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Imagery in Art Appreciation and the Understanding of the Self and Others

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Abstract

Mental imagery refers to the ability to generate “images in the mind’s eye” (i.e., quasi-percepts in the absence of external stimulation) which allows us to conflate past and current events with imaginary futures in the ongoing narratives of ourselves. As such, mental imagery is likely to be associated with prosociality, emotional self-awareness and aesthetic experiences, but empirical evidence is still limited. Experiment 1 examined if differences in styles of mental imagery were associated with social cognition and emotional self-awareness, while Experiment 2 examined if those imagery styles were associated with the aesthetic appreciation of visual forms of art. The findings showed that *Object*-oriented imagery was associated with prosocial traits (empathy and the ability to be transported into fictional worlds), but not with perspective taking. *Spatial*-oriented imagery was associated with an increased difficulty describing one’s own feelings, while *Verbal*-oriented imagery was associated with a better understanding of one’s own feelings. Visual styles of imagery (*Object*, *Spatial*) predicted some of the variation in the aesthetic appreciation of photographs (but not paintings) and such relationship was moderated by the vividness of the imagery (but not by art experience). Conversely, art experience (but not vividness) was a moderator of the appreciation of paintings, but only in individuals with a weak *Object*-oriented imagery. The results point to reliable associations of mental imagery with prosociality and emotional self-awareness and support a role for imagery in fine-tuning the aesthetic appreciation of visual art, important to inner simulations underpinning an adaptive imagination.

Keywords: *mental imagery, prosociality, empathy, aesthetic appreciation, visual art*

Introduction

At the center of our own perceived reality stands a construct of the self built on experiences engraved in a dynamic memory system and imbued with predictive abilities, some of which linked to mental imagery ability. Mental imagery is a form of weak or quasi-percept appearing in the mind's eye in the absence of any external sensory input; it is not a hallucination as it is linked, even if tenuously, to reality. Mental imagery is often audiovisual in nature, but it also includes motor-sensory forms of embodiment and more intangible aspects of our sense of self. As such, imagery as a broad experience is an essential component of introspection (“inward look”), retrospection (“backward look”) and prospection (“forward look”), each of which integral to our perceived reality (Dijkstra et al., 201; Phillips, 2014; Thomas, 2009). In other words, imagery can conflate one's past with the scenario in which the self is currently immersed, as well as with imaginary futures (Pearson, 2019). The ongoing narrative of such perceived reality relies on somatosensory inputs and top-down information to generate mental representations of immediate experiences and future expectations. Whether we are fully aware of them or not is still a controversial issue, but unarguably mental imagery combines many forms of sensory perceptions common to shared environments that contribute to the formation of mental landscapes (Thomas, 2009; Nanay, 2010).

Not long ago, styles of mental imagery were described within a categorical verbalizer–visualizer distinction (Richardson, 1977). The terms refer to dominant preferences in the use of mental imagery; the so-called “visualisers” would focus on mental images to solve problems, while “verbalizers” would focus on language to do so (Kosslyn et al., 2001; Kosslyn et al., 2003). Later studies subdivided the “visualisers” according to the predominant focus of the cognitive styles used: object or spatial. Visualizers with a dominant *Object*-based cognitive style of mental imagery focus on the properties of the percept (e.g., color, shape, brightness). Those with a dominant *Spatial*-based cognitive style of

Imagery, Social Cognition and Aesthetics

imagery tend to focus on the spatial relations between static and dynamic parts of objects and their location in space (Blajenkova et al., 2006; Campos, 2009; Lacey et al., 2009).

Neurotypical individuals share those three cognitive styles but often differ from each other in terms of which style dominates when mental imagery is triggered. Imagery ability in everyday life is a dynamic component of the self and has an important functional role in many aspects of cognition (Pearson et al., 2015; Schacter & Addis, 2007; Smallwood & Schooler, 2015). An example of the strong relationship between imagery and the self refers to the emergence of simulations of inner narratives as part of a mythopoetic cognitive model that situates the individual within a series of dramatically organized schema or templates intended to facilitate interactions with the outside world (Asma, 2022; Felisberti & King, 2022).

It could be argued mental imagery can act as a ‘glue’ to hold the moment-by-moment experiences together, embracing and relying on empathy, self and vicarious emotional awareness, and the enjoyment of art to promote prosocial and cultural interactions. With this in mind, the current study focused on the contribution of mental imagery styles (pictorial, spatial, and verbal) to the understanding of the emotional self, the understanding of others, and the aesthetic appreciation of (visual) art. Although mental imagery is embedded into human cultures and likely to be associated with aesthetic enjoyment, social cognition (e.g., mindreading, empathy, fantasy), and emotional self-awareness, empirical evidence of such associations is scarce. Below is an overview of such traits.

Mindreading and Perspective Taking

Mindreading (also known as Theory of Mind, mentalizing, mind attribution, etc.) refers to one’s ability to recognize and/or predict the actions, intentions, and motivations of others, either in real life or in fictional characters in drama (e.g., theater, films, literature) and several other forms of artistic

Imagery, Social Cognition and Aesthetics

expression (Corballis, 2003; Frith & Frith, 2005; Turner & Felisberti, 2019). Through shared intentionality, mindreading ability may extend to the intentions of the artists who created those characters (Tomasello et al., 2005). In some cases, mindreading is merged with perspective taking, such as when we spontaneously compute the perspectives of others during communication and other social exchanges (Surtees, Apperly, Samson, 2016; Turner & Felisberti, 2017).

Empathy and Emotional Self-awareness

Empathy is often described as the ability to identify not only assorted emotional states of others but also to imagine how they feel, providing a platform for the interpretation of the social cues that permeate prosocial behaviour (Davis, 1980; Davis, 1983). Indeed, empathic abilities contribute to social bonding and the sharing of social experiences (Batson et al., 2015; de Vignemont & Singer, 2006). Previous studies reported that art, here in the form of literary fiction, had favorable effects on mindreading and prosocial behaviours, including empathy (Dodell-Feder & Tamir, 2018; Johnson, 2012).

Emotional self-awareness is likely to impact the ability to empathize with the emotions of others, even if only by having an internal reference with which to work. People with alexithymia (the inability to define and describe one's own emotions) exhibit a limited ability to distinguish between their own personal thoughts, bodily sensations and feelings (Grynberg et al., 2018; Ridout et al., 2021). As expected, individuals with alexithymia have great difficulty not only recognizing and understanding the thoughts or feelings of others, but also in empathizing with them (Bagby et al., 1994; Guttman & Laporte, 2002; Luminet et al., 2021; Lyvers et al., 2017; Prkachin et al., 2009).

