Research Article

The Relations of Empathy and Gender to Aesthetic Response and Aesthetic Inference of Visual Artworks

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Abstract

The relation between empathy and aesthetic experience has been stated early in empirical aesthetics. Aesthetic empathy means the ability to take the perspective of an artwork´s depicted content or form. Nowadays, empathy defines the ability to infer other persons´ mental states and feelings. In this study, we investigated the relationship between empathy and aesthetic response and aesthetic inference abilities. Subjects judged twenty-four visual artworks on an affective, a cognitive, and a beauty dimension, in a Self- and Other-assessment. We analyzed these data in relation to self-judged empathy on four dimensions: emotional and cognitive empathy in fictitious and in real-world situations. Additionally, we considered gender differences in empathy and aesthetic response. Results show (gender-specific) correlations between empathy and aesthetic response and aesthetic inference abilities. This supports the assumption that empathy assists to adopt the perspective of visual artworks as well as to infer the aesthetic preferences of other people.

Keywords

Empirical aesthetics, empathy, aesthetic preference, aesthetic inference, gender differences

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Introduction

One of the most fundamental concepts in early psychology of aesthetics, around the beginning of the twentieth century, is the idea of *Einfühlung* into an artwork (for an introduction to *Einfühlung*, see Curtis & Elliott, 2015; also Currie, 2011; Lanzoni, 2018). The concept of aesthetic *Einfühlung*, later translated by Edward Titchener as *empathy* into the English language, was initially understood as a kind of voluntary identification with, or inner imitation of an artwork and its properties. Theodor Lipps, one of the founders of the concept of aesthetic empathy, understood the subjective *Einfühlung* as a main characteristic of the aesthetic experience, and thus as a matter of the experiencing mind, rather than a bodily response. After Lipps, the imaginary projection of the perceiver into the artwork requires the ability to voluntarily shift the focus of the own perspective to the depicted content or form of the artwork, which, as a result, induces a qualitative affective reaction. Thus, the act of *Einfühlung* leads to a cognitive and affective resonance of the artwork in the perceiver.

Other psychologists understood *Einfühlung* more from the perspective of bodily motor responses as involuntary, automatic reactions to the artwork (for an overview, see Lanzoni, 2018). The concept of aesthetic empathy as a bodily motor response has recently been refined and investigated in the context of mirror neurons and embodied simulation by Vittorio Gallese and colleagues (e.g., Freedberg & Gallese, 2007; Gallese, 2019). Here, the main assumption is that the perceiver automatically simulates an artwork´s content, such as depicted emotional expressions, movements, or even pattern and forms. In this respect, embodied simulation is understood as an immediate, pre-rationally sense making of actions, emotions, and sensations, be it in real-world or fictitious situations, which does not require an explicit cognitive evaluation.

Nowadays, empathy is defined as "understanding a person from his or her frame of reference rather than one's own, or vicariously experiencing that person's feelings, perceptions, and thoughts" (Vandenbos, 2015). General empathy has been distinguished into emotional and cognitive empathy (Hogan, 1969; Mehrabian & Epstein, 1972). Recent neuroscientific research, demonstrating distinct brain processes related to these two kinds of empathy, supports this differentiation (Cox et al., 2011). While emotional empathy is usually understood as an affective response to another person´s emotional state, and thus as pre-reflective resonance or mirroring of her displayed emotions, cognitive empathy is rather a reflective process, supporting inferences about others mental as well as emotional states, often termed as perspective-taking or mentalizing (Dvash & Shamay-Tsoory, 2014; Smith, 2006). In this regard, both suggested forms of aesthetic empathy relate to the concepts of general empathy.

Of fundamental importance for the concept of aesthetic empathy is the shift in perspective, from the perceiver to the artwork, and that this new perspective evokes affective-qualitative reactions (Ganczarek, Hünefeldt, & Olivetti Belardinelli, 2018), which might be due to automatic body responses (e.g., Finisguerra et al., 2021; Freedberg, 2017) or rather to a voluntary cognitive act of the mind. Hence, even though the perceiver is bodily, cognitively, and emotionally moved by the

artwork, she recognizes that the artwork depicts a (bodily) form or an (emotional) content, which is distinct from her own, and, therefore, might even cause unfamiliar or novel reactions (Brinck, 2018). These reactions can be further processed and evaluated to form an aesthetic response, which can be finally measured as an aesthetic judgement.

Empathy and Aesthetic Response

Unfortunately, the fundamental idea that the subjective aesthetic experience and related aesthetic responses, such as affective and cognitive reactions to an artwork, are linked to the perceiver´s empathy is hardly supported by empirical evidence. However, in a promising study, Gerger, Pelowski, and Leder (2017) investigated whether emotion contagion affects aesthetic experience, focusing on valence and arousal, using psychophysiological measures (facial electromyography and skin conductance responses) and aesthetic evaluation questionnaires. Authors report that higher empathy measures (a disposition for emotion contagion) impacted participant´s aesthetic experience (arousal and valence) and the subjective judgements of representational and abstract art. Recently, it has also been reported that highly empathic individuals respond visually faster to areas in artworks, which present emotional cues, and score higher on questionnaires of aesthetic interest and emotional engagement, compared to individuals with lower empathy scores (Wilkinson, Cunningham, & Elliott, 2021). These empirical results support the assumption that empathy enables people to adopt the perspective of the artwork´s depicted content or form, which leads to affective and cognitive reactions in the perceiver, as suggested by Theodor Lipps.

The first aim of the present study was to examine whether self-judged empathy correlates with affective and cognitive aesthetic judgements of visual artworks, and whether these stand in relation to people´s beauty judgements, as reported in previous research (see Graf & Landwehr, 2017; Miller & Hübner, 2020). In this regard, our first hypothesis reads as follows: *There is a relationship between empathy and people´s affective and cognitive responses to an aesthetic experience, which also affects their beauty judgement.* To investigate this hypothesis, we collected aesthetic judgements on a beauty, an affective and a cognitive dimension of aesthetic appreciation (see Hager, Hagemann, Danner, & Schankin, 2012) for twenty-four visual artworks of a broad range of style (representational and abstract art), content (portraits and groups of people, still-lives, pattern, and forms) and historical background (for a detailed description of the artworks, see Chatterjee, Widick, Sternschein, Smith, & Bromberger, 2010). Our participants further judged their empathy on four dimensions: emotional and cognitive empathy in fictitious and in real-world situations, which, averaged, resulted in a general empathy score per participant (see Leibetseder, Laireiter, & Köller, 2007; Tran et al., 2013). Emotional and cognitive empathy usually occurs in real-life interpersonal situations. Nevertheless, it has been shown that people are able to empathize with, or

to take the perspective of fictitious characters of visual artworks (Carroll in The Routledge Handbook of Philosophy of Empathy, 2017; Freedberg & Gallese, 2007; also, Menninghaus et al., 2019). We consider it thus of importance for this study not only to concentrate on general empathy, but also to differentiate between the four kinds of empathy, since they might relate differently to people's aesthetic response of visual artworks.

