pleasure and arousal. On the basis of the published mean affective ratings, picture sets can be selected that are equated on the dimensions of valence and arousal. Half of the IAPS pictures selected for the present research had an unpleasant emotional valence (e.g., photographs of mutilated bodies, crime, disasters), the other half were pleasant (e.g., sport events, loving families, erotic couples). For unpleasant pictures, the mean IAPS norm scores (rated on a scale from 1 to 9) were 2.05 for valence and 6.19 for arousal. For pleasant pictures, the mean IAPS norm scores were 7.36 for valence and 5.95 for arousal. With Camera Raw 6.0 of Adobe Bridge CS5, the original digital IAPS images were edited to look more aesthetically pleasing. The images

were uniformly adjusted in exposure, contrast, clarity, color-saturation, sharpness, and noise reduction (see Appendix A).

There were two conditions: the photograph condition and the artwork condition, each with a set of 25 pleasant and 25 unpleasant pictures. Picture sets were matched for valence and arousal ratings and were counterbalanced across conditions. In the photograph condition, participants were instructed: *"The following images are a collection of family photographs, newspaper photographs, and other forms of documentation photography. To ensure that you are not familiar with these images, the photographs were selected from local newspapers and personal collections. Permission for using these images was obtained where necessary. Keep in mind that the images you will see are photographs of real-life events."* In the artwork condition, participants were instructed: *"The following images are digital reproductions of artworks selected from reputable institutions, like the Guggenheim, National Gallery, Saatchi & Saatchi, and Christies. To ensure that you are not familiar with these images, the artworks were selected from the institution's undisplayed collections. Keep in mind that the images you will see are reproductions of paintings, digital renderings, or photographs of staged scenes using actors and props."*

To create the impression of research about art perception, all participants completed an art-experience questionnaire (Chatterjee, Widick, Sternschein, Smith, & Bromberger, 2010) prior to the EEG experiment. Participants were then seated in a dimly-lit room. Half of the participants started with the photo condition, the other half started with the artwork condition. In each condition, participants passively viewed the positive and negative pictures. After each picture, they rated the likability, valence, and arousal of it by pressing one of the numbers 1-9 on a keyboard in front of them for each rating scale. For the likability ratings, there was an on-screen instruction: *"how much did you like the artwork/photograph that you saw? (1 = not at all; 9 = very much)"*. For the valence and arousal ratings, the appropriate diagrams of the self-assessment manikin (SAM, Bradley & Lang, 1994) were displayed

on the screen. These diagrams are non-verbal visual analog scales with a row of schematic human faces or bodies indicating valence (very sad to very happy face) or arousal (calm to heavily pounding heart), respectively.

The sequence of each trial was (1) the variable 2250-2750 ms presentation of a fixation cross in the middle of the screen, (2) the 3000 ms presentation of the IAPS picture (3) the 1000 ms presentation of a fixation cross, after which the on-screen rating instructions were given until rating responses were made. Pictures fitted a 20" PC monitor screen with a resolution of 1024 × 768 pixels, and were viewed at a distance of 120 cm. Prior to the experimental run, there were 10 practice trials with unspecified pictures that were not used in the photograph or artwork condition.

2.3. EEG recording

EEG activity was recorded using a BioSemi Active-Two system from 32 pin type active Ag/AgCl electrodes mounted in an elastic cap. Electrodes were Fz, Cz, Pz, Oz, FP1/2, AF3/4, F3/4, F7/8, FC1/2, FC5/6, C3/4, T7/8, CP1/2, CP5/6, P3/4, P7/8, PO3/4, and O1/2. Flat-type active electrodes were attached to the left and right mastoids. Electro-oculogram (EOG) activity was recorded from flat-type active electrodes placed above and beneath the left eye, and from electrodes at the outer canthus of each eye. An additional pin-type active electrode (common mode sense) and a pin-type passive electrode (driven right leg) were used to comprise a feedback loop for amplifier reference. The EEG and EOG data were digitized with a sampling rate of 512 Hz, a low-pass filter of 134 Hz, and 24-bit A/D conversion.

