Running Title: Effects of Art-experience on Aesthetic Processing

Electrophysiological indices of aesthetically stimulated processes in art-experienced individuals as compared to art-naïve individuals

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ABSTRACT

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Aesthetic judgment processes were investigated in art-experienced and art-naïve individuals. Previous electrophysiological data suggest that aesthetic judgment is a two-stage process (Hofel & Jacobson, 2007). The first stage of aesthetic judgment is impression formation which is not spontaneous, and is reflected by an early Event Related Potential (ERP) frontocentral deflection. The second stage reflected by a lateralized late ERP positivity, evaluative categorization is also not spontaneous. Participants in the current study were instructed to either simply view black and white geometric patterns or were instructed to contemplate the beauty of the patterns. Results suggest that aesthetically stimulated processes differ between art-expereinced individuals and art-naive individuals, and impression formation requires intention in art-naive individuals, but occurs spontaneously in art-experienced individuals.

Electrophysiological indices of aesthetically stimulated processes in art-experienced individuals as compared to art-naive individuals

Neuroaesthetics, also known as the neuro-cognitive psychology of aesthetics, is an exciting new field of neuroscience investigating the neural processing of aesthetic experience (Cinzia and Vittorio, 2009). Aesthetic experience is what allows individuals to perceive, feel and sense an artwork by stimulating sensorimotor, emotion and cognitive processes. Although there are many mechanisms involved in aesthetic experience, most of the neuroaesthetic research done over the past ten years involves the psychophysical aspects of the visual processes in the brain. A variety of methodological techniques have been used including functional magnetic resonance (fMRI), magnetoencephalography (MEG) and electroencephalography (EEG). The neuro-cognitive psychology of aesthetics is an interesting topic for researchers because different aesthetic stimuli elicit different processes that can be studied independently (Leder, Belke, Oeberst, and Augustin, 2004). For example, emotional stimuli elicit affective processes and familiar stimuli elicit memory processes. One aspect of aesthetic experience that has been investigated in neuroaesthetics research is aesthetic judgment.

An individual's aesthetic judgment of a visual stimulus is influenced by many factors (Jacobsen, 2010) including the emotional state of the individual, the meaning or interestingness of the presented stimulus and the beauty and symmetry of the stimulus. Jacobsen and Hofel (2003, 2007) distinguished between descriptive and evaluative neuroaesthetic processes by comparing event-related potentials (ERPs) of

aesthetic judgment to ERPs of symmetric judgment. Descriptive judgments are cognitive processes that are nonevaluative, objective and do not depend on an individual's personal experience (Jacobsen and Höfel, 2003). Evaluative judgments, in contrast, are cognitive processes based on an individual's subjective experience. Jacobsen and Höfel (2003), investigated descriptive processes by asking participants to make judgments of symmetry and evaluative processes were investigated by asking participants to make judgments regarding beauty of a stimulus. The stimuli used to elicit aesthetic judgment processes were simple black and white geometric stimuli, some of which are shown in Figure 1. In Phase 1 of the Jacobsen and Höfel (2003) experiment, the participants became familiar with the 252 black and white geometric patterns while they judged each stimulus as either beautiful or not beautiful. The same geometric patterns were then presented to the participants during EEG recording.

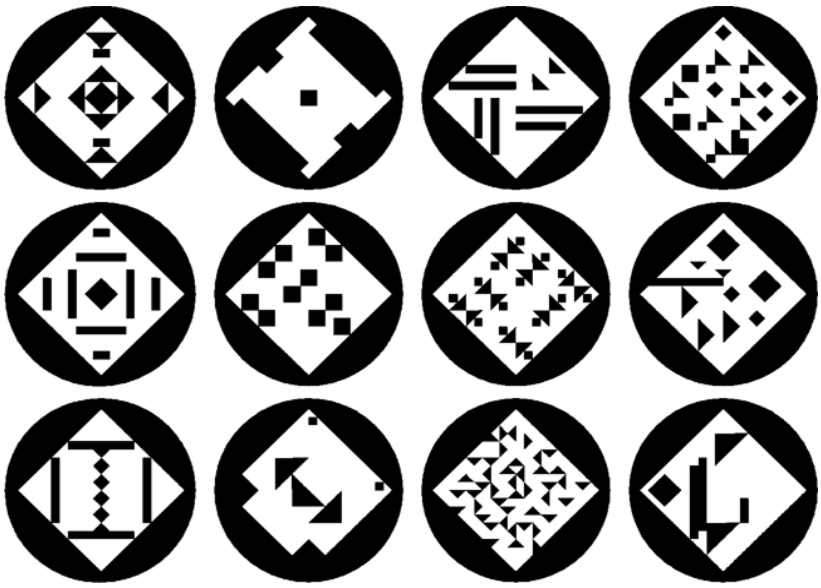

Figure 1. Examples of the black and white geometric patterns used as stimuli from Jacobsen and Höfel, (2003).