Gender Differences in Aesthetic Response and Empathy

There is evidence that aesthetic preferences differ with gender. It has been shown that females appreciate impressionistic paintings and paintings from the Rococo area most among distinct art styles, and rate impressionistic paintings more pleasing and relaxing than males (Bernard, 1972; Polzella, 2000). Females present higher beauty ratings for representational art, while males present higher beauty ratings for abstract art (Salkind & Salkind, 1997). Females also show higher pleasure and alertness ratings for representational art depicting human behavior compared to males (Polzella, 2000), and prefer art, which is "arousal moderating", such as warm and emotionally less intense paintings (Cupchik & Gebotys, 1990). Moreover, it has been shown that women prefer simple, colorful, and happy paintings, whereas men prefer geometric, complex, and sad paintings (Chamorro-Premuzic, Burke, Hsu, & Swami, 2010). Also, females are shown to be more attracted to beautiful picture details, compared to males, whereas males show a greater variability in aesthetic preferences, with some males favoring threatening over beautiful content (Ortlieb, Fischer, & Carbon, 2016). Furthermore, females like pop art, representational art, and Japanese paintings less than males (Furnham & Walker, 2001), evaluate pattern art lower than males, and in general, have a lower arousal value and present lower pleasingness ratings for figurative as well as abstract art compared to males (Neperud, 1986).

Research on empathy also highlights gender differences, with superior, especially affective empathy of females (for a review, see Christov-Moore et al., 2014). These gender differences in empathy are mainly reported for self-judged empathy (e.g., Baron-Cohen & Wheelwright, 2004; O'Brien, Konrath, Grühn, & Hagen, 2013; Rueckert & Naybar, 2008; Tran et al., 2013), while behavior-based studies do not necessarily find any gender differences (e.g., Derntl et al., 2010; Rueckert & Naybar, 2008; but see Proverbio, 2017). These results were hence critically discussed in the context of motivational differences and differences in gender-related social expectations rather than reflecting the differential empathy of female and male participants (e.g., Baez et al., 2017; Graham & Ickes, 1997; Ickes, Gesn, & Graham, 2000). Nevertheless, gender-related differences in empathy have also been found in studies using neuroscientific methods, supporting the assumption that females and males, at least, apply empathy differently or recruit different brain areas or neural networks while being empathic (e.g., Derntl et al., 2010;

Groen, Wijers, Tucha, & Althaus, 2012; Schulte-Rüther, Markowitsch, Shah, Fink, & Piefke, 2008; Singer et al., 2006)

Since we hypothesize that there is a relationship between people´s empathy and their affective and cognitive aesthetic responses, which might also affect beauty judgements, we wondered whether gender-specific differences in empathy would also relate to gender-specific differences in aesthetic response. Therefore, we collected a sample with about equal gender ratio, and compared empathy judgements and aesthetic judgements, as well as the interrelation of both, between the two gender groups.

Empathy and Aesthetic Inference

The early idea of *Einfühlung* as a main characteristic of the aesthetic experience, and its affective and cognitive reactions, is reflected in more recent models of aesthetic experience (e.g., Leder, Belke, Oeberst, & Augustin, 2004; Martindale, 1984; Parsons, 1987). Importantly, in these models the cognitive evaluation of the artwork includes not only the interpretation of the artwork´s content and form, but also self-related associations and interpretations, which, in turn, influence the perceiver´s affective reactions towards the artwork. This leads to strong individual differences of aesthetic preferences for visual artworks (Vessel, Maurer, Denker, & Starr, 2018). Since, the concept of empathy is defined by the understanding of another person from his or her frame of reference, including the person's feelings, perceptions, and thoughts (Vandenbos, 2015), we wonder whether empathy also relates to the ability to infer other people´s aesthetic preferences, i.e., aesthetic inference (Miller & Hübner, 2020).

In a previous study (Miller & Hübner, 2020), we investigated aesthetic preferences and aesthetic inferences, and the underlying processes, and presented evidence that it is feasible to infer the aesthetic preferences of other people. Specifically, when judging the beauty of an artwork, affective and cognitive processes are equally involved, whereas, when inferring the beauty of an artwork from the perspective of other people, mainly affective appraisal plays a role. From these results we concluded that the processes underlying those beauty inferences are promoted by a kind of simulation (Gordon, 1986) of another person's affective response to the aesthetic stimulus. Thus, the ability to correctly infer other people´s aesthetic preferences is deeply connected to the ability to emphasize with another person and is therefore understood to depend on general Theory of Mind (ToM) abilities (see Premack & Woodruff, 1978). Moreover, people have an understanding that other people hold individual affective and cognitive aesthetic reactions, which might differ from the own ones, and that these aesthetic reactions influence people's aesthetic preferences. Accordingly, we labeled this knowledge "Theory of Aesthetic Preferences", and proposed that it is a sub-category of the ToM, established through shared exposure to the same aesthetic objects within a culture or socialized group of people, and thus through cultural learning (Tomasello, Kruger, & Ratner, 1993).

In a related study by Beudt and Jacobsen (2015) on the role of perspective taking in aesthetic appreciation of visual art, it has been shown that distinct brain processes are recruited when people make aesthetic judgements from the own versus a fictive artist´s perspective, possibly reflecting higher cognitive demand in the perspective-taking condition. These results support the idea that aesthetic inference is a distinct processing mode, requiring higher ToM abilities, compared to the evaluation of the own aesthetic response. In both aesthetic processing modes, i.e., the subjective aesthetic response mode and the aesthetic inference mode, empathy might play a crucial role, yet in greatly distinct ways. In the subjective aesthetic response mode, empathy with the artwork´s depicted content and form would play the major role. In this context, we hypothesize that people with high empathy also show strong aesthetic responses, possibly due to a stronger *Einfühlung* into the artwork (see Gerger, Pelowski, & Leder, 2017). In the aesthetic inference mode, we assume that the ability to empathize with other people relates to the ability to infer other´s aesthetic preferences, due to a stronger *Einfühlung* into other persons (the distinction between *Einfühlung* into artworks and *Einfühlung* into people was already made by Theodor Lipps, see Matravers, 2017; see also Ganczarek et al., 2018). Importantly, we do not suppose that during the aesthetic inference mode participants need to emphasize with a specific person, but that the aesthetic inferences can also be made about an unknown, absent or fictive person (see Beudt & Jacobsen, 2015; Pelowski, Specker, Gerger, Leder, & Weingarden, 2020), or a whole group of unknown or absent people, since a Theory of Aesthetic Preferences had already been established. Yet, we assumed that participant would refer to other people as people in their proximity, such as people they know or people from their own community or society (Miller & Hübner, 2020), since the Theory of Aesthetic Preferences is established through shared exposure to the same aesthetic objects, and thus through cultural learning (Tomasello et al., 1993).

The second aim of this study was hence to investigate whether aesthetic inference abilities, likely based on a well-established Theory of Aesthetic Preferences, relate to people´s empathy. In this regard, our second hypothesis states as follows: *Aesthetic inference abilities relate to a person´s empathy*. We ground this hypothesis on the assumption that people with high empathy might be superior in perspective-taking and learning of the aesthetic preferences of other people. To investigate this hypothesis, we asked participants to judge the artworks on the three aesthetic dimensions not only from their own perspective, but also from the perspective of most other people. To examine participant´s aesthetic inference abilities, we compared each participant´s aesthetic inferences on the three aesthetic dimensions with the entire groups´ averaged aesthetic judgements on the respective dimension. This procedure is in accordance with the assessment of "empathic accuracy", i.e., the ability to accurately infer the specific content of another person's thoughts and feelings, developed by Ickes (1993). We finally correlated each participant´s aesthetic inference ability scores with participant´s self-judged empathy scores.