2.4. ERP data analysis

The EEG signals were referenced to the averaged mastoids, and phase-shift-free filtered with a band pass of 0.10–30 Hz (24 dB/Oct). Correction for ocular artifacts was done using the Gratton, Coles, and Donchin (1983) algorithm. ERP epochs were extracted lasting from 100 ms before stimulus onset to 1500 ms after stimulus onset. The ERP signals were defined relative to the mean amplitude of the prestimulus period. For each participant and each condition, average ERPs were computed for the pleasant and unpleasant pictures, respectively. Epochs with a baseline-to-peak amplitude difference larger than 100µV or smaller than -100µV on any channel were excluded from further analysis. The mean percentage of valid epochs at analysis-relevant electrodes was 98%. Visual inspection of the grand average waveforms revealed that the 350-600-ms time window after stimulus onset best represented the early LPP and the 600-900 ms time window best represented the later part of the LPP. These time windows are consistent with our previous LPP studies using IAPS pictures (e.g., Langeslag & Van Strien, 2009, 2010). The LPP has a symmetrical scalp distribution with a maximum amplitude at midline electrodes. Over the course of affective processing, the LPP shifts from a posterior to a more central position (Hajcak, Weinberg, MacNamara, & Foti, 2012). For these reasons, and after visual inspection of the LPP topographies, the 350-600 ms LPP was scored at occipito-parietal and parietal electrodes (P3, Pz, P4, PO3, PO4), and the 600-900 ms LPP was scored at central and parietal electrodes (Cz, CP1, CP2, Pz).

2.5. Statistical analysis

For the likability, SAM valence, and SAM arousal ratings, we conducted separate repeated measures analyses of variance (ANOVAs) with valence category (pleasant, unpleasant), and context (photos, artworks) as within-subject factors. For the early and late LPP we conducted separate repeated

measures analyses of variance (ANOVAs) with valence category (pleasant, unpleasant), context (photos, artworks), and electrode (P3, Pz, P4, PO3, PO4 for the early LPP; Cz, CP1, CP2, Pz for the late LPP) as within-subject factors.

3. Results

3.1. Participants' ratings

Rating data of one participant were missing due to technical failure. Pleasant pictures, when compared to unpleasant pictures, were rated higher on likability [6.29 versus 3.13; $F(1,22) = 78.28$, $p < .001$, $\eta_p^2 = .78$], SAM valence [6.26 versus 2.62; $F(1,22) = 124.65$, $p < .001$, $\eta_p^2 = .85$], and SAM arousal [4.76 versus 3.15; $F(1,22) = 36.59$, $p < .001$, $\eta_p^2 = .63$]. Across pleasant and unpleasant pictures, artworks were rated higher on likability than photos [4.85 versus 4.57; $F(1,22) = 1.76$, $p = .044$, $\eta_p^2 = .17$]. Although there was no significant interaction of valence and condition ($p = .129$), inspection of the data revealed that the increase in likability was larger for negative pictures than for positive pictures (negative pictures, photo: M= 2.92, SD= 1.25, artwork: M = 3.35, SD = 1.47; positive pictures, photo: M= 6.23, SD= 1.09, artwork: M = 6.35, SD = 1.07). Artworks and photos did not differ in SAM valence and SAM arousal ratings.

3.2. LPP

For the 350-600 ms mean LPP amplitude measure we found a significant main valence category effect, $F(1,23) = 10.25$, $p = .004$, $\eta_p^2 = .31$, with larger amplitudes for unpleasant than for pleasant pictures. The valence category effect is depicted in Figure 1. From this figure, it can be seen that across occipito-parietal and parietal electrodes the LPP was substantially larger for unpleasant compared to pleasant pictures.

For the 600-900 ms mean LPP amplitude measure we found a significant main context effect, with larger LPP amplitudes for photos than for artworks, $F(1,23) = 4.58$, $p = .043$, $\eta_p^2 = .17$. The context effect is depicted in Figure 2. From Figure 2, it can be seen that the LPP context effect is evident across central and parietal electrodes. Notably, there was no interaction of valence category and context, $F(1,23) = .002$, $p = .966$, $\eta_p^2 = .00$) .