The Jacobsen and Höfel (2003) results yielded several definitive EEG signatures. A late positive potential with a right lateralization was elicited only by the beautiful judgment task. This finding concurs with a previous finding of right hemisphere involvement in aesthetic evaluative processes (Cacioppo, Crities, and Gardner, 1996). The finding that the evaluative task elicited ERPs that were not elicited by the descriptive task suggests that there are differences between descriptive and evaluative judgments processes. An early frontocentral negative deflection was also elicited during the beautiful judgment task and showed the most negative ERPs for the stimuli judged as not beautiful. The finding that not beautiful stimuli elicited different ERPs than beautiful stimuli suggests that negative and positive aesthetic evaluative processes are distinct and occur at different locations in the brain. From these results, Jacobsen and Höfel (2003) concluded that descriptive and evaluative processes are elicited individually and the aesthetic judgment process elicits an early, frontocentral negativity and a late positivity. Jacobsen and Höfel labeled the early frontocentral negativity impression formation and the lateral late positivity evaluative categorization. Impression formation and evaluative categorization are the two stages of aesthetic judgment processing.

Höfel and Jacobsen (2007) expanded their previous conclusion by determining the automaticity of evaluative and descriptive processes. In this follow-up study, participants were randomly assigned to one of two conditions: Viewing or Contemplation. Participants assigned to the Viewing condition were instructed to view the patterns, (i.e., a nonevaluative task), and participants assigned to the

Contemplation condition, were told to contemplate the beauty of the patterns, (i.e., an evaluative task). Neither group in the study was asked to judge the patterns as beautiful or not-beautiful. The same black and white geometric pattern stimuli from the Höfel and Jacobsen (2003) study were used in the Höfel and Jacobsen (2007) experiment, but 40 of the patterns had an additional small black or white imbedded probe circle. The only overt response required was in response to the participant detecting this probe in the circle to ensure the participants were engaged with the stimuli in the specific tasks. Höfel and Jacobsen (2007) found a similar result to their previous study. A posterior sustained negativity was elicited in both groups, indicating descriptive processes of symmetry analysis occur automatically. The early frontal negativity reflecting impression formation in the previous study was not elicited in either group, suggesting that the process of making an aesthetic judgment must be explicitly instructed and is not automatic. Höfel and Jacobsen (2007) did find a lateralized late positivity similar to their previous study, but only for the participants assigned to the Contemplation condition, which implies impression formation and evaluative categorization are two separate processes, both which require intention and do not occur automatically. Specifically, impression formation requires an explicit instruction to judge aesthetic stimuli as beautiful or not beautiful and evaluative categorization requires instruction to aesthetically evaluate the stimuli. Evaluation processes occur when an individual is only thinking about aesthetic value (i.e. judgment condition in Höfel and Jacobsen, 2007), but judgment processes occur only when an individual makes on overt decision about the aesthetic value (i.e., Höfel and

Jacobsen 2003). These results suggest that aesthetic appreciation of beauty is influenced by intention.

Aesthetic processes are influenced by other factors besides intention, including art-related experience (Jacobsen, 2009). Individuals who have art-training and previous structured art-related knowledge utilize different cognitive systems, resulting in differences perceptual analysis and appreciation of visual stimuli (Jacobsen, 2009). Art-knowledge also influences how individuals engage with aesthetic stimuli (Chatterjee, 2011) and an individual's aesthetic appraisal (Hekkert and Van Wieringen, 1996). For example, Nodine, Locher and Krupinski (1993) investigated the effect of art-training on perception and judging of aesthetic stimuli. Seven untrained individuals and seven art-trained individuals with previous graduate level art-training who were working professionally in an art field were presented with 12 pieces of modern art shown in pairs. One piece of art per pair had a more formal geometric structure and was considered more balanced than the second piece of art in the pair. The participants' eye movements were recorded during the presentation of the stimuli and the participants were instructed to judge the pairs of artworks and choose which one they preferred. Results suggested differences in eye movements and art preferences for art-trained individuals as compared to art-naïve individuals. Specifically, differences in the eye movements suggested that art-training influences attention to the design and details of an aesthetic stimulus such that art-trained participants paid more attention to the global design of the piece of art and the untrained participants focused on the local details. Art-trained individuals analyze the

relationships between the features of the stimuli and not necessarily the elements individually. Art-trained individuals also preferred different pieces of art as compared to the untrained individuals. Nodine et al. (1993) also found that aesthetic judgments are made based on an individual's perception of the lines, shapes, colors and themes of stimuli. Since art-training influences an individual's perception and perception influences aesthetic judgment, it can be hypothesized that art-training influences aesthetic judgment which was the question investigated in the present study.