Material and Methods

Participants

A total of 60 students (32 females, $M_{age} = 25$, $SD = 3.55$) of the University of Konstanz participated in this study. As a compensation, they received a 5 Euros Amazon voucher. All participants gave written informed consent to take part in this study. The study was conducted in accordance to the ethical standards of the 1964 Declaration of Helsinki and its later amendments (World Medical Association, 2013). Participants were informed of their right to abstain from participation in the study or to withdraw consent to participate at any time without any reprisal. Three (2 female) participants indicated a formal training or professional background in the arts, and were hence excluded from data analysis.

Material

Stimulus set. A set of twenty-four artworks of diverse content, style, and from distinct art historical periods, including figural (portraits, landscape and still-lives) and abstract art, was used. This set was already examined in the reference study by Miller and Hübner (2020). Images were scaled to a hight of 600 pixels, with the respective width varying, and a resolution of 72 dpi for online display. Contrast equalization was not possible, due to the great heterogeneity of artwork colours. Each image occurred on a separate webpage, in the centre of the screen, with a white background colour. Images were displayed in randomized order.

Aesthetic assessment. Aesthetic judgements for the 24 artworks were collected on three dimensions of aesthetic appreciation: an affective dimension (AD), a cognitive dimension (CD), and a beauty dimension (BD) (see Hager et al., 2012), in a Self- and Other-assessment. Participants indicated their beauty judgements ("This artwork is beautiful" / "Most other people find his artwork beautiful") and cognitive judgements ("This artwork is thought-provoking" / "Most other people find his artwork thought-provoking") on continuous rating scales (1–101, numbers hidden to participants, see Treiblmaier & Filzmoser, 2011) from "not at all" to "very much". Affective judgements ("This artwork elicits emotions. These are:" / "This artwork elicits emotions in most other people. These are:") were made on a continuous rating scale (-50 – 50) from "negative" to "positive", with a value of zero indicating no particular emotional valence induced by the artwork. Artworks as well as the scales occurred in randomized order to control for order and familiarity effects.

Empathy. Empathy was assessed by means of the German version of the E-scale (Leibetseder et al., 2007; Tran et al., 2013).This scale differentiates between emotional and cognitive components of empathy, in real-life and fictitious situations. Cognitive-sensitivity in fictitious situations includes 5 items, Emotional-sensitivity

in fictitious situations includes 4 items, Cognitive-concern in real-life situations includes 7 items, and Emotional-concern in real-life situations includes 5 items. Participants indicated their self-judged empathy on the four independent empathy scales on 4-point Likert scales, ranging from "I do not agree at all" to "I fully agree". Averaged over the four empathy dimensions, judgements led to a general empathy score per participant.

Procedure

Participants received a link to the online survey platform SoSci Survey (Leiner, 2019; https://www.soscisurvey.de). Participants were informed about the experiment and gave sociodemographic information as well as information about their art expertise (whether they had a formal training in the arts, and how often they visited museums and exhibitions). Then, participants judged the 24 artworks on the three aesthetic dimensions in the Self-assessment, asking for their individual aesthetic responses. Afterwards, participants judged the artworks on the three aesthetic dimensions in the Other-assessment, from the perspective of "most other people". In both assessments, artworks and aesthetic questions occurred in randomized order to control for order and familiarity effects. Nevertheless, the specific order of the two assessments was carefully chosen to make use of an anchoring effect (Kahneman, Slovic, & Tversky, 1982). We assumed people use their own aesthetic preferences as an anchor to draw inferences about most other peopl´s aesthetic preferences. Thus, we used this fixed order to anchor participants own aesthetic judgements. After the two aesthetic assessments, participants completed the experiment with the E-scale. There was no time limit. The total duration of the experiment was about 20 to 30 min.

Results

Aesthetic Judgement and Aesthetic Inference

Gender related differences in aesthetic judgement and aesthetic inference. To first investigate gender related differences in aesthetic judgement (Self-assessment) and aesthetic inference (Other-assessment), median rating scores on the three aesthetic dimensions (AD, CD, BD) for female and male participants were calculated. Internal consistency of the aesthetic scales was good. The three aesthetic measures showed partial intercorrelations. Also, the Self- and Other-assessments showed partial intra-correlations per dimension (for a descriptive statistic see Table 1). We found no significant differences in median aesthetic rating scores between female and male participants on the AD ($t(50.6) = -1.45$, $p = .15$, $d = .39$, .95% CI [-7.91, 1.28]) and the CD ($t(54.5) = .83$, $p = .41$, $d = .22$,.95% CI [-4.97, 12.0]) in the Self-assessment. Yet, there was a significant difference between aesthetic ratings on the BD, with male participants presenting higher beauty judgements ($t(54.9) = 2.27$, $p = .03$, $d = .60$,.95% CI

Table 1. Descriptive Statistic, Reliability, and Intercorrelations of the Three Aesthetic Dimensions, for Female and Male Participant´s Self- and Other-Assessments.

			Intercorrelations					
Aesthetic dimension	Median (IQR)	α	AD (Self)	AD (Other)	CD (Self)	CD (Other)	BD (Self)	BD (Other)
Female (N = 30)								
AD (Self)	-3.75 (-10.9 – 0)	.88		.36*	.35		.50**	
AD (Other)	-2.25 (-6.88 – 2)	.92				.11		.55**
CD (Self)	52.3 (40.5 – 61)	.91				.46**	.52**	
CD (Other)	53.5 (35.5 – 63.9)	.91						.50**
BD (Self)	46.0 (32.5 – 58.1)	.89						.42*
BD (Other)	55.3 (44.4 – 63.5)	.90						
Male (N = 27)								
AD (Self)	-1.1 (-4 – 2.25)	.79		.32	.-.04		.42*	
AD (Other)	-1.5 (-9.5 – 2.25)	.85				-.12		.47*
CD (Self)	50.0 (35.5 – 55.8)	.88				.59***	.36	
CD (Other)	54.5 (45.8 – 61.0)	.86						.54**
BD (Self)	55.5 (50.3 – 66.0)	.86						.69***
BD (Other)	57 (43.5 – 68.0)	.92						

AD = affective dimension, CD = cognitive dimension, BD = beauty dimension, Self = Self-assessment, Other = Other-assessment. P <.001 = ***, p <.01 = **, p <.05 = *.

[-18.3, -1.15]). In the Other-assessment, there were no significant differences between female and male participants aesthetic ratings on any dimensions (AD: $t(48.5) = .69$, $p = .49$, $d = .19$, .95% CI [-3.78, 7.71]; CD: $t(53.6) = .43$, $p = .67$, $d = .11$, .95% CI [-10.7, 6.91]; BD: $t(52.0) = .18$, $p = .86$, $d = .05$, .95% CI [-9.31, 7.77]).