Aesthetic Appreciation

Imagery, Social Cognition and Aesthetics

Aesthetic appreciation results from complex interactions between artistic outputs and the viewers, which involve mnemonic, affective, and perceptual processes (Gernot et al., 2018; Menninghaus et al., 2017; Onians, 2018; Rusu, 2017) to cite just a few. Artists can create fictional worlds and characters that entice observers to join in those fantasies (Bullot & Reber, 2013; Dubourg & Baumard, 2021; Iosifyan, 2021); the stronger the vividness of the mental depictions generated, the more enjoyable those fictional worlds are likely to be (c.f., Friedlander, Lenton & Fine, 2022). Often audiences juggle attempts to understand the possible ‘storylines’ running through an artwork with attempts to understand the artist’s intentions when creating it (c.f. (Marković, 2010; Pelowski & Akiba, 2011; Pelowski et al., 2017). Imagined percepts can also interact with incoming external signals by increasing or lowering detection thresholds (Stein & Peelen, 2015).

This study used a multidimensional approach of mental imagery to examine the strength of its association with prosocial traits, emotional self-awareness, and aesthetic appreciation of visual art. The aims were, firstly, to test the prediction that the ability to simulate interactive scenarios in our minds (imagery) was associated with emotional self-awareness and prosociality (Experiment 1). Secondly, to test the prediction that mental imagery was associated with aesthetic appreciation of cultural products such as paintings and photography (Experiment 2). And thirdly, the study aimed at examining if the viewers’ vividness of mental imagery and their experience with art moderated the association between mental imagery and art appreciation of our stimulus set (Experiment 2).

The results are likely to help the understanding the relationship between mental imagery and core elements of our own internal simulations and sociocultural interactions, which is likely to have practical implications for wellbeing (c.f., Luft et al., 2019), clinical therapies (c.f., Boe & Krautner, 2018), and a wide range of cultural endeavors (c.f., Ward, 1994).

Experiment 1 – Mental Imagery, Prosociality and Emotional Self-awareness

All studies reported here received a favorable opinion from the Psychology Ethics Committee and were carried out in accordance with the ethical standards of the British Psychological Society and the Declaration of Helsinki 2013. Participation was voluntary, and no payments were made to the participants, although some received course credits for their participation.

It should be noted that while not part of the main aims, data analyses were controlled for gender (male/female) here and in Experiment 2, since it varied with mental imagery style in previous studies (Miller & Hübner, 2023; Pérez-Fabello, Campos & Felisberti, 2018).

Participants

There were 567 participants (411 females, 156 males) with an age range of 17-65 ($M = 27.22$ years, $SE = .44$, $CI = 26.37, 28.08$) in the analyzed dataset for Experiment 1. Omitted from that total were the 65 participants because they did not complete the survey, were too fast for a meaningful understanding of the questions (< 6 min) or took long breaks before completing the study (durations > 60 min). There were four data sets comprising the total n , each with a unique set of participants: mental imagery style only ($n = 231$), imagery style and prosocial traits only ($n = 177$), imagery style and emotional self-awareness only ($n = 87$), and imagery style, prosocial traits, and emotional self-awareness ($n = 72$).

All participants were fluent English speakers and had lived in the United Kingdom for more than three years, but they had assorted first languages (395 native speakers, 172 with English as second language). Most of the cohort were university students from a wide range of degrees (ca. 1/3 from psychology), and some participants were recruited via social media or through word of mouth.

Imagery, Social Cognition and Aesthetics

Participants did not report any physical or mental health issues and their vision was normal or corrected-to-normal.

Materials

Object-Spatial Imagery and Verbal Questionnaire - OSIVQ

The OSIVQ (Blajenkova & Kozhevnikov, 2009) has 45 self-assessed statements about cognitive styles of mental imagery, with answers rated on a five-point Likert scale, from '1' for totally disagree to '5' for totally agree. It contains three subscales based on the dominant cognitive style of the participants: verbal or visual (subdivided into object or spatial). High scores for *Verbal*-oriented style statements indicate a predominant use of an "inner voice" to describe situations and actions (e.g., "When remembering a scene, I use verbal descriptions rather than mental pictures"). The *object*-oriented style refers to the ability to picture objects, people, and surroundings in ones' "mind eye" (e.g., "When reading fiction, I usually form a clear and detailed mental picture of a scene or room that has been described"). The second visual subscale, the *Spatial*-oriented style, contains statements indicating high levels of visual abstraction and a preference for schematic rather than pictorial visualizations (e.g., "I can easily imagine and mentally rotate three-dimensional geometric figures"). The Cronbach's alpha in this cohort was: *object*-oriented style ($\alpha = .73$), *Spatial*-oriented style ($\alpha = .72$), and *Verbal*-oriented style ($\alpha = .69$).

Interpersonal Reactivity Index - IRI

The IRI index (Davis, 1983) was used to assess prosocial individual traits. It has 28 self-assessed statements measured with a five-point Likert scale, and divided in four independent subscales: fantasy, empathic concern, personal distress, and perspective taking. The *Personal Distress* subscale was not directly relevant to this study and not included in the data analysis. The *Fantasy* subscale serves as an

Imagery, Social Cognition and Aesthetics

index of identification and empathy with fictional situations and characters and the ability to be transported into narrative worlds (e.g., “After seeing a play or movie, I have felt as though I were one of the characters”). The *Empathic Concern* subscale assesses the so-called cognitive empathy towards other individuals (“When I see someone being taken advantage of, I feel kind of protective towards them”). The *Perspective Taking* subscale is used to assess the capacity to mentalize the points of view of other people (“Before criticizing somebody, I try to imagine how I would feel if I were in their place”) and can be thought as an important component of ‘mindreading’. The Cronbach’s alpha with a reversed item excluded was *Fantasy* ($\alpha = .76$), *Perspective Taking* ($\alpha = .74$), and *Empathic Concern* ($\alpha = .75$).

Toronto Alexithymia Scale – TAS-20

The TAS-20 (Bagby et al., 1994) is also a self-report scale with 20 statements rated using a five-point Likert scale. It is used to assess emotional self-awareness (hence its use in alexithymia diagnosis). The TAS-20 has 3 subscales: difficulty describing feelings (five items), difficulty identifying feelings (seven items), and externally oriented thinking (eight items). *Difficulty Describing Feelings* refers to the difficulty one has to describe one’s own emotions and feelings (“It is difficult for me to reveal my innermost feelings, even to close friends”), while *Difficulty Identifying Feelings* refers to the difficulty identifying one’s own emotions and feelings (“I am often confused about what emotion I am feeling”). *Externally Oriented Thinking* is the subscale used to measure the tendency of individuals to focus their attention externally (“I prefer to just let things happen rather than to understand why they turned out that way”) and it was not used in this study, as it was not directly related to emotional self-awareness. The Cronbach’s alpha for the TAS-20 was .77; the α values for two of the three separate subscales was: *Difficulty Describing Feelings* ($\alpha = .75$; one item removed) and *Difficulty Identifying Feelings* ($\alpha = .83$).