Following from the previous work of Höfel and Jacobsen (2003, 2007) and other research regarding the effect of expertise on aesthetic processing, the present study sought to assess differences in automaticity of the two stages of aesthetic judgment, impression formation and evaluative categorization, by comparing art-naïve individuals and art-experienced individuals. Höfel and Jacobsen (2007) used only art-naïve participants and thus the required intention for the aesthetically stimulated processes observed could have been due to the participants' lack of art-related knowledge. Thus, it was hypothesized that art-experienced individuals have more specific art-related knowledge and should be more likely to engage in an aesthetic stimulus and aesthetically evaluate it without instruction to do so. More specifically, it was hypothesized that art-experienced individuals would elicit the impression formation and evaluative categorization stages of aesthetic processing spontaneously, and thus the ERPs from art-experienced participants in the nonevaluative tasks and the evaluative tasks were predicted to show the early frontocentral negativity and, in contrast to previous studies, art-experienced

participants would also exhibit the lateralized late positivity not found in the ERPs of art-naïve participants.

Method

Participants

Sixteen Union College students participated in this study for monetary compensation or class credit. Ten participants never took an art history class before and were classified as art-naïve participants. Six Union College students took at least three trimesters of Art History courses and were considered art-experienced. The participants ages ranged from 18 to 22 and 11 of the students were female and five were male. Fifteen of participants were right handed and one was left handed. All of the participants had normal or corrected-to-normal vision and no history of neurological disorders. The six of art-experienced participants and ten art-naive participants were randomly assigned to two conditions. Five art-naive participants were randomly assigned to the Viewing condition and five art-naive were assigned to the Contemplation condition. Three art-experienced participants were assigned to the Viewing condition and three art experienced participants were assigned to the Contemplation condition.

Materials & Apparatus

The black and white geometric patterns from Jacobsen and Höfel (2003), Jacobsen and Hofel (2003) and Höfel and Jacobsen, (2007) were used as stimuli in this experiment. Each pattern consisted of a black circle with an 8.8cm diameter and a

white quadratic rhombic shape in the center. The rhombic shape contained 86-88 basic graphic elements that were organized using a grid to create a pattern of geometric shapes. Some of the shapes created were triangles, squares, diamonds and rectangles. There were a total of 252 black and white geometric patterns. Half of the patterns were symmetric and half of the patterns were not symmetric. There were 240 patterns used in the main experiment and 12 patterns were used in the practice trials. 40 of the geometric patterns used in the main experiment and four of the patterns used as practice were used as target-patterns. The target-patterns had small black or white imbedded circles in the geometric patterns. The stimuli were sequenced in a pseudo-randomized order so there were no more than nine patters in a row without a probe pattern and so that two probe trials never occurred one after another. The stimuli were presented in four blocks, each with 60 trials. Before the beginning of each block, participants were instructed to press either the right or left mouse button assignment when they detected a probe. The mouse button press alternated between left and right with each block so each button was used for two blocks.

At the beginning of each trial, a 1000 Hz warning tone sounded for 200 ms with a completely black screen. Immediately following the sound, a grey fixation cross was presented for 600 ms with a black background. The black screen remained for 800ms after the disappearance of the grey cross until the presentation of the stimulus. The black and white geometric stimuli were each presented in the center of the screen for 3000 ms with an ITI of 3800 ms. The stimuli were presented visually and judgment responses were recorded using an IBM desktop computer running $STIM^2$.

An IBM laptop running NeuroScan Acquire software was used to record electroencephalogram (EEG) continuously from 40 scalp electrodes. The reference electrodes were placed on left and right mastoid bones (A1 and A2). A linked ears reference was used : (A1 + A2)/2. The ground electrode was the most frontal center electrode. A 0.05 Hz high-pass and a 100 Hz low-pass filter were applied.