To further investigate a possible effect of gender on aesthetic judgements and aesthetic inferences on the three aesthetic dimensions, we applied a linear mixed effects analyses with Maximum Likelihood (ML) estimation (usage of lme4; Bates, Mächler, Bolker, & Walker, 2015), implemented in R (R Core Team, 2016), using individual data points. This allowed us to control for the variability across participants as well as across artworks. As fixed effects, we entered gender affiliation and assessment type (Self-assessment, Other-assessment) into the model. As random effects, we entered participants and artworks into the model, thus allowing the intercepts to vary across both to account for interindividual differences and artwork specific effects. We did not apply centering of the raw data points since our data have "clearly interpretable or meaningful zero points" (see Enders & Tofighi, 2007). Degrees of freedom were calculated using the Satterthwaite's approximations for the *t*-test and corresponding *p-values*.

Our results show that gender (female participants: $\beta = -3.34$, $p < .001$, 95% CI [-4.95, -1.73]) as well as assessment (Self: $\beta = -3.34$, $p > .001$, 95% CI [-4.92, -1.76]) significantly predicted beauty judgements, with lower beauty judgements of females compared to males, and lower beauty judgements in the Self-assessment.

For affective judgements, neither gender (female participants: $\beta = -1.02$, $p = .22$, 95% CI [-2.40, .36]) nor assessment (Self: $\beta = .01$, $p = .99$, 95% CI [-1.34, 1.37]) were significant predictors.

For cognitive judgements, gender was no significant predictor (female participants: $\beta = .08$, $p = .94$, 95% CI [-1.49, 1.64]), yet, assessment was a significant predictor (Self: $\beta = -2.68$, $p = .004$, 95% CI [-4.21, -1.15]), with lower cognitive judgements in the Self-assessment.

Person-group agreement. To investigate homogeneity of aesthetic preferences and aesthetic inferences of both gender groups, each participant's Self- and Other-assessment scores were first correlated with the entire participant group´s mean rating scores ($N = 57$, minus the respective single participant), i.e., the person-entire group agreement, and then with the specific gender group´s mean Self- and Other-assessment scores, i.e., the person-gender group agreement, across the three aesthetic dimensions. Higher mean correlation coefficients present a higher mean person-group agreement. Correlation coefficients were Fisher z-transformed for statistical comparison. Finally, person-entire-group agreements and person-gender-group agreements were compared.

Person-entire-group agreement

Female participants. For the female group, the person-entire-group affective ratings had a mean correlation of .38 ($SD = .24$, range: -.13 – .79) in the Self-assessment

and .52 ($SD = .22$, range: .05 – .81) in the Other-assessment. The beauty ratings had a mean correlation of .39 ($SD = .27$, range: -.36 – .72) in the Self-assessment and .48 ($SD = .20$, range: .13 – .86) in the Other-assessment. For the cognitive ratings, mean correlation was.49 ($SD = .21$, range: .00 – .80) in the Self-assessment and.48 ($SD = .23$, range: -.30 – .78) in the Other-assessment.

Male participants. For the male group, the person-entire-group affective ratings had a mean correlation of .36 ($SD = .23$, range: -.16 – .74) in the Self-assessment and .44 ($SD = .29$, range: -.29 – .80) in the Other-assessment. The beauty ratings had a mean correlation of .44 ($SD = .22$, range: -.04 – .78) in the Self-assessment and .56 ($SD = .22$, range: .11 – .85) in the Other-assessment. For the cognitive ratings, mean correlation was .49 ($SD = .19$, range: .10 – .77.) in the Self-assessment and .47 ($SD = .23$, range: -.04 – .78) in the Other-assessment.

We found no statistically significant differences between female and male group´s person-entire-group agreements in the Self-assessment (AD: $t(55.0) = .43$, $p = .67$, $d = .11$, .95% CI [-.12, .18]; CD: $t(54.9) = .10$, $p = .93$, $d = .02$, .95% CI [-.13, .15]; BD: $t(54.6) = -.76$, $p = .45$, $d = .20$, .95% CI [-.22, .10]), nor in the Other-assessment (AD: $t(50.1) = 1.12$, $p = .27$, $d = .30$, .95% CI [-.08, .28]; CD: $t(53.9) = .26$, $p = .80$, $d = .07$, .95% CI [-.14, .18]; BD: $t(51.9) = -1.63$, $p = .11$, $d = .43$, .95% CI [-.30, .03]).

Person-gender-group agreement

Female participants. For the female group, the person-gender-group affective ratings had a mean correlation of.38 ($SD = .23$, range: -.04 – 80) in the Self-assessment and .51 ($SD = .23$, range: .00 – .83) in the Other-assessment. For beauty ratings the mean correlation was .38 ($SD = .27$, range: -.34 – .72) in the Self-assessment and .48 ($SD = .19$, range: .11 – .82) in the Other-assessment. For the cognitive ratings, mean correlation was .48 ($SD = .20$, range: -.04 – .80) in the Self-assessment and .48 ($SD = .23$, range: -.25 -.78) in the Other-assessment.

Male participants. For the male group, the person-gender-group affective ratings had a mean correlation of .31 ($SD = .20$, range: -.05 – .63) in the Self-assessment and .38 ($SD = .28$, range: -.31 – .75) in the Other-assessment. The beauty ratings had a mean correlation of .41 ($SD = .21$, range: .00 –.73) in the Self-assessment and .54 ($SD = .23$, range: .10 – .83) in the Other-assessment. For the cognitive ratings, mean correlation was .45 ($SD = .21$, range: .07 – .76) in the Self-assessment and .42 ($SD = .21$, range: -.10 – .72) in the Other-assessment.

We found no statistically significant differences between female and male group´s person-gender-group agreements in the Self-assessment (AD: $t(53.9) = 1.49$, $p = .14$, $d = .39$, .95% CI [-.04, .24]; CD: $t(53.7) = .61$, $p = .55$, $d = .16$, .95% CI [-.10, .18]; BD: $t(54.8) = -.28$, $p = .78$, $d = .07$, .95% CI [-.18, .13]), nor in the Other-assessment (AD: $t(52.7) = 1.93$, $p = .06$, $d = .51$, .95% CI [-.01, .34]; CD: $t(54.9) = 1.21$, $p = .23$, $d = .32$, .95% CI [-.06, .23]; BD: $t(48.6) = -1.45$, $p = .15$, $d = .39$, .95% CI [-.27, .04]).

Gender Related Differences in the Formation of Beauty Judgements in Self- and Other-Assessment

It has been shown that beauty judgements depend on affective and cognitive stimulus appraisal, whereas beauty inferences rather depend on affective stimulus appraisal alone (see Miller & Hübner, 2020). In order to examine gender related differences in the formation of beauty judgements in Self- and Other-assessment as well as differences between the two assessments, we applied for each assessment a linear mixed effects analyses with ML estimation. We used affective judgements, cognitive judgements, and gender affiliation as fixed effects. Random effects were calculated for participants and artworks. Degrees of freedom were calculated using the Satterthwaite's approximations for the *t*-test and corresponding *p-values*. To quantify the partial R^2 for fixed effect predictors based on linear mixed-effect model fits, we used the package partR2 implemented in R (Stoffel, Nakagawa, & Schielzeth, 2021). Additionally, we calculate the variance explained by the fixed effects only and for the whole model, including fixed and random effects, using the Mu-Min package implemented in R (Barton, 2020). A follow-up analysis for multiple comparison was conducted using the emmeans package (Lenth, 2018) in R.