Imagery, Social Cognition and Aesthetics

Procedure

The survey was run online on the Qualtrics platform. Information about the study was provided at the start of the survey and participants gave their informed consent by continuing the survey rather than opting to exit it. The data reported here was collected between 2016 and 2019 in four separate surveys. All surveys had the demographic questions about age, gender, language, and included the OSIVQ imagery scale ($n = 567$).

Data analysis

All statistical analysis was performed in JASP (JASP team, 2020). Pearson's correlation, linear regression and repeated-measures ANOVAs with Greenhouse–Geisser and Bonferroni correction were used to investigate the relationships between the study variables. To reiterate, across the three surveys: 72 participants completed all surveys, 177 participants completed the OSIVQ and IRI, 87 completed the OSIVQ and TAS-20, and 231 completed the ASIVQ only. The data was then aggregated for the statistical analysis. A sample size of 166 participants was needed in for a medium effect size with a 95% power calculated with G*Power (Faul et al., 2007). All data and stimuli for both experiments are available on the Open Science Framework:

https://osf.io/yjvz4/?view_only=3ad385a2a19148439a620ddb26aa45e8.

Results

Preliminary analysis: Mental imagery styles and gender

A 3 (imagery styles) by 2 (gender) repeated-measures ANOVA showed that the scores for each of the three mental imagery styles were reliably different from each other, $F(1.82, 1124) = 113.79, p <$

Imagery, Social Cognition and Aesthetics

.001, $\eta^2 = .107$. The distribution of imagery styles varied with gender, $F(2, 1124) = 21.64, p < .001, \eta^2 = .020$. Females had a dominant *Object*-oriented style ($M_{\text{female}} = 52.14, SD = 8.41, M_{\text{male}} = 49.82, SD = 8.11; p = .003$), while males showed a dominant *Spatial*-oriented style ($M_{\text{male}} = 47.43, SD = 8.60; M_{\text{female}} = 41.81, SD = 7.93; p < .001$). The scores for the *Verbal*-oriented style were statistically similar ($M_{\text{female}} = 52.67, SD = 11.60; M_{\text{male}} = 54.23, SD = 11.33; p = .148$). Results are shown in Figure 1 and are broadly consistent with previous work (Miller & Hübner, 2023, Pérez-Fabello, Campos & Felisberti, 2018).

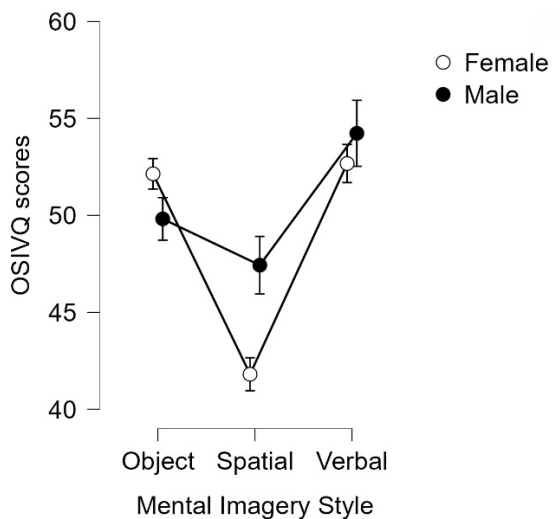


Figure 1.

Mean scores for the three cognitive styles of mental imagery in males and females obtained from the *Object-Spatial Imagery and Verbal Questionnaire (OSIVQ)*. Bars indicate 95% confidence intervals.

Imagery styles, prosocial traits and self-awareness

The initial aim of these studies was to examine the relationship between different imagery styles and emotional and prosocial traits of the individual. To this end, we conducted Pearson's correlations which showed the broad relationships between imagery styles (*Object, Spatial* and *Verbal*) and

Imagery, Social Cognition and Aesthetics

emotional self-awareness (*Difficulty in Describing Feelings* and *Difficulty in Identifying Feelings*), and imagery style and prosocial traits (*Perspective Taking*, *Empathic Concern*, and *Fantasy*). Linear regression was then used to further examine the relationships between variables of interest.

Table 1 shows the results of the Pearson's correlations: emotional self-awareness in the upper panel and prosocial traits in the lower panel. The data comparing imagery styles indicate that *Object-* and *Spatial-*oriented imagery styles were positively correlated with each other (0.16), which is not entirely surprising since the two subfactors are related to visual aspects of mental imagery. There were moderate significant correlations seen between *Difficulty in Describing Feelings* and the *Spatial* (+0.20) and *Verbal* (-0.18) imagery styles in the emotional self-awareness dataset. Imagery style and prosocial traits were also linked: there was also a strong correlation between the *Object-*style imagery and *Fantasy* (+0.24) and a lesser correlation with *Empathic Concern* (+0.13). Imagery styles, however, were not significantly correlated with *Perspective Taking* in our dataset.

Mental imagery and Emotional Self-Awareness

Linear regression (also controlling for gender) showed that a prominent *Spatial-*oriented style accounted for a modest variation in the scores for *Difficulty Describing Feelings*, ($\Delta F(1, 157) = 6.86, p = .010, R^2 = .04; \beta = .21$). As expected, a dominant *Verbal-*oriented style was linked to a facility in accessing one's feelings, indicated by the negative association with the subscale *Difficulty Describing Feelings*, ($\Delta F(1, 157) = 4.32, p = .039, R^2 = .03; \beta = -.16$), but not with the *Difficulty Identifying Feelings*.

Table 1.

Imagery, Social Cognition and Aesthetics

Pearson Partial Correlations between Mental Imagery, Emotional Self-Awareness and Prosociality.

Partial correlations (controlling for gender) with the subscales of mental imagery styles (*Object—O*, *Spatial—S*, *Verbal—V*), emotional self-awareness (*Difficulty Describing Feelings—DDF*, *Difficulty Identifying Feelings—DIF*), and prosocial traits (*Perspective Taking—PT*, *Empathic Concern—EC*, *Fantasy—F*).

	O	S	V	DDF	DIF			
Object	1	.07	.12	-.13	.04			
Spatial		1	-.05	.20*	.11			
Verbal			1	-.18*	-.15			
	O	S	V			PT	EC	F
Object	1	.16**	.11			.05	.13*	.24***
Spatial		1	-.02			-.06	-.08	.01
Verbal			1			.05	.03	-.01

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Mental imagery and Prosociality

A second regression analysis indicated that the *object*-oriented style was associated with high scores in the *Fantasy* and the *Empathic Concern* subscales of IRI, $F(2, 247) = 9.73$, $p < .001$, $R^2 = .074$; $\beta_{\text{Fantasy}} = .25$, $\beta_{\text{Empathic concern}} = .06$, again when controlling for gender. In other words, a dominant *object*-oriented style was associated with the ability to be transported into different narrative worlds and, to a lesser extent, the ability to empathise with others.