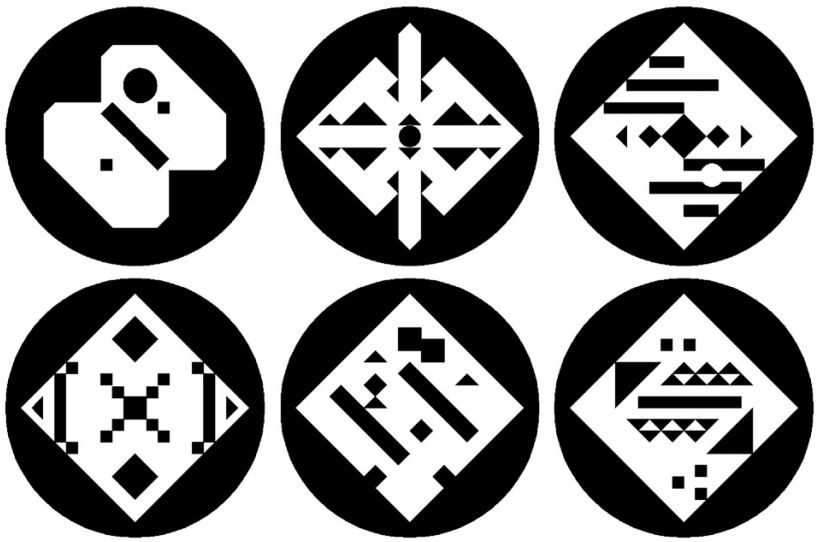

Figure 3. Examples of the black and white geometric patterns used as stimuli. The patterns in the top row are target-patterns with the small, imbedded circles and the patterns in the bottom row are normal patterns.

Procedure

The only difference between the present study and Höfel and Jacobsen (2007) was the addition of art-experience as a between subjects factor. Specifically, the present study consisted of two parts: the EEG recording phase and the aesthetic categorization procedure.

After the participants provided informed consent, participants were randomly assigned to one of the two experimental conditions. The participants assigned to the Viewing condition were told only to view the aesthetic stimuli and the participants assigned to the Contemplation condition were instructed to contemplate the beauty of the aesthetic stimuli. The only overt responses required were for the probe detection task. Participants in both conditions were instructed push a mouse button when they detected the small, imbedded circles in the patterns. Speed was not mentioned in the instructions for the probe detection task.

EEG recording phase. The participants were seated during the application of the cap and electrode amplifying gel. Once the cap was fully gelled, the participants were positioned prone in a lazyboy chair and their cap was connected with the NuAmp. The lights were then turned off and the instructions were read to the participant. Once the participant understood the directions, a practice block was run with 12 trials. After the practice block, the participant had the opportunity to ask questions. The participants were then presented with four blocks of the stimuli and EEG was recording continuously. The application of the cap and the EEG recording took about 50 minutes.

Aesthetic categorization procedure. After the EEG recording, the participants were disconnected from the NuAmp and seated at a desk. They were presented with the same 200 black and white non-probe stimuli used during the main experiment in a random order. The participants were instructed to judge the patterns according to their aesthetic value as either beautiful or not beautiful. A box for the geometric patterns judged as beautiful and a box for the not beautiful patterns were given to the

participants to create piles. The participants were also given the option to create a pile of indifferent patterns if needed. At least 60 patterns had to be judged as beautiful and at least 60 had to be judged as not beautiful. The participants were encouraged to take their time judging the patterns. This aesthetic categorization procedure was used to assign the aesthetic value for each participant to each of the patterns used during the EEG recording. Although the judging conditions were different than the conditions of the EEG recording, previous studies have shown that the patterns judged as beautiful and not beautiful remain consistent independent of conditions (Höfel and Jacobsen, 2003).

Results

The ERPs were filtered using a band-pass with a finite impulse response filter (FIR) with a critical high-pass frequency of 1 Hz and a low-pass frequency of 30 Hz. 1700 ms epochs were created including 200 ms before the presentation of each stimulus and 1500 ms after the onset of the stimuli resulting in 426 data points. The EEG epochs were sorted into those judged as beautiful and not beautiful for each participant. The baseline correction was based on the prestimulus interval and the linear detrending was applied to the entire sweep. Artifact rejection was applied to all channels between -115 uV and 115 uV. After the baseline correction, linear detrending, and artifact rejection, grand averages were created using the epochs. The ERPs time windows analyzed were similar to the time windows used by Höfel and Jacobsen (2007; Jacobsen and Höfel, 2003) so that the specific findings could be compared directly to these earlier studies. Specifically, the time windows were 300-500ms after the onset of the stimulus and 500-700ms after the onset of the stimulus.

The most negative potential was analyzed for the early time window and the most positive potential was analyzed for the late time window. ERPs from six electrodes (FP1, FZ, FP2, P3, PZ, P4) were used in the analysis. A 6 x 2 x 2 repeated measures analysis of variance (ANOVA) was computed for each time window. The between-subjects factors were the condition, either Viewing or Contemplating, and level of art-experience, either art-naïve or art-experience. The within-subjects factors were the judgment of the stimuli as beautiful and not beautiful and electrode.

The overt responses from the probe detection task were not recorded due to a programming error. Nevertheless in a previous study (Hofel and Jacobsen, 2007), target detection was correct for 98.9% of trials for participants in the Contemplation condition and 98.4% correct for the participants in the Viewing condition and were not significantly different (Hofel and Jacobsen, 2007).