Self-assessment. Our analyses revealed that affective judgements ($\beta = .49$, $p < .001$, 95% CI [.44, .54]), cognitive judgements ($\beta = .36$, $p < .001$, 95% CI [.32, .40]), and gender (female: $\beta = -4.53$, $p < .001$, 95% CI [-6.36, -2.69]) significantly predicted beauty judgements, with lower beauty judgements of female participants compared to male participants. Affective judgements and cognitive judgements explained both 13% of the variance in beauty judgements. The fixed effects explained 37% of the variance in beauty judgements. Fixed and random effects together explained 46% of the variance in beauty judgements.

To further investigate the unique contribution of affective judgements and cognitive judgements on beauty judgements, for female and male participants respectively, we computed the semi-partial correlations of both predictor variables with beauty, while removing the effect of the other variable, using the ppcor package in R (see Kim, 2015). It shows that for female participants cognitive judgements had a significant medium correlation with beauty ($r = .37$, $p = .05$), while affective judgements did not correlate significantly with beauty ($r = .34$, $p = .07$). Whereas, for male participants, only affective judgements had a significant medium correlation with beauty ($r = .43$, $p = .03$), while cognitive judgements did not correlate significantly with beauty ($r = .37$, $p = .06$).

Other-assessment. In the Other-assessment, affective inferences ($\beta = .51$, $p < .001$, 95% CI [.47, .55]) and cognitive inferences ($\beta = .30$, $p < .001$, 95% CI [.26, .34]) significantly predicted beauty inferences. Gender was no significant predictor of beauty inferences (female: $\beta = -1.14$, $p = .27$, 95% CI [-2.83, .56]). Affective judgements explained 19% and cognitive judgements explained 8% of the variance in beauty judgements. The fixed effects explained 35% of the variance in beauty judgements.

Fixed and random effects together explained 47% of the variance in beauty judgements.

For the inference condition, it shows that for female participants affective inferences ($r = .49$, $p = .006$) and cognitive inferences ($r = .44$, $p = .02$) had a significant medium correlation with beauty inferences. Also, for male participants, affective inferences ($r = .53$, $p = .005$) and cognitive inferences ($r = .60$, $p = .001$) correlated significantly with beauty inferences.

Aesthetic Response and Empathy

We hypothesized that people, who judge themselves as very emphatic, present higher aesthetic responses, possibly due to a stronger ability to emphasize with the artwork´s depicted content. A stronger empathic response to the artwork might stand in relation to a stronger emotional response, more thoughts provoked, and a stronger beauty response (see Gerger, Pelowski, & Leder, 2017).

To investigate whether empathy relates to aesthetic responses, as well as gender related differences, first, a General Empathy score as well as empathy scores for the four empathy dimensions were calculated, for female and male participants, respectively. Internal consistency of the empathy scales was good. The four empathy measures showed medium to high intercorrelations with General Empathy, also, the two fictitious and the two real-world empathy scales showed medium to high intercorrelations (for a descriptive statistic, see Table 2).

Table 2. Descriptive Statistic, Reliability, and Intercorrelations of General Empathy and the Four Empathy Dimensions, for Female and Male Participants, Respectively.

			Intercorrelation			
Empathy dimension	*M* (*SD*)	α	E1	E2	E3	E4
Female (N = 30)						
E1	3.37 (.45)	.96		.43*	.18	.31
E2	3.33 (.59)	.92			.37*	.28
E3	3.10 (.50)	.92				.57***
E4	2.65 (.64)	.93				
General Empathy	3.09 (.39)	.88	.59***	.67***	.80***	.79***
Male (N = 27)						
E1	2.88 (.71)	.88		.62***	.24	.18
E2	2.95 (.60)	.94			.27	.04
E3	2.89 (.47)	.92				.72***
E4	2.67 (.57)	.90				
General Empathy	2.85 (.41)	.75	.73***	.65***	.79***	.68***

E1 = Cognitive-sensitivity (fictitious situation), E2 = Emotional-sensitivity (fictitious situation), E3 = Emotional-concern (real-life situation), E4 = Cognitive-concern (real-life situation). P <.001 = ***, p <.01 = **, p <.05 = *.

We found significant differences between female participants´ and male participants´ General Empathy scores ($t(53.6) = 2.22$, $p = .03$), as well as significant difference between females´ and males´ empathy scores for Cognitive-sensitivity ($t(43) = 3.04$, $p = .004$) and Emotional-sensitivity ($t(54.1) = 2.35$, $p = .02$) in fictitious situations, with higher scores of female participants.

We further assessed the relation between empathy scores and aesthetic responses in calculating correlation coefficients between averaged empathy scores on the four empathy dimensions and General Empathy, and averaged aesthetic judgements on the three aesthetic dimensions, for the female and male participants, respectively (see Table 3).

Female participants. For the female participants, a significant moderate negative correlation showed between Emotional-sensitivity in fictitious situations and beauty judgements. A small positive correlation showed between Cognitive-concern in real-life situation and cognitive judgments. *Male participants.* For the male participants, a small positive correlation occurred between General Empathy and affective judgments. Also, a small positive correlation showed between Emotional-sensitivity in fictitious situation and cognitive judgements.

To further examine to what extent averaged aesthetic judgements on the three aesthetic dimensions can be predicted by empathy, we computed multiple linear

Table 3. Correlations Between Averaged Aesthetic Judgements on the Three Aesthetic Dimensions and Averaged Empathy Scores on the Four Empathy Dimensions and General Empathy for the Female and Male Participants, Respectively.

	Correlation				
	Empathy dimension				
Aesthetic dimension	E1	E2	E3	E4	General Empathy
Female (N = 30)					
AD	-.05	-.14	-.07	.19	.00
CD	.13	-.23	-.13	.26	.01
BD	.24	-.39*	-.14	.24	-.01
Male (N = 27)					
AD	.22	.12	.19	.18	.25
CD	-.03	.27	.00	.08	.09
BD	-.21	-.18	-.03	.15	-.10

AD = affective dimension, CD = cognitive dimension, BD = beauty dimension, Self = Self-assessment, Other = Other-assessment. E1 = Cognitive-sensitivity (fictitious situation), E2 = Emotional-sensitivity (fictitious situation), E3 = Emotional-concern (real-life situation), E4 = Cognitive-concern (real-life situation). $p < .001$ = ***, $p < .01$ = **, $p < .05$ = *.

regressions having General Empathy, the four specific empathy dimensions, and gender affiliation as predictors.

For the beauty dimension, the four empathy measures, General Empathy, and Gender explained as much as 28% of the total variance ($R^2 = .28$, $R^2_{adj.} = .19$, $F(6, 50) = 3.23$, $p = .009$). Here, Emotional-sensitivity in fictitious situation ($\beta = -9.91$, $p = .03$, 95% CI [-17.1, -2.71]) and Cognitive-concern in real-life situation ($\beta = 9.88$, $p = .04$, 95% CI [2.14, 17.6]) presented significant contributions. Gender was no significant predictor of beauty judgements. There was no multicollinearity of the empathy measures (VIF: E1 = 1.92, E2 = 1.73, E3 = 2.23, E4 = 1.84, General Empathy = 2.99). For the affective dimension, the overall regression model did not reach the significance level ($R^2 = .12$, $R^2_{adj.} = .01$, $F(6, 50) = 1.12$, $p = .37$). For the cognitive dimension, overall regression results were also not significant ($R^2 = .10$, $R^2_{adj.} = .02$, $F(6, 50) = 1.01$, $p = .43$).