4. Discussion

The present study investigated if and to what extent the appreciation of, and the brain's electrophysiological responses to emotional stimuli are affected by presenting pleasant and unpleasant IAPS pictures as either a work of art or a photograph depicting a real event. To summarize, both negative and positive pictures in the artwork condition were appreciated differently from pictures in the photograph condition, with likability scores being higher in the artwork condition than in the photo condition. In addition, we found that the art context resulted in a distinct attenuation of the participants' LPP in the 600-900 ms time window in response to both positively and negatively valenced pictures. These results point to an implicit emotion regulation induced by the art context.

Likability ratings were higher for pictures framed as artworks than for pictures framed as photographs. This was found for both negative and positive stimuli, although this increase in appreciation tended to be somewhat larger for negative stimuli. From the assumption of a distanced aesthetic mode (Bullough, 1912; Cupchik, 2002) it would follow that aesthetic detachment yields a better appreciation of negative stimuli in particular. Consistent with this notion, Wagner et al. (2014) found that participants experienced disgusting images more positively in the art photograph compared to the documentary photograph condition. Notably, Gerger et al. (2014) found that unpleasant but not pleasant stimuli were judged more positively in an art context. Our participants' likability ratings suggest

that their appreciation changes with context and that, in contrast to previous studies, describing both pleasant and unpleasant pictures as works of art increases these pictures' aesthetic value.

Not surprisingly, the participants' ratings on likability and SAM valence were higher for pleasant than for unpleasant pictures. Although we matched the pleasant and unpleasant picture categories on the IAPS norms for arousal, the present sample of participants exhibited higher SAM arousal ratings for pleasant compared to unpleasant pictures. From an evolutionary point of view, both pleasant (e.g., food, sex) and unpleasant stimuli may be important for survival, although prioritizing unpleasant (i.e., threatening) stimuli may have the highest acute survival value. The IAPS norm ratings show similar high arousal ratings for pleasant and unpleasant pictures (Bradley & Lang, 2007). It is not exactly clear, why our participants rated the unpleasant stimuli as relatively less arousing. It could be that in our sample, participants had a more defensive voluntary appraisal of the unpleasant stimuli, while their involuntary brain response, as reflected by a larger early LPP for unpleasant stimuli, may have been indicative of a negativity bias (i.e., prioritizing unpleasant over pleasant stimuli).

Regarding the ERP measures, we found a mean valence category effect for the early LPP (in the 350-600 ms time window) at the occipito-parietal cluster, with amplitudes being higher for unpleasant than for pleasant pictures. The larger early LPP in response to unpleasant pictures is consistent with previous research that found a larger LPP for unpleasant rather than pleasant stimuli (Foti et al., 2009; Schupp et al., 2000). The larger early LPP amplitude for unpleasant compared to pleasant pictures is not driven by the extent of self-reported arousal (Olofsson, Nordin, Sequeira, & Polich, 2008), as SAM arousal ratings were significantly lower for unpleasant than for pleasant pictures.

The centro-parietal late LPP amplitude attenuation that we found in the present study as a consequence of providing an art context, is consistent with previous research employing explicit emotion down-regulation. In their reappraisal study employing IAPS pictures, Hajcak and Nieuwenhuis

(2006) demonstrated that in the reappraise condition the 600 - 1000 ms LPP amplitude at the centro-parietal electrode (CPz) was significantly smaller than the LPP amplitude in the attend condition. The similarities in the time course and location of the LPP modulation between their study and the present results suggest that in the late LPP time window the underlying neurophysiological process involved in implicit down-regulation is comparable to the process involved in deliberate reappraisal.

Valence category modulated early LPP but not late LPP amplitude, whereas art context modulated late LPP but not early LPP amplitude. This suggests that valence categorization (pleasant versus unpleasant) precedes the implicit emotion regulation. From an evolutionary viewpoint, prioritizing unpleasant above pleasant stimuli before subsequent emotion regulation makes sense. The present early LPP valence effect, which can be interpreted as a negativity bias (Ito, Larsen, Smith, & Cacioppo, 1998), challenges the notion that the quick goal-oriented response to art works will be reduced, because one typically views art in a rather safe environment and the artworks pose no threat to survival (Dissanayake, 2007; Tooby & Cosmides, 2001). It appears that the implicit emotion regulation does not take place immediately, but at a somewhat later processing stage after valence categorization. Note that the early LPP valence effect is localized at occipito-parietal sites, while the late LPP context effect is localized at centro-parietal sites. This is consistent with the known spatial shift of the LPP over the course of affective processing from posterior to more central sites (Hajcak et al., 2012).