Electrophysiological data. On average, 12% of the ERP epochs were rejected per participant. The six electrodes used for the analysis, FP1, FZ, FP2, P3, PZ, and P4 were selected to show the difference between the hemispheres and the anterior and the posterior.

Early frontal effect For the 300-400ms post-stimulus time window the main effect for beautiful/not judgment, $F(1) = 6.07$, $p = 0.03$, showed that the beautiful stimuli elicited a greater negative potential than the not beautiful stimuli, shown in Figure 4. For the 300-400ms post-stimulus time window. there was also a main effect of electrode and a significant electrode x experience interaction but, both of these main effects were mediated by the electrode x experience x condition interaction. $F(5,12) = 2.637$, $p = 0.032$, such that differences in early negative ERPs depended on

experience and condition. The ERPs from four electrodes, three across the front of the scalp and one from the posterior, are shown in Figure 5. The frontal electrodes differed across hemispheres, but the posterior electrodes showed similar ERPs across both hemispheres. More specifically, the ERPs from FP1 electrode differed depending on experience, where greater negative potential was elicited by art-naïve individuals than art-experienced individuals. ERPs from the FZ electrode differed depending both on condition and experience, such that for both art-experienced and art-naïve individuals, participants assigned to the Viewing condition had a greater positive ERP than the participants assigned to the Contemplation condition. Art-experienced participants in both the Viewing and Contemplation conditions showed a more positive potential than the art-naïve participants in both the Viewing and Contemplation conditions. The FZ electrode also showed different ERPs depending on experience and condition such that art-experienced participants in the Viewing and Contemplation conditions and art-naïve participants in the Viewing condition showed an early frontocentral negative potential, but art-naïve participants in the Viewing condition did not show an early frontocentral negativity.

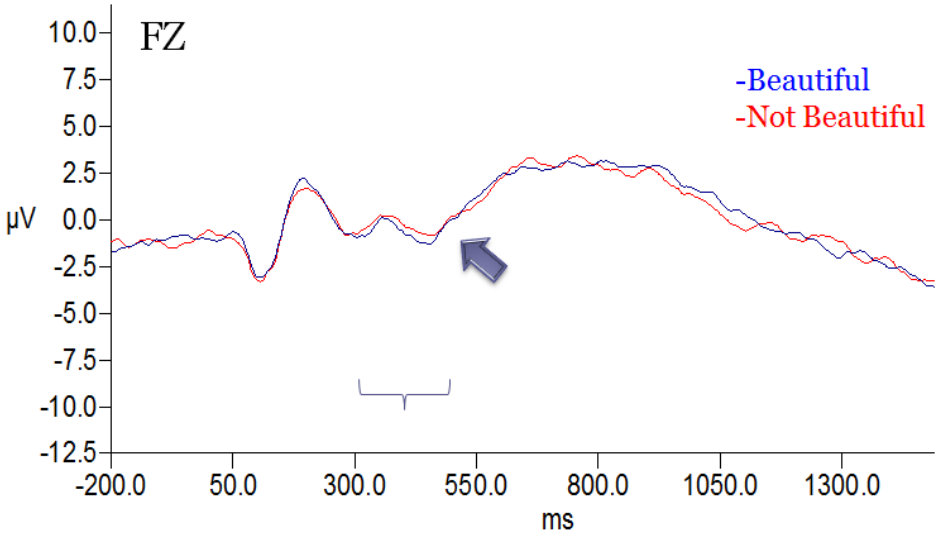

Figure 4. Grand-average event-related potentials for the stimuli individually judged as beautiful and not beautiful. ERP show 200 ms before and 1500 ms after the presentation of the stimuli. The Impression formation is reflected between 300-500 ms after the onset of the stimuli. The beautiful stimuli reflected a greater negative potential as represented by the blue line than the not beautiful stimuli represented by the red line.