Experiment 2 – Mental Imagery and Aesthetic Appreciation

Experiment 1 showed that dominant imagery styles had a significant relationship with some prosocial and emotional traits (first aim). The second and third aims of this study, addressed here, were to examine the role of mental imagery in the appreciation of art and whether it varied with the type of visual artwork (i.e., photographs and paintings). We hypothesized that the participants' experience with art and vividness of the images generated in their minds' eyes moderated the relationship between the style of mental imagery and their appreciation of the artwork.

Participants

Participants included those from Experiment 1 ($n=231$) and those unique to Experiment 2 ($n = 65$) giving a total of 296 participants (209 females, 87 males) with ages ranging between 18 and 69 ($M = 27.75$ years, $SE = .63$, $CI = 26.50, 28.99$). Participants were recruited through the university research participation scheme, via social media or through word of mouth. As in Experiment 1, participants were fluent English speakers and there were no reports of physical or mental health issues. Participants' vision was normal or corrected-to-normal.

Materials

Object-Spatial Imagery and Verbal Questionnaire – OSIVQ (Blajenkova & Kozhevnikov, 2009)

As described in Experiment 1; the Cronbach's alpha was: *object-oriented style* ($\alpha = .80$), *Spatial-oriented style* ($\alpha = .73$), and *Verbal-oriented style* ($\alpha = .74$).

Vividness of Visual Imagery Questionnaire – VVIQ (Marks, 1973)

The VVIQ is a commonly used measure to assess how vivid, or strong, an individual's mental image is. It comprises 16 items asking participants to consider their mental images when thinking about

Imagery, Social Cognition and Aesthetics

a specific situation or scene (e.g., “Visualise the rising sun. Carefully consider the picture that comes before your mind’s eye. - The sun is rising above the horizon into a hazy sky”). A five-point Likert scale is used to rate the vividness of a described image (‘1’ for “no image at all, you only “know” that you are thinking of the object” to ‘5’ for a “perfectly clear and vivid as normal vision”). Participants were free to keep their eyes open or closed during the visualisations (Cronbach’s $\alpha = .90$).

Art Experience Questionnaire – AEQ (Chatterjee et al., 2010)

In order to examine the role of experience in the exposure to and the appreciation of art, we used the AEQ. This is a screening self-report questionnaire examining a participant’s classroom experience in studio art (e.g., “*How many studio art classes have you taken at the high school level or above?*”; scale: 0 to 6+), art theory and history, and frequency of visits to museums and galleries (e.g., “*On average, you visit art galleries about once every...*”, scale: 0 = “never” to 5 = “weekly”). (Cronbach’s $\alpha = .77$).

Visual Stimuli

The digital images of paintings and photographs were sourced from Art Museums and Galleries with webpages in the Internet. From a sample of about 200 images of Picasso paintings and of artistic photographs, we selected the 32 images with the highest preference ratings in previous studies (Felisberti et al., 2019; Felisberti, 2021a,b). The luminance of the images was adjusted with Adobe Photoshop and presented at a resolution of approximately 150 x 150 dpi. Attempts were made to balance the content of the images and the number of scenes with people and with objects or landscapes.

- *Paintings*. The Picasso’s paintings were from different periods of his career and had different styles. Attempts were made to keep a balance between his ‘quasi-abstract’ ($n = 17$) and his ‘figurative’ ($n = 16$) paintings.

Imagery, Social Cognition and Aesthetics

- *Photographs*. The 30 black and white artistic photographs were from Henri Cartier-Bresson ($n = 11$) and from assorted (but well-known) artistic photographers ($n = 19$).

Procedure

The online survey ran on the Qualtrics platform between 2017 and 2019. Once they gave their informed consent, participants could proceed with the survey. The evaluation of the images used a 5-points Likert scale which had a vertical slider (from '1' for 'I dislike it a lot' to '5' for 'I like it a lot') stationed at the value '3' ('I neither like nor dislike it'). 'Like' is a general term denoting enjoyment and it does not cover a multifaceted expression like "aesthetic preference", but we wanted to make the questions as simple and accessible as possible for naïve participants, and the scale was used in previous studies (Felisberti et al., 2019; Felisberti, 2021). For a more detailed discussion on aesthetic judgment across domains see Clemente and colleagues (2021).

Data analysis

Given that gender differences in imagery style were observed in Experiment 1, gender was also controlled here. In addition to repeated-measures ANOVA (with Greenhouse–Geisser and Bonferroni correction), Pearson's correlation and linear regression, moderation analyses were carried out using the PROCESS macro for SPSS developed by Hayes (2012). Post hoc analyses to examine significant interactions used the Johnson-Neyman technique. The recommended sample size needed for a medium effect size with 95% power was 153 participants (current $n = 296$).

Results

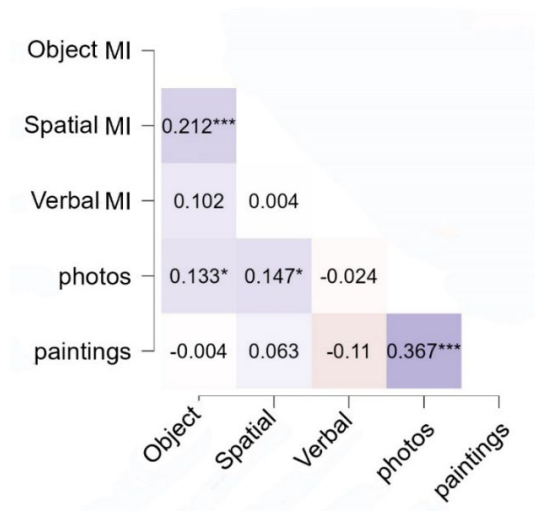
Preliminary analysis: Mental imagery styles and gender

Females had higher scores for *Object*-oriented style than males ($F(1, 294) = 5.93, p = .015, \eta^2 = .020$), while males had higher scores for *Spatial*-oriented style ($F(1, 294) = 13.80, p < .001, \eta^2 = .045$). No significant gender differences were observed with the scores for *Verbal*-oriented imagery ($F(1, 294) = 1.48, p = .224, \eta^2 = .005$). This was unsurprisingly in line with the results of Experiment 1.

Table 2 shows the Pearson’s correlations relating the imagery style with the preference ratings for the two types of images: photographs and paintings. Participants with either *Object*- or *Spatial*-style imagery dominance show higher liking ratings for the art images presented.

Table 2.

Correlations Between Aesthetic Appreciation and Mental Imagery. Correlations heatmap with the liking ratings for paintings and photographs and cognitive styles of mental imagery (MI): *Object*-oriented, *Spatial*-oriented and *Verbal*.