Aesthetic Inference Abilities

Gender related differences in aesthetic inference abilities. To assess possible gender related differences in the ability to infer aesthetic judgements of other people, the aesthetic inference abilities of female and male participants were investigated.

Therefore, each participant´s Other-assessments were correlated with the entire group´s ($N = 57$) mean Self-assessments (minus the respective single participant), for the three aesthetic dimensions. To assess gender specific aesthetic inference abilities, females´ and males´ Other-assessments were correlated with the specific gender group´s mean Self-assessment (minus the respective single participant) (see

Table 4. Averaged Correlation Coefficients Between Each Participant's Other-Assessments with the Entire Group´s as well as the Gender Specific Group´s Mean Aesthetic Judgements for the Three Aesthetic Dimensions.

	Aesthetic inference ability		
	AD	CD	BD
Female (N = 30)			
Entire group (*N* = 57)	-.04 (SD = .19, range: -.43 – .28)	.18 (SD = .18, range: -.11 – .48)	.09 (SD = .17, range: -.24 – .42)
Gender specific	-.09 (SD = .17, range: -.41 – .17)	.19 (SD = .16, range: -.10 – .50)	.07 (SD = .18, range: -.31 – .39)
Male (N = 27)			
Entire group (*N* = 57)	.00 (SD = .16, range: -.32 – .38)	.16 (SD = .16, range: -.18 – .39)	.17 (SD = .18, range: -.13 – .60)
Gender specific	.05 (SD = .16, range: -.39 – .31)	.16 (SD = .16, range: -.20 – .41)	.19 (SD = .17, range: -.09 – .59)

AD = affective dimension, CD = cognitive dimension, BD = beauty dimension. SD = standard deviation.

Table 4). Higher correlation coefficients, i.e., the aesthetic inference ability scores, indicate better aesthetic inference abilities. Correlation coefficients were Fisher z-transformed to test differences between gender groups.

Female participants. We did not find any significant differences between the female participants´ entire group and gender specific aesthetic inference abilities on any aesthetic dimension (AD: $t(57.1) = 1.04$, $p = .31$, $d = .27$, .95% CI [-.05, .14]; CD: $t(57.3) = -.14$, $p = .89$, $d = .04$, .95% CI [-.10, .09]; BD: $t(58) = .59$, $p = .56$, $d = .15$, .95% CI [-.07, .12]).

Male participants. We also did not find any significant differences between the male participants´ entire group and gender specific aesthetic inference abilities on any aesthetic dimension (AD: $t(51.9) = -1.23$, $p = .22$, $d = .33$, .95% CI [-.14, .03]; CD: $t(52) = .04$, $p = .97$, $d = .00$, .95% CI [-.09, .09]; BD: $t(52) = -.60$, $p = .55$, $d = .16$, .95% CI [-.13, .07]).

There were no significant differences between female and male participant groups´ aesthetic inference abilities for the entire group on any aesthetic dimensions (AD: $t(54.9) = -.82$, $p = .42$, $d = .21$, .95% CI [-.14, .06]; CD: $t(55) = .49$, $p = .62$, $d = .12$, .95% CI [-.07, .12]; BD: $t(54) = -1.52$, $p = .13$, $d = .40$, .95% CI [-.17, .02]). There was also no significant difference between females´ and males´ gender specific aesthetic inference abilities on the CD, $t(54.7) = .71$, $p = .48$, $d = .19$, .95% CI [-.06, .12]. Yet, we found gender differences between the gender specific aesthetic

Table 5. Averaged Correlations Between Each Participant's Aesthetic Inference Ability Scores with the Averaged Empathy Scores on the Four Empathy Dimensions and General Empathy for the Three Aesthetic Dimensions.

	Correlation				
	Empathy dimension				
Aesthetic inference ability score	E1	E2	E3	E4	General Empathy
Female (N = 30)					
AD	-.12	.08	.07	.05	-.08
CD	.10	-.35	.37*	.05	.22
BD	-.13	-.29	.17	-.08	-.08
Male (N = 27)					
AD	-.09	.15	.21	-.13	.04
CD	.24	.14	.28	.28	.34
BD	-.03	-.23	.19	.48**	.15

AD = affective dimension, CD = cognitive dimension, BD = beauty dimension, Self = Self-assessment, Other = Other-assessment. E1 = Cognitive-sensitivity (fictitious situation), E2 = Emotional-sensitivity (fictitious situation), E3 = Emotional-concern (real-life situation), E4 = Cognitive-concern (real-life situation). p <.001 = ***, p <.01 = **, p <.05 = *.

inference abilities on the AD, $t(54.9) = 3.25$, $p = .002$, $d = .86$, .95% CI [-.23, -06], and on the BD, $t(54.1) = 2.68$, $p = .009$, $d = .71$, .95% CI [-.23, -.03], with better gender specific aesthetic inferences abilities of male participants.

Aesthetic Inference Abilities in Relation to Empathy

To investigate the hypothesis that aesthetic inference abilities relate to people´s empathy, we conducted a correlation analysis between the scores on the four empathy dimensions as well as General Empathy and the aesthetic inference ability scores on the three aesthetic dimensions for both gender groups (see Table 5).

Female participants. For the female participants, a significant moderate positive correlation showed between Emotional-concern in real-life situation and cognitive inference abilities. A moderate negative correlation showed between Emotional-sensitivity in fictitious situation and cognitive inference abilities. Also, a small negative correlation occurred between Emotional-sensitivity in fictitious situation and beauty inference abilities.

Male participants. For the male participants, a significant moderate positive correlation showed between Cognitive-concern in real-life situation and beauty inference abilities. Also, a small positive correlation showed between Cognitive-concern in real-life situation and cognitive inference abilities. A moderate positive correlation showed between General Empathy and cognitive inference abilities.

In order to examine to what extent aesthetic inference abilities on the three aesthetic dimensions can be predicted by the four specific empathy dimensions, General Empathy as well as gender, we computed for each aesthetic dimension a multiple linear regression.

For the beauty dimension, the four empathy measures, General Empathy, and gender explained as much as 28% of the total variance ($R^2 = .28$, $R^2_{adj.} = .20$, $F(6, 50) = 3.30$, $p = .008$). Here, Emotional-sensitivity in fictitious situation ($\beta = -.10$, $p = .05$, 95% CI [-17, -.02]), Emotional-concern in real-life situation ($\beta = .16$, $p = .02$, 95% CI [.05, .28]), and General Empathy ($\beta = -.23$, $p = .01$, 95% CI [-.13, .03]) presented significant contributions. Gender was no significant predictor of beauty inference abilities. There was no multicollinearity of the empathy measures (VIF: E1 = 2.06, E2 = 1.74, E3 = 2.27, E4 = 1.91, General Empathy = 2.99). For the affective dimension, Emotional-concern in real-life situation was a significant predictor ($\beta = .16$, $p = .03$, 95% CI [.04, .29]), yet, the overall regression model did not reach the significance level ($R^2 = .13$, $R^2_{adj.} = .02$, $F(6, 50) = 1.20$, $p = .32$). Also, for the cognitive dimension, Emotional-concern in real-life situation was a significant predictor ($\beta = .20$, $p = .008$, 95% CI [.08, .31]), yet again, the overall regression results were not statistically significant ($R^2 = .17$, $R^2_{adj.} = .07$, $F(6, 50) = 1.74$, $p = .13$).