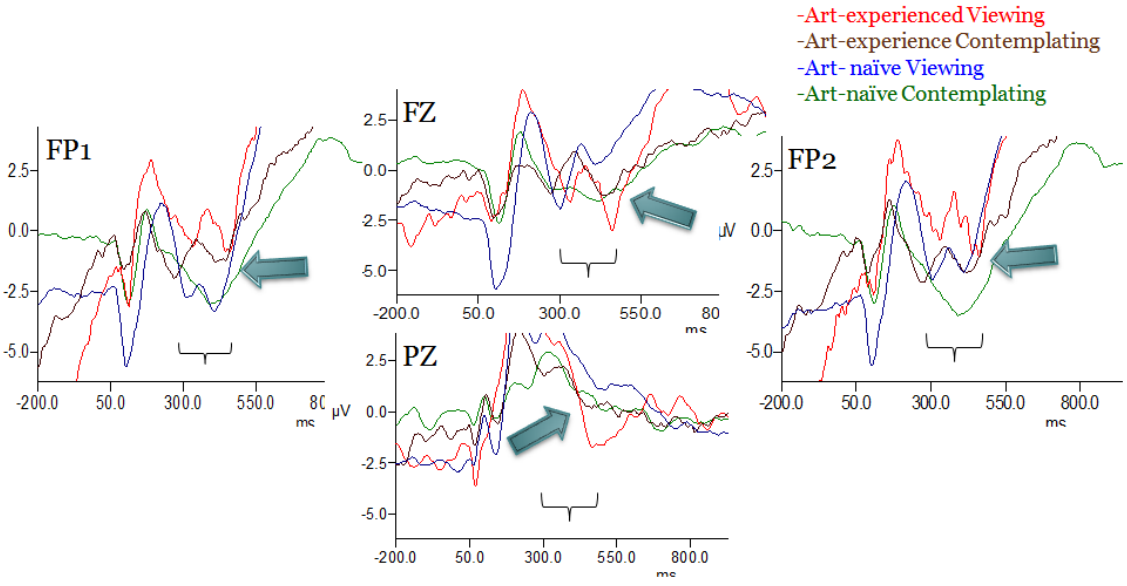

Figure 5. Grand-average event related potentials showing the differences in Impression formation depending on condition and experience. The difference between the ERPs from the participants in the Viewing condition and the participants in the Contemplation condition differed depending on the

participants' art-experience. The ERPs differed across the front of the scalp, but were laterally symmetric in the posterior. ERPs show 200 ms before and 1500 ms after the onset of the stimulus.

Late positivity. For the 500-700 post-stimulus time window a three-way electrode x beautiful/not beautiful judgment x experience interaction $F(5,12) = 5.68$, $p < 0.001$ mediated the significant main effect of electrode and two-way electrode x beautiful/not beautiful judgment interaction. In the three-way interaction the ERPs from the electrodes in the front of the scalp reflected a late positivity, but the ERPs from the electrodes in the posterior did not. The greatest differences in late positivity depending on experience and beautiful/not beautiful judgment were found in the frontal electrodes FP1 and FP2. Both showed similar ERPs, so only FP1 is presented for the electrode x beautiful/not beautiful judgment x experience interaction in Figure 7. Both beautiful and not beautiful stimuli elicited a late positivity for art-experienced and art-naïve participants. The ERPs for the beautiful stimuli differed depending on experience. For the art-experienced participants, the beautiful stimuli elicited a greater positivity than not-beautiful stimuli. For the art-naïve participants, the beautiful stimuli elicited a smaller positive potential than the not beautiful stimuli. There was no difference between the positivity elicited by not beautiful stimuli in art-experienced participants as compared to art-naïve participants.

Additionally for the 500-700 post-stimulus time window there was a significant electrode x condition interaction, $F(5,12) = 3.73$, $p < 0.01$ such that the frontal electrodes reflected a late positive potential for participants in both conditions, but the posterior electrodes did not elicit any positivity. The frontal electrode ERPs from the participants in the Viewing condition showed a greater late positivity than

the participants in the Contemplation condition. Nevertheless no right laterality was indicated in this finding.