*** $p < .001$, ** $p < .01$, * $p < .05$

Imagery, Social Cognition and Aesthetics

Examining the role of image type, a repeated-measures ANOVA (Bonferroni corrected) showed a main effect of image category (photography vs painting), $F(1, 295) = 78.25, p < .001, \eta^2 = .210$. The mean liking ratings for photographs ($M = 3.42, SE = .03, CI = 3.37, 3.48$) were higher than the mean ratings for paintings ($M = 3.08, SE = .04, CI = 3.03, 3.16, p < .001$). These data are plotted in Figure 2.

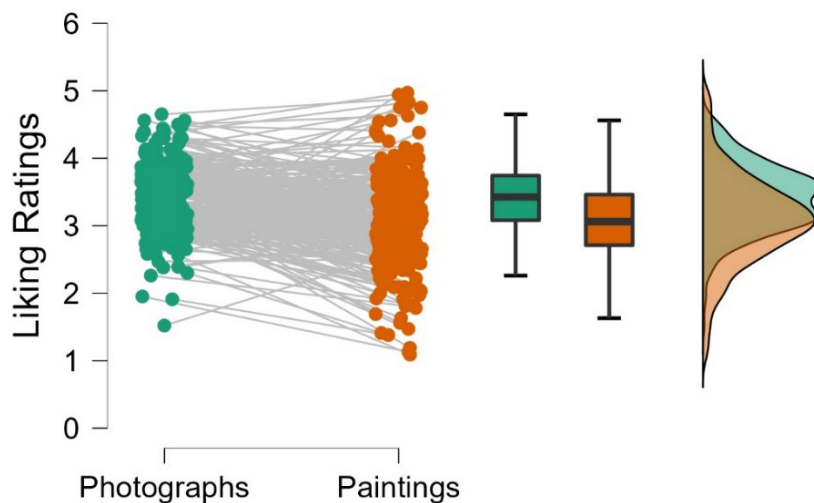


Figure 2.

Mean Liking Ratings for Aggregated Photographs and Picasso Paintings. Bars indicate 95% confidence intervals.

Mental Imagery and the appreciation of photographs

Examining the response to each type of image separately, a correlational analysis revealed significant correlations between the liking ratings for photographs and the *object*-oriented style ($r = .133; p = .022$) and *Spatial*-oriented style ($r = .146; p = .012$) (Table 2). A regression analysis showed that the scores for *object* and *spatial* styles accounted for about 3% of the variance in the overall ratings of photographs ($F(2, 295) = 4.88, p = .008, R^2 = .032; \beta_{\text{Object}} = .11, \beta_{\text{Spatial}} = .12$).

Imagery, Social Cognition and Aesthetics

To examine whether the vividness of imagery and art experience affected the relationship between styles of mental imagery and the ratings for photographs, a moderation analysis was carried out. The analysis showed that *Vividness* scores in the upper quartile moderated the relationship between the liking ratings for photographs and the *object*-oriented style ($b = .015, t(232) = 2.53, p = .012, CI = [.003, .026]$), as well as the *Spatial*-oriented style ($b = .019, t(232) = 2.87, p = .005, CI = [.006, .031]$). These data are plotted in Figure 3a-b. The level of *Art Experience* of the participants had no significant moderator effect on the relationship between styles of mental imagery and the appreciation of photographs.

Mental Imagery and the appreciation of paintings

No correlations were observed between the *object*-oriented and *Spatial*-oriented styles and the aggregated ratings for paintings (Table 2). The *Vividness* of mental images had no significant effect on the relationship between mental imagery and the aggregated liking ratings for paintings.

Art Experience, on the other hand, moderated the relationship between an *Object*-oriented style and the appreciation of paintings, at both low levels ($b = .017, t(291) = 2.51, p = .013, CI = [.004, .031]$), and high levels ($b = -.015, t(291) = -2.50, p = .013, CI = [-.026, -.003]$) of *Art Experience* (Figure 3c). Participants with a weak *Object*-oriented style but a high level of *Art Experience* showed a higher appreciation of the paintings than those with a weak *Object*-oriented style and low exposure to art. Conversely, the appreciation of paintings of individuals with a dominant *Object*-oriented style were not affected by their level of *Art Experience*.

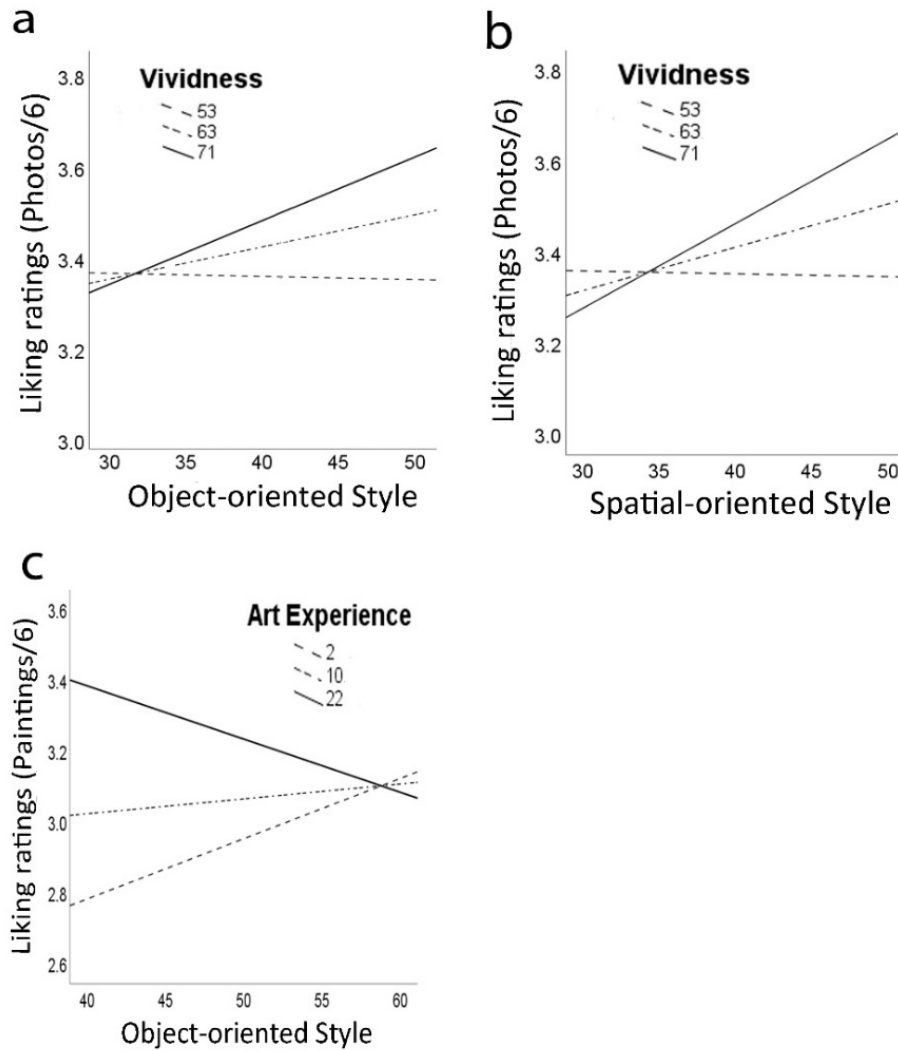


Figure 3.