The LPP attenuation might result from a difference in attention allocation between artworks and non-art pictures. Presenting a picture as a work of art might entice people to appreciate its form and style instead of what is depicted (e.g., Cupchik et al., 2009). While people are goal-oriented towards non-art pictures and therefore react to what is depicted, they react differently to art (Cupchik & Winston, 1996). Instead of studying a picture's content (e.g., a grotesque picture of a severed hand), attention is allocated to how it is depicted (e.g., composition, light, and color) and as a result people's

emotional reaction is attenuated. It is our expectation that further insight into causes and mechanisms of context-related emotion regulation could be gained by continuing research with aesthetic stimuli.

The LPP context effect was not reflected in the participants' SAM valence and SAM arousal ratings as artworks and photos did not differ in these ratings. Asking participants to explicitly rate the IAPS pictures on these two emotional dimensions may be less susceptible to implicit emotion regulation.

It could be argued that the instruction that we used for the artwork condition suggested that at least some of the artworks were staged. This leaves the possibility that the not only the art context but also the fictitious character of the stimuli contributed to the implicit emotion regulation that we found (e.g., Mocaiber et al., 2010). It should be noted however, that throughout the art condition, the pictures were specifically presented as artworks. During the experiment, the context condition itself was stressed in each trial, because after each picture the participants were asked to rate the "artwork" or "photograph", respectively. Further research should disentangle the art and fiction aspect by framing pictures either as art or as staged.

A related limitation of the present research is that there was no manipulation check to find out if the participants actually believed that they were viewing artworks versus photographs. Research (Gerger et al., 2014; Wagner et al., 2014) has demonstrated the efficacy of the framing manipulation that we employed. However, it may be worthwhile to examine whether the magnitude of the LPP context effect is associated to the extent to which participants are convinced that they are looking at artworks.

We suggest several additional avenues for further research, to corroborate our results and continue the investigation into emotion and emotion regulation. Similar experiments using EMG or fMRI could provide more insight into context effects on both the valence and arousal dimension. A picture set of artworks with normative valence and arousal ratings comparable to IAPS could be used to further

investigate emotion regulation through art. Using various fictitious contexts could provide further insight in emotion regulation in general, for instance, describing pictures as staged for a documentary; staged for a prank by individuals; a frame from a movie; or a commercial advertisement.

To summarize, our results show that presenting a picture as a work of art changes people's appreciation of, and brain electrical activity to it. The late LPP in particular is attenuated by the art context. The present results are indicative of an implicit emotion regulation mechanism, which is induced by an art context and in which psychological distancing and attention to aesthetic properties might play a role.

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Figure captions

Fig. 1. A: LPP potentials (350–600 ms) in response to unpleasant (red lines) and pleasant pictures (black lines) at the occipito-parietal cluster. Negativity is up. B: Topographic map of the difference between LPP amplitudes evoked by unpleasant versus pleasant pictures.

Fig. 2. A: LPP potentials (600–900 ms) in response to photos (red lines) and artworks (black lines) at the centro-parietal cluster. Negativity is up. B: Topographic map of the difference between LPP amplitudes evoked by photos versus artworks.

Appendix A

Aesthetic IAPS pictures adjustment in Camera Raw 6.0 of Adobe CS5:

- Exposure: 0.45 points increase (starting on 0 on a scale of -4.00 to +4.00)
- Contrast: 49 points increase (on a scale of -100 to +100)
- Clarity: 29 points increase (on a scale of -100 to +100)
- Color-saturation: 36 points decrease (on a scale of -100 to +100)
- Sharpening:
    - Amount: 57 points increase (on a scale of 0 to 150)
    - Radius: 1.0 point increase (on a scale of 0 to 3.0)
    - Detail: 25 points increase (on a scale of 0 to 100)
    - Masking: 26 points increase (on a scale of 100)
- Noise Reduction,
    - Luminance: 26 points increase (on a scale of 0 to 100)
    - Luminance detail: 50 points increase (on a scale of 0 to 100)
        - Luminance Contrast, 13 increase (on a scale of 0 100)
        - Color, 10 increase (on a scale of 0 to 100)
        - Color Detail, 50 increase (on a scale of 0 to 100)