Discussion. In this study, we investigated the relationship between self-judged empathy on four empathy dimensions (Cognitive-sensitivity and Emotional-sensitivity, in fictitious situation and in real-life situation) and aesthetic judgements on three aesthetic dimensions (affective, cognitive, beauty) as well as between empathy and aesthetic inference abilities. We assumed that empathy relates to the affective and cognitive aesthetic responses, and, in this regard, also to beauty judgements, since it enables people to adopt the perspective of the artwork´s depicted content or form, which can then be further processed and evaluated to form an aesthetic judgement. Also, we hypothesized that the ability to infer aesthetic preferences of others, i.e., aesthetic inference, relates to people´s empathy, because it facilitates people to take the perspective of other persons. We additionally put a focus on possible gender differences, due to previous results, indicating gender differences in empathy and aesthetic preference.

Aesthetic Judgement and Gender Differences

Regarding the aesthetic judgements, we did not find any gender specific differences on the affective and cognitive dimension in the Self-assessment. Yet, the male participants rated the artworks significantly more beautiful compared to the female participants, which is comparable to previous results (e.g., Neperud, 1986). Gender differences in the perception of beauty, and aesthetic experience in general, have been found in behavioral (e.g., Bernard, 1972; Chamorro-Premuzic et al., 2010; Furnham & Walker, 2001; Ortlieb et al., 2016; Polzella, 2000; Salkind & Salkind, 1997) as well as neuroaesthetic studies (e.g., Cela-Conde et al., 2009; Sabatinelli, Flaish, Bradley, Fitzsimmons, & Lang, 2004), and are usually related to differences in visuo-spatial processing as well as to gender specific evolutionary brain development (for an overview, see Fedrizzi, 2012).

We did not find any gender differences in aesthetic judgements in the Other-assessment, i.e., the aesthetic inference condition. There were no significant gender differences in the person-entire-group agreement and person-gender-group agreement in Self- and Other-assessment. Participants presented low to moderate positive correlations between their aesthetic judgements and the mean group´s aesthetic judgements, demonstrating a moderate homogeneity of aesthetic preferences across participants, as already reported by Miller and Hübner (2020).

We further applied a linear mixed effects model, to investigate the effects of gender and assessment on the judgements on the three aesthetic dimensions, while controlling for the variability of participants and artworks. Gender as well as assessment were significant predictors of beauty judgements, with female participants scoring lower than male participants. Beauty scores were also lower in the Self-assessment than in the Other-assessment. Gender and assessment were no significant predictors of affective judgements. For cognitive judgements, only assessment was a significant predictor, with lower cognitive scores in the Self-assessment. Interestingly, participants inferred other people to judge the artworks more beautiful and more thought-provoking,

compared to themselves, which might be due to a familiarity effect, in response to the order of the assessments (first the Self-assessment than the Other-assessment). It has been shown that mere exposure (Zajonc, 1968) and thus the familiarity of a stimulus increase the preference for it (Bornstein, 1989). Yet, this result might also be an effect of the inference strategy. We assumed that participant would refer to "most other people" as people in their proximity, such as people they know or people from their own community or society (see Miller & Hübner, 2020), since the Theory of Aesthetic Preferences is considered to be established through shared exposure to the same aesthetic objects, and thus through cultural learning (Tomasello et al., 1993). Nevertheless, participants had to infer a rather general aesthetic taste of a big group of people. Therefore, we suppose that they relied on a stereotype person´s aesthetic taste, which might represent the aesthetic taste of the entire group. It has been shown that people use stereotyping inference strategies, when they understand themselves as rather different from the target group (see Ames, 2004a, 2004b). This might indicate that our participant group of young students perceived their aesthetic taste to be rather distinct from a stereotype´s taste, even though they belong to the same group of people culturally.

Since the beauty judgements differed with gender, we examined whether there are also gender specific differences in the underlying formation processes of beauty judgements and beauty inferences. It has been shown that aesthetic liking (see Graf & Landwehr, 2017) and beauty judgements (see Miller & Hübner, 2020) depend on the affective as well as the cognitive evaluation of artworks, while beauty inference depends on the affective evaluation alone (Miller & Hübner, 2020). In the current study, beauty judgements could also be predicted by affective and cognitive judgements, which both explained equal variance of beauty judgements. In the Other-assessment, affective and cognitive inferences were again significant predictors of beauty inference, yet, affective inference explained double of the variance in beauty inference compared to cognitive inference.

To further investigate gender specific differences in the underlying processes of beauty judgements and beauty inferences, we assessed the semi-partial correlations of affective and cognitive judgements with beauty judgements, while removing the effect of the other variable, respectively (see Kim, 2015). In the Self-assessment, there was a significant positive correlation between cognitive judgements and beauty judgements of female participants, while affective judgements did not correlate significantly with beauty judgements. Whereas, for male participants, affective judgements showed a significant positive correlation with beauty judgements, while cognitive judgements did not correlate significantly with beauty judgements. It appears that there are not only gender specific differences in beauty judgements, but that also the processes leading to these beauty judgements are distinct between gender groups. In the Other-assessment, it showed that for female participants as well as for male participants affective and cognitive inferences had a positive correlation with beauty inferences. Consequently, when assessing beauty judgements and beauty inferences,

gender affiliation and the gender ratio have to be taken into consideration to avoid possible misleading results.

Aesthetic Judgement in Relation to Empathy

We further hypothesized that there is a relationship between people´s empathy and their affective and cognitive responses to an aesthetic experience. This relationship should also affect beauty judgements, due to the fundamental affective and cognitive evaluation processes involved (see Graf & Landwehr, 2017; Miller & Hübner, 2020).

Because of the reported gender specific differences in self-judged empathy (e.g., Christov-Moore et al., 2014; Baron-Cohen & Wheelwright, 2004; O'Brien et al., 2013; Rueckert & Naybar, 2008; Tran et al., 2013), we first assessed differences on the four empathy scales between the female and male participants. Consistent with the literature, we found significant gender difference for General Empathy, with higher scores of female participants. Specifically, females presented higher scores for Cognitive-sensitivity and Emotional-sensitivity in fictitious situations. Females seem to emphasize better with the apparent thoughts and emotions of fictitious characters or situations compared to males. A correlation analysis between empathy and aesthetic judgements per gender group also revealed gender specific differences. Here, the female participants showed a moderate negative correlation between Emotional-sensitivity in fictitious situations and beauty judgements, and a small positive correlation between Cognitive-concern in real-life situation and cognitive judgments. The male participants showed a small positive correlation between General Empathy and affective judgments, and a small positive correlation between Emotional-sensitivity in fictitious situation and cognitive judgements. These results support the assumption that females and males do not only differ in their empathy, but that they also apply the distinct kinds of empathy differently, which is in line with recent neuroscientific findings (e.g., Derntl et al., 2010; Groen et al., 2012; Schulte-Rüther et al., 2008; Singer et al., 2006). This gender specific application of empathy while viewing art might be an explanation for the reported gender specific differences in aesthetic preference.