Moderating of Vividness of Mental Images (Vividness) and Art Experience on the Relationship Between Liking Ratings for Photographs and Paintings. Vividness: Ratings for photographs and (a) Object-oriented and (b) Spatial-oriented cognitive styles of mental imagery. Art Experience: Ratings for Picasso paintings and (c) Object-oriented cognitive style of mental imagery.

Discussion

This study explored mental imagery links with different facets of social cognition, emotional self-awareness, and the appreciation of some forms of visual art.

Even though not included in the core aims of this study, we examined (then controlled for) gender differences in mental imagery and showed that females tended to have a dominant *Object*-oriented style while males tended to have a dominant *Spatial*-oriented style; no gender difference was observed in the *Verbal*-oriented style. Such findings are aligned with studies using the same, more granular categorisation of visualizers (Blajenkova & Kozhevnikov, 2009; Campos, 2009; Cho, 2017; Pazzaglia & Moè, 2013), but whether this is “nature” or “nurture” remains an open question (Pérez-Fabello et al., 2018). In contrast, earlier studies, like the one by Coltheart and colleagues (1975), reported that females performed better in verbal tasks while males performed better in visuospatial tasks. The conflicting results may be due to differences in the methods used to access mental imagery where participants were subdivided simply into “visualizers” or “verbalisers”; “visualisers” were not subdivided into *Object*- or *Spatial*-oriented groups like in this study.

The relationship between mental imagery and prosocial traits was examined in Experiment 1. The results indicated the existence of a significant link between *Object*-oriented imagery and some prosociality traits. *Object*-oriented imagery was strongly associated with the ability to be transported into different narrative worlds and, to a lesser extent, associated with the ability to empathise with others. Consistent with such findings, another study showed that individuals trained to generate imagery across multiple sensory domains felt greater empathy for characters in a fictional story and were more likely to exhibit prosocial behaviour than individuals without the training (Johnson et al., 2013). The finding is also in line with a study on the association between imagery and fiction reading (Mak, DeVries & Willems, 2020), where the IRI *Fantasy* trait was positively correlated with the enjoyment of

Imagery, Social Cognition and Aesthetics

a written story and the vividness of the mental imagery. In fact, fantasy and empathy seem to be integral to our ability to engage with assorted prosocial behaviours (Gaesser et al., 2018) and with different manifestations of culture, from visual art and literature to music (Mar et al., 2006; Schwering et al., 2021; Woody, 2002). While it might have been logical for the IRI *Perspective Taking* to be correlated with some of the mental imagery styles, no significant association was observed. Some studies have criticised the suggestion that we spontaneously take the perspective of others (Cole & Millett, 2016; Samson et al., 2010) and argued that perspective taking is just one of the many processes involved in the understanding others and inferring what they may experience. It seems that spontaneously taking the perspective of others is potentially less functional than understanding their point of view and then inferring their visual perspective (Samson et al., 2010). In the context of this study such criticisms may be supported in that there is growing evidence that perspective taking can be further split into cognitive and affective components (Beudt & Jacobsen, 2015; Healey & Grossman, 2018; Miller & Hübner, 2020).

Experiment 1 also examined the relationship between mental imagery and emotional self-awareness. The results showed that a dominant *Verbal*-oriented style of imagery was linked to the participants' ability to better describe their own feelings. Such individuals are likely to have better verbal skills, or a verbal skill set, enabling them to describe their feelings more accurately than others. However, whether the preferred style of representation increased the attainment of strong verbal skills could not be addressed in this exploratory study. Conversely, a prominent *Spatial*-oriented style was associated with difficulties describing one's own feelings. It suggests that those who can easily navigate and rotated objects in their mind's eye have lower emotional self-awareness, which may point to disturbances in the relationship between insular interoceptive and affective processing (Simmons et al.,

Imagery, Social Cognition and Aesthetics

2013) and *Spatial*-oriented imagery. Future studies are needed to examine the viability of such suggestion.

Our second and third aims were addressed in Experiment 2. It examined the involvement of mental imagery in the aesthetic appreciation of visual art, namely Picasso paintings and photographs of Henri Cartier-Bresson and other well-known photographers. The study also examined if art exposure and knowledge and the vividness of mental images moderated the relationship between imagery and the appreciation of the images. The results revealed that participants liked the photographs more than the paintings—in line with previous studies (Balling & Falk, 1982; Felisberti & Harrison, 2022; Ulrich, 1983)—and that the liking ratings for photographs were positively correlated with *Object*- and *Spatial*-oriented imagery styles.

Curiously, while *Art Experience* (but not *Vividness*) moderated the association between imagery style and the appreciation of paintings, *Vividness* (but not *Art Experience*) moderated the association between imagery style and the appreciation of photographs. These findings suggest a beneficial effect of prior contact with art on the aesthetic appreciation of paintings (Arnheim, 1974; Chatterjee et al., 2010; Nadal & Chatterjee, 2019). However, the positive moderator effect of *Art Experience* was only observed in individuals with a weak *Object*-oriented style of imagery (i.e., less likely to visualize objects in their mind's eye); there was no effect of *Art Experience* on dominant *Object*-oriented imagery in the appreciation of paintings. *Vividness*, on the other hand, moderated the relationship between *Object*- and *Spatial*-oriented imagery and the appreciation of photographs (but not paintings).

The strong tonal contrast of photographs may have favoured the mental vividness of those images and primed preferences by pre-activating stimulus-driven visual processing streams more strongly than the suggestive nature of imagery stimulated by paintings. In a study about the use of photographs of commercial products, the reduction of ambiguity in the background of an image with a product could

Imagery, Social Cognition and Aesthetics

make it more salient and more likely to engage mental imagery (Maier & Dost, 2018). It seems reasonable to assume that perceptual shifts from reality to imagination may benefit from monochrome photography more than from colour photography. Furthermore, since most of us experience the world as colourful, art photographers can use monochrome images to increase the distance between the observers and the subject matter, making them to pause, pay attention, and focus on the emotional valence of the images. This may also explain the preference for photographs over paintings, since photographs are more immediately accessible, sometimes familiar, and congruent with reality, but the intricacies involved in such mechanism are yet unknown and need to be addressed in future studies.