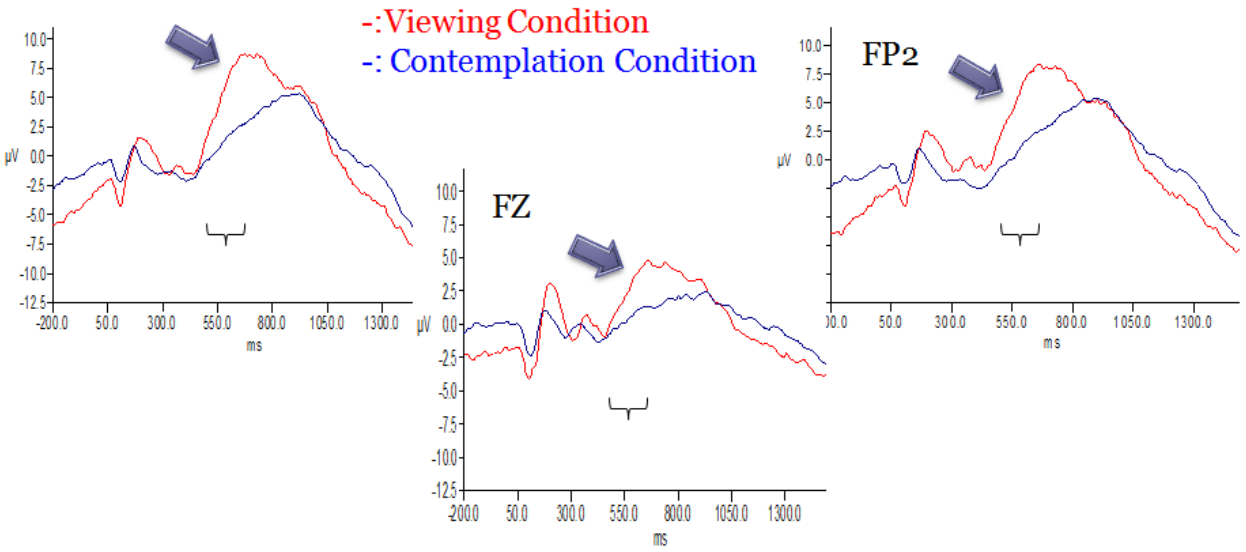

Figure 6. Grand-averages of event related potentials elicited by participants randomly assigned to either the Viewing condition or the Contemplation condition. Impression formation is shown by a late positive potential between 500 to 700 ms after the onset of the stimulus. ERPs from the participants in the Viewing condition showed a greater late positivity than the ERPs from the participants in the Contemplation condition.

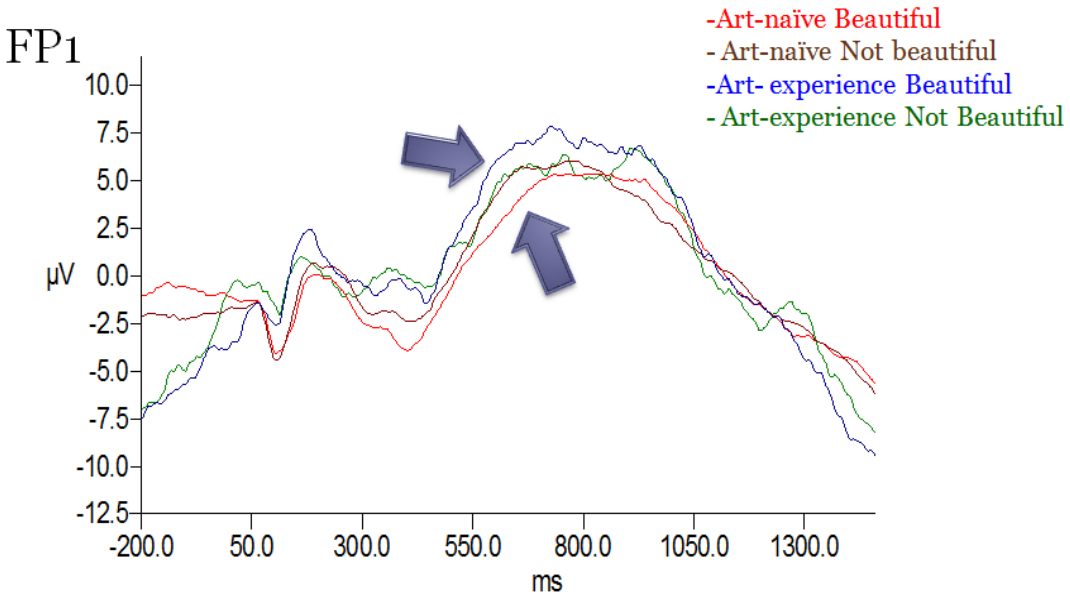

Figure 7. Grand-average event-related potentials elicited by the beautiful and not beautiful stimuli as judged by art-experienced individuals and art-naïve individuals. There is a difference in the Evaluative categorization reflected by a late positive potential for the stimuli judged as beautiful for art-experienced individuals and art-naïve individuals. ERPs show 200 ms before and 1500ms after the onset of the stimuli.

Discussion

The results of the present study imply that art experience does influence aesthetically stimulated processes. Participants with art-experience showed differences in the automaticity of the aesthetic judgment processing stages as compared to participants with no art-experience. The ERP results also showed an asymmetry for aesthetically stimulated processes involving art-experience.

Impression formation, reflected by an early frontal negativity, was elicited without intention in the present study. In contrast to Höfel and Jacobsen (2007), the results of the present study suggest that impression formation occurs spontaneously and explicit judgment instructions are not required. Specifically, the significant main effect for the beautiful/not beautiful judgment implies that there are different negative and positive evaluative processes of aesthetic judgment and they are aesthetically stimulated automatically. The difference in the results from the present study and the results from the previous study could be due to the addition of experience as a factor. If experience did influence the beautiful/not beautiful judgments in the present study, an interaction between beautiful/not beautiful judgment and experience would also be expected. This interaction, however, was not statistically significant in the present data possibly due to the low statistical power in the present study, since there were only three art-experienced participants in each condition. More research is needed to

clarify the difference in results. Nevertheless, the present findings support the conclusion that without explicit instruction to judge the stimuli, beautiful stimuli elicit stronger negative potentials than not beautiful stimuli.