We further applied a multiple linear regression analysis, predicting aesthetic judgements by General Empathy, the four specific empathy measures, and gender. The results were significant only for the beauty dimension. Here, Emotional-sensitivity in fictitious situation and Cognitive-concern in real-world situation were significant predictors. While Emotional-sensitivity in fictitious situation predicted beauty judgements negatively, Cognitive-concern in real-world situation was a positive predictor of beauty judgements. Cognitive-concern in real-world situation stands for a cognitive perspective-taking, which is defined as a volitional and active experience and mental representation of other people's concrete social and emotional concerns (Leibetseder et al., 2007). This definition is comparable to Theodor Lipp´s understanding of aesthetic empathy, as an active mental shift of perspective, from the perceiver to the depicted content or form of an artwork, which then provokes qualitative-affective

reactions (see Matravers, 2017). In our study, the viewing of the artworks was accompanied by affective and cognitive reactions, possibly due to the active perspective-taking of the depicted content and form, which, as hypothesized, influenced and predicted participants´ beauty judgements. We conclude in this regard with Gerger, Pelowski, and Leder (2017, p.163) that "…across a broad range of types of art, higher emotion contagion, that is more empathizing with art, can lead to more profound, deeper, and ultimately also better aesthetic experiences".

Aesthetic Inference Abilities

We first assessed gender specific differences in aesthetic inference abilities. Aesthetic inference abilities were computed in correlating each participant´s Other-assessment scores on the three aesthetic dimensions with the mean Self-assessment scores for the respective dimension (minus the single participant), which resulted in an inference ability score per participant per aesthetic dimension (see Ickes, 2016; Ickes, 2001; Ickes, 1993). We did not find significant differences between female and male participants´ aesthetic inference abilities for the entire participant group. Nevertheless, there were significant differences between female and male participants´ gender specific aesthetic inference abilities, i.e., inferences for the own gender group. Here, male participants showed significantly higher correlations on the affective dimension and the beauty dimension, compared to the female group. Consequently, males seem to be better in inferring other males´ affective responses and beauty judgements.

Aesthetic Inference Abilities in Relation to Empathy

Our second aim in this study was to investigate whether aesthetic inference abilities relate to empathy. Aesthetic inference founds on the understanding that other people have individual affective and cognitive aesthetic reactions, which produce specific aesthetic responses and preferences. The ability to infer others´ aesthetic judgements is considered to be a subcategory of general ToM abilities (Miller & Hübner, 2020). Since empathy is understood to be a prerequisite of a cognitively sophisticated ToM (see Dvash & Shamay-Tsoory, 2014; Seyfarth & Cheney, 2013), the relation of empathy and aesthetic inference abilities seems evident.

To test whether this was really the case in our study, we first conducted a correlation analysis between General Empathy and the four specific empathy measures and the aesthetic inference ability scores on the three aesthetic dimensions per gender group. Again, gender differences became apparent. For the female participants, a moderate positive correlation occurred between Emotional-concern in real-life situation and cognitive inference abilities. Whereas, a moderate negative correlation showed between cognitive inference abilities and Emotional-sensitivity in fictitious situation. Also, a small negative correlation occurred between Emotional-sensitivity in fictitious situation and females´ beauty inference abilities. The male participants showed a moderate positive correlation between their beauty inference abilities and Cognitive-concern in real-

life situation. Also, a small positive correlation showed between Cognitive-concern in real-life situation and cognitive inference abilities. Additionally, a moderate positive correlation showed between General Empathy and males´ cognitive inference abilities. Hence, we can conclude that there is a relation of empathy and aesthetic inference abilities, yet again, females and males seem to apply their empathy differently, not only when making aesthetic judgements from their own perspective, but also when inferring the aesthetic preferences of other people.

To further investigate the relation between aesthetic inference abilities and empathy, we conducted for each aesthetic dimension a multiple linear regression analysis. For the beauty dimension, Emotional-sensitivity in fictitious situation, Emotional-concern in real-life situation, and General Empathy were significant predictors. Gender was no significant predictor of beauty inference abilities. For the affective dimension, Emotional-concern in real-life situation was a significant predictor, yet, the overall regression model was not significant. Also, for the cognitive dimension, Emotional-concern in real-life situation was a significant predictor, yet again, the overall regression results were not significant. Even though the overall regression models for the affective and cognitive dimensions failed to reach significance, we still consider the result to be informative (see Gigerenzer, 2004; Greenland et al., 2016). Emotional-concern in real-life situation describes the ability to emotionally accord with broad social situations (Leibetseder et al., 2007). In this regard, it seems to be an emotional ability to consider which artworks other people find beautiful, how other people emotionally respond to artworks, and which ones they might find thought-provoking. This might appear counterintuitive at first. Yet, Tran et al. (2013) indicated that the differences of the four empathy dimensions reflect rather the distinction between real-world and fictitious situations than the two components, affective and cognitive empathy. As aesthetic inference concerns the ability to infer the aesthetic preferences of other people, the reality status seems to be of primary concern here.

Limitations

Limitations of this study pertain to the relatively small sample size. Moreover, sampling covered only university students, which possibly also affected results. Generalizability should be proven in future investigation.

Moreover, the particular influences of the distinct empathy dimensions on aesthetic judgements and aesthetic inference abilities, and respective gender differences, were rather difficult to interpret and require more specific research. Tran et al. (2013) indicated that the difference of cognitive and emotional empathy does not weight as much as the difference between empathy for fictitious and real-world situations. In our study, the two fictitious and the two real-world empathy scales showed moderate to high intercorrelations, and each empathy dimension presented moderate to high intercorrelations with General Empathy. Nevertheless, we observed that sometimes empathy could rather be distinguished into emotional and cognitive empathy, and sometimes

rather the situational character of empathy related to our data. We consider it thus of importance to investigate the distinct empathy dimensions in relation to aesthetic judgement and aesthetic inference abilities more closely, again, concentrating on possible gender effects.

In this regard, also the artworks´ style and content might impact the relation of the distinct forms of empathy to aesthetic judgement and aesthetic inference. Due to the theoretical considerations (Curtis & Elliott, 2015; Currie, 2011; Lanzoni, 2018; Freedberg & Gallese, 2007; Gallese, 2019) and recent findings (Gerger, Pelowski, & Leder, 2017) that empathy relates to the artwork´s depicted content as well as its pattern and form, we used an artwork set including representational as well as abstract art (see Chatterjee et al., 2010). In a consecutive study it might be helpful to investigate the relation of empathy to different contents (e.g., humans vs. nature), pattern and forms, and other representations of the visual arts, separately, to obtain more specific results.

Conclusion

As hypothesized, we observed relations between empathy and aesthetic judgements as well as between empathy and aesthetic inference abilities. Our results strongly support the assumption that empathy enables people not only to take the perspective of other people, but also to adopt the perspective of an artwork´s content and even form. Importantly, we found gender specific differences in the involved affective and cognitive processes underlying beauty judgement and beauty inference. Also, there were gender specific differences in empathy, and the relation of empathy to aesthetic judgement and aesthetic inference. These gender specific differences are important to consider in future studies in empirical aesthetics, since gender affiliation and gender ratio might lead to different study outcomes when investigating aesthetic judgement and aesthetic inference.

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