Some of the limitations in this exploratory study have been already mentioned above and need to be further investigated. With hindsight, perspective taking should not have been used as the sole proxy trait for mindreading (Nichols & Stich, 2003); future studies would benefit from using more sensitive and granular scales to address mindreading ability and possible links with imagery (if there is indeed one). Recent work by Miller and Hübner (2020, 2023) proposed a subcategory of mindreading termed Theory of Aesthetic Preference – the ability to reason and infer the preference of others. This is partially consistent with the link observed between *Object*-oriented imagery and prosocial traits like fantasy and empathy.

Aesthetic appreciation is an intensely subjective experience, and the choice of visual artworks is expected to impact it. A more efficient way to understand the interaction between imagery and art appreciation might have been to ask participants to select a number of artworks that they *do* like and then use them to examine possible imagery-aesthetic appreciation links, an approach similar to the method of production suggested by Fechner (1876) and used in a different study (Felisberti, 2021). Finally, a larger follow up study is needed to confirm (or disambiguate) some of the findings in this

Imagery, Social Cognition and Aesthetics

study, since there were four separated datasets, some of which did not contain all the variables for each of the participants (see methods).

Explanatory models of art appreciation attempt, with varying degrees of success, to integrate the many aspects of aesthetic experiences from the initial viewing of an artwork to the multiple levels of response experienced by the viewers (c.f., Pelowski, Marling, Luring & Leder, 2016), which often overlook the role of their personality traits and emotional states. This study explored the assumption that a set of complex responses emerge when we look at an artwork; the visual information retained in our working memory and then retrieved in our mind's "eye" is likely to be linked to our ability to be transported into imaginary worlds, to understand our own emotional reactions, the artists' emotions and intentions (via empathy), as well as their personal, social, and cultural perspectives (Friedlander et al., 2019).

In short, the findings reported here confirmed some of our predictions, namely that mental imagery styles were associated with the appreciation of visual art. Such findings supported a role for mental imagery in fine tuning aesthetic experiences with art—paintings and photographs—as shown in fine art students in an earlier study (Pérez-Fabello et al., 2007). Cognitive styles of mental imagery were linked to the ability to fantasise, to empathise, and to be emotionally self-aware, which can have important clinical implications: imagery was associated with the strength of contextualised emotional responses (Böker et al., 2010; Holmes & Mathews, 2010; Schwarz, 2020), and with impairments in autism and alexithymia (Bagby, Parker & Taylor, 1994; Guttman & Laporte, 2002; Prkachin, Casey & Prkachin, 2009), among others. We propose that the links between mental imagery, prosociality traits and emotional awareness play an important role in simulations of inner narratives essential to human exchanges and aesthetic experiences at the core of culture and mythopoetic imagination.

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Data Availability Statement

The datasets analyzed in this study can be found in the Open Science Framework (Mental Imagery, Prosocial Skills, Aesthetics study):

https://osf.io/yjvz4/?view_only=3ad385a2a19148439a620ddb26aa45e8

Appendix

Photographs and Picasso Paintings Used in the Survey.

Photographs			
Photographer	Year	Title	Location
Henri Cartier-Bresson	1932	<i>Hyeres</i>	Museum of Modern Art
	1933	<i>Children on a spiral staircase</i>	Tel Aviv Museum of Modern Art
	1934	<i>Calle Cuauhtemotzin</i>	Museum of Modern Art
	1952	<i>The decisive moment</i>	Museum of Modern Art
	1954	<i>Boy carrying a wine bottle</i>	Museum of Modern Art
	1967	<i>Flower Child</i>	Atlas Gallery
	1968	<i>Brie</i>	Huxley-Parlour
Francis Frifth	1858	<i>The Great Pyramid and Sphinx</i>	Metropolitan Museum of Art
Edward Steichen	1902	<i>Self- Potrait with Brush and Palette</i>	Gallery Claire Fontaine
Edward Weston	1927	<i>Pepper</i>	Weston Gallery Museum
August Sander	1928	<i>Handlanger</i>	Tate and National Galleries
Aleksandr Rodchenko	1930	<i>Pioneer with Trumpet</i>	Museum of Modern Art
Karl Blossfeldt	1932	<i>Botanical Anthology</i>	Michael Hoppen Galery
Dorothea Lange	1936	<i>Migrant Mother</i>	Oakland Museum
Lee Miller	1937	<i>Surrealism</i>	Victoria and Albert Museum
Ansel Adams	1942	<i>The Tetons and snake river</i>	Museum of Fine Arts
W H Fox	1944	<i>The open door</i>	Fox Talbot Museum at Lacock
Robert Frank	1955	<i>The Americans</i>	Ackland Art Museum
Lee Friedlander	1967	<i>Social Landscape</i>	Museum of Modern Art
Eddie Adams	1968	<i>Saigon Execution</i>	Jean Paul Getty Museum
Robert Adams	1968	<i>Re- Prettification</i>	Frankael Arts Gallery
Lewis Baltz	1970	<i>Santa Cruz</i>	Fine Arts Museum
Picasso Paintings			
	1895	<i>How to transcend willpower</i>	Museum of Barcelona
	1900	<i>Landscapes of Barcelona</i>	Museum of Picasso of Barcelona
	1901	<i>L' enfant et la colombe</i>	National Gallery
	1901	<i>The greedy girl</i>	National Gallery of Washington
	1903	<i>The blindman's meal</i>	Metropolitan Museum of Art
	1905	<i>Boy with a pipe</i>	Baltimore Museum of Art
	1905	<i>Seated harlequin</i>	The Metropolitan Museum
	1908	<i>La Rue des Bois</i>	Museum of Modern Art
	1909	<i>The reservoir</i>	Museum of Modern Art
	1910	<i>Girl with a Mandolin</i>	Museum of Modern Art

Imagery, Social Cognition and Aesthetics

1910	<i>Portrait of Ambroise Vollard</i>	Museum of Fine art
1911	<i>Still life with a bottle of rum</i>	Metropolitan Museum of Art
1912	<i>Guitar (I love Eva)</i>	Musée National Picasso-Paris
1912	<i>Ma jolie</i>	Museum of Modern Art
1912	<i>Musical Instruments</i>	Nevada Museum of Art
1913	<i>Violin hanging on the wall</i>	Museum of Fine Arts
1914	<i>Papier colle pipe et bouteille</i>	Tate Modern
1919	<i>Still life with pitcher and apples</i> <i>Fenetre ouvert sur la rue de</i>	Musée National Picasso-Paris
1920	<i>Penthiavre</i>	Musée National Picasso-Paris New York Museum of Modern Art
1921	<i>The musicians</i>	Art
1922	<i>Deux femmes courant sur la plage</i>	Musée National Picasso-Paris
1928	<i>Painter and model</i>	Museum of Modern Art
1929	<i>Nude standing by the sea</i>	Metropolitan Museum of Art
1932	<i>Bather beach ball</i>	Museum of Modern Art
1932	<i>Le sauvetage (The rescue)</i>	Tate Modern Art Gallery
1937	<i>Weeping of woman</i>	Art Gallery
1938	<i>Fillette au bateau (Maya)</i>	Museum of Collection Rosengart
1945	<i>Enamel saucepan</i>	Museum of Modern Art Paris
1948	<i>The Kitchen</i>	Musée National Picasso-Paris
1952	<i>Mediterranean landscape</i>	Albertina Museum of Vienna
1953	<i>Head of a woman</i>	Tel Aviv Museum of Art
1954	<i>Portrait of Sylvette</i>	Museum of Barcelona
1955	<i>The studio</i>	Tate Modern Art Gallery

Imagery, Social Cognition and Aesthetics

Table 1.