The significant impression formation electrode x experience x condition interaction found in the 300-400 ms post-stimulus time window implies that art-experience influences aesthetic processing and involves a hemispheric asymmetry. The ERPs from front left hemisphere differed only by experience, but the ERPs from the front right hemisphere differed depending on experience and condition. This suggests that the front of the brain is involved with experience and task, but is laterally asymmetric.

The frontocentral negativity reflective of the impression formation was reflected in the FZ electrode of participants in three of the four groups: art-experienced participants in the Viewing condition, art-experience participants in the Contemplation condition and art-naïve participants in the Contemplation condition. Only art-naïve participants in the Viewing condition did not elicit an early, frontocentral negativity. These results suggest that impression formation occurs spontaneously in art-experienced individuals, but is elicited only with instruction in art-naïve individuals. This finding supports the hypothesis that art-experience influences aesthetic judgment processes, such that processes not spontaneous in art-naïve individuals occur automatically in art-experienced individuals because the early frontocentral negativity was reflected only by the art-naïve individuals with instruction, but was reflected by the art-experienced individuals with and without instruction.

Similar to the results regarding impression formation, evaluative categorization reflected by a late positivity was also elicited with and without aesthetic evaluative instruction in the present study. The significant electrode x condition interaction found between 500-700 ms after the onset of the stimulus in the present study was different than the result from that observed by Höfel and Jacobsen, (2007). The previous study found a late positivity with a right lateralization for participants in the contemplation condition, but not for participants in the viewing condition. The ERPs from the present experiment showed a late positive potential in both conditions with no right lateralization. The participants in the viewing condition reflected greater positive potentials than the participants in the contemplation condition. These results could be driven by the addition of experience, but that would again suggest a significant electrode x condition x experience which was not found in the present study. As with the results regarding impression formation, the difference in the results from the previous study and the present study could also be a result of low statistical power with only three art-experienced individuals in each condition. More research is necessary to further elucidate these differences.

The electrode x beautiful/not beautiful judgment x experience interaction found between 500-700 ms after the onset of the stimulus was reflected by the greatest late positivity in the front of both hemispheres. The results show a difference in ERPs for beautiful and not beautiful judgments depending on art-experience. The aesthetic stimuli judged as not beautiful elicited similar ERPs for both the art-naïve and the art-experienced participants. The stimuli judged as beautiful, differed depending on the experience of the participant. The beautiful stimuli elicited a greater

positive potential than the not beautiful stimuli for the art-experienced individuals, but a smaller positive potential than the not beautiful stimuli for the art-naïve individuals. These results suggest that evaluative judgment processes differ depending on experience. A previous study investigating the aesthetic processes stimulated by faces found that beautiful faces elicit a greater late positive potential than not beautiful faces (Roye, Höfel and Jacobsen, 2008). Similarly, emotional aesthetic stimuli have been shown to elicit a greater positive potentials than non-affective stimuli (Schupp, Cuthbert, Bradley, Cacioppo, Ito and Lang, 2000). Since art-experience has been shown to influence an individual's aesthetic experience and influence the way an aesthetic stimulus is perceived, the results from the present study support the conclusions of the previous studies that suggest that art-experience influences the way aesthetic stimuli are evaluated. The late positive potential was stimulated only by the beautiful stimuli judged by the art-experienced individuals. This result suggests that art-experienced individuals meaningfully evaluate geometric patterns similarly to the way all people evaluate faces, but art-naïve individuals do not meaningfully evaluate aesthetic stimuli. It can be concluded from this result that the difference in evaluative aesthetic processes involving art-experience occurs spontaneously. It can also be concluded from the results of the present study that aesthetic processing and art-experience should be included in future research of aesthetic processing.

One weakness of the present study is the relatively small number of participants. More participants would increase the statistical power and strengthen the conclusions made in the present study. Future work is planned to provide more

statistical power. In future studies, it also maybe useful to further define art experience, such that art-experience could be defined as experience creating art rather than learning about art. It would be interesting to investigate the differences between art-creative experience and art-knowledge experience and if they influence aesthetically stimulated processes differently. Other aesthetic stimuli besides black and white geometric patterns might also elicit different ERPs in art-naïve individuals and art-experienced individuals and show other stages of aesthetic judgment processing beside impression formation and evaluative categorization.

In summary, the results from the present study suggest that some aesthetically stimulated processes differ for art-experienced individuals as compared to art-naïve individuals and some processes that are spontaneous in art-experienced individuals require intention in art-naïve individuals.

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