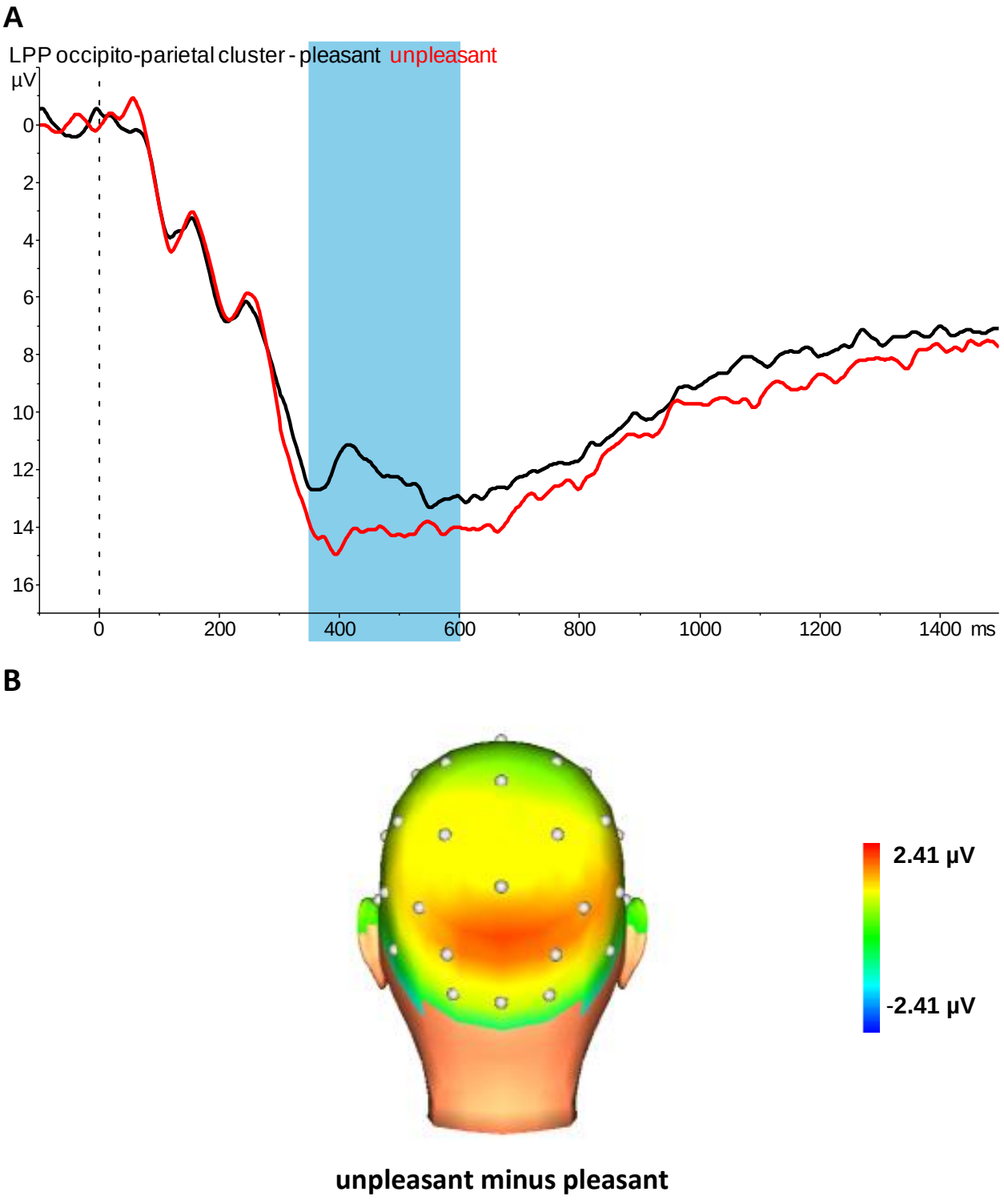
A
LPP occipito-parietal cluster - pleasant unpleasant
μV
0
2
4
6
8
10
12
14
16
0
200
400
600
800
1000
1200
1400 ms
B
2.41 μV
-2.41 μV
unpleasant minus pleasant

Fig. 1.