Pearson Partial Correlations between Mental Imagery, Emotional Self-Awareness and Prosociality.

Partial correlations (controlling for gender) with the subscales of mental imagery styles (*Object—O*, *Spatial—S*, *Verbal—V*), emotional self-awareness (*Difficulty Describing Feelings—DDF*, *Difficulty Identifying Feelings—DIF*), and prosocial traits (*Perspective Taking—PT*, *Empathic Concern—EC*, *Fantasy—F*).

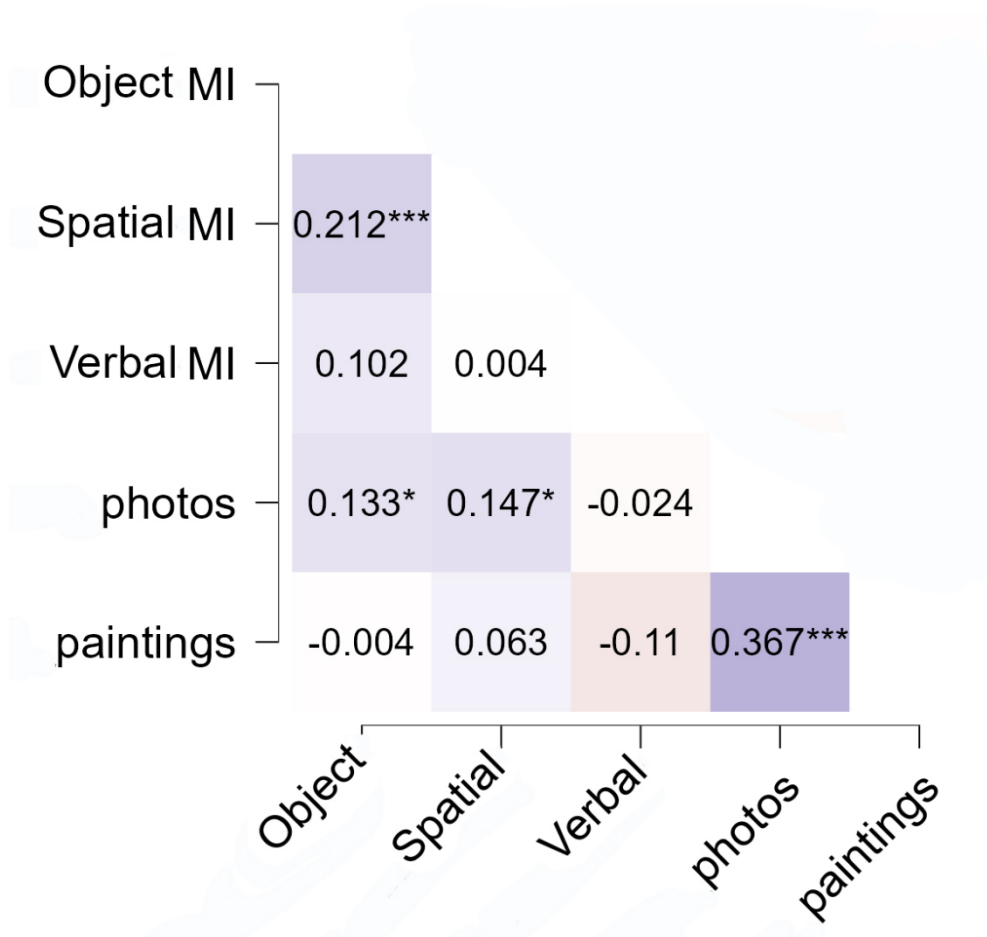
	O	S	V	DDF	DIF			
Object	1	.07	.12	-.13	.04			
Spatial		1	-.05	.20*	.11			
Verbal			1	-.18*	-.15			
	O	S	V			PT	EC	F
Object	1	.16**	.11			.05	.13*	.24***
Spatial		1	-.02			-.06	-.08	.01
Verbal			1			.05	.03	-.01

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Imagery, Social Cognition and Aesthetics

Table 2.

Pearson's r correlations heatmap with the liking ratings for paintings and photographs and the mental imagery (MI) styles: *Object-oriented*, *Spatial-oriented* and *Verbal*.



*** $p < .001$, ** $p < .01$, * $p < .05$

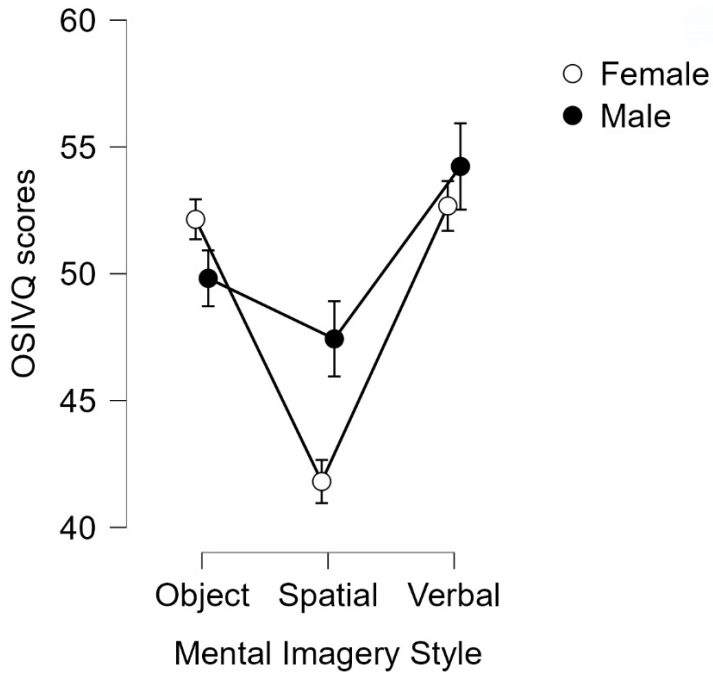


Figure 1.

Mean scores for the three cognitive styles of mental imagery in males and females obtained from the *Object-Spatial Imagery and Verbal Questionnaire (OSIVQ)*. Bars indicate 95% confidence intervals.