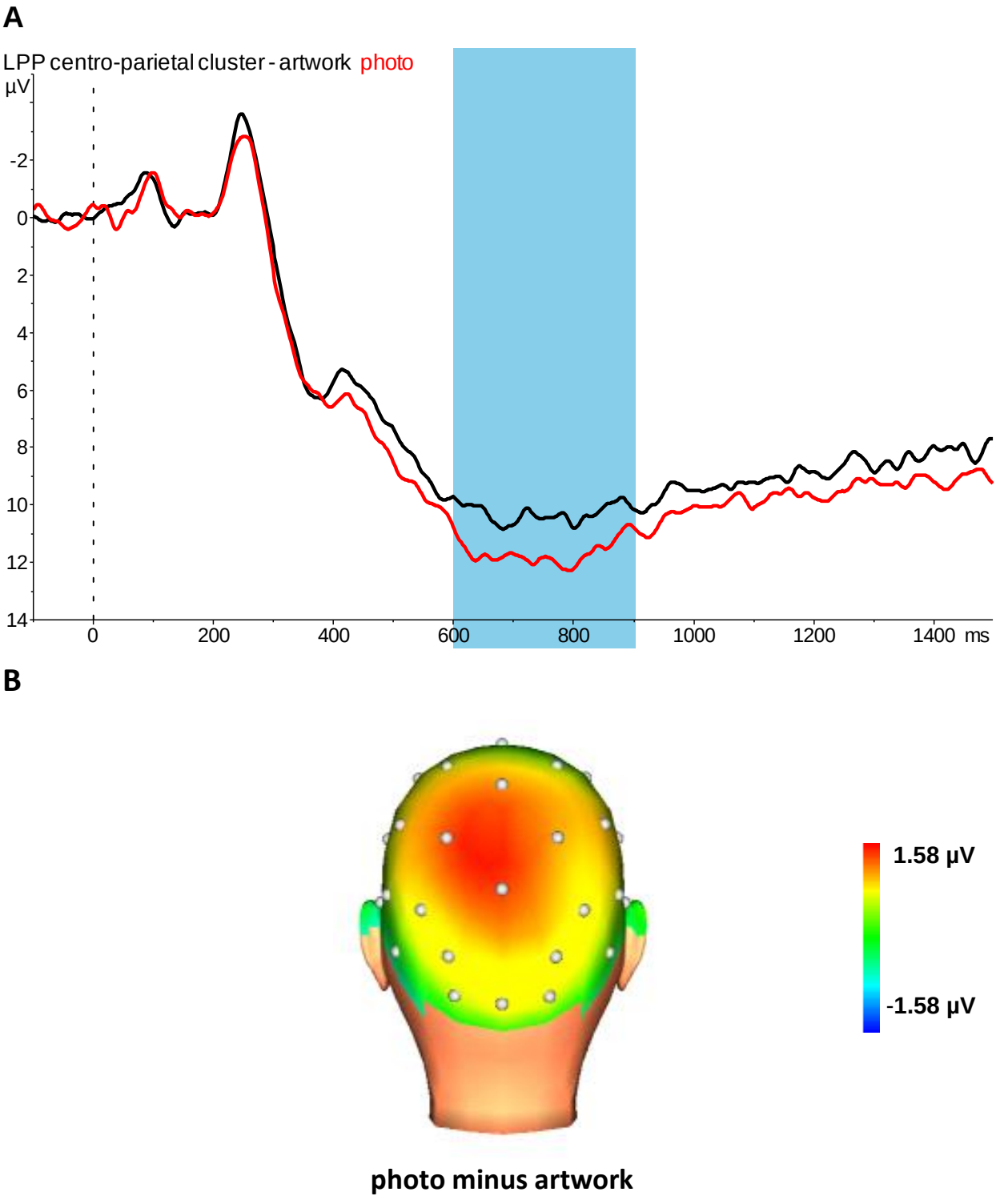
A
LPP centro-parietal cluster - artwork photo
µV
-2
0
2
4
6
8
10
12
14
0
200
400
600
800
1000
1200
1400 ms
B
1.58 µV
-1.58 µV
photo minus artwork

Fig. 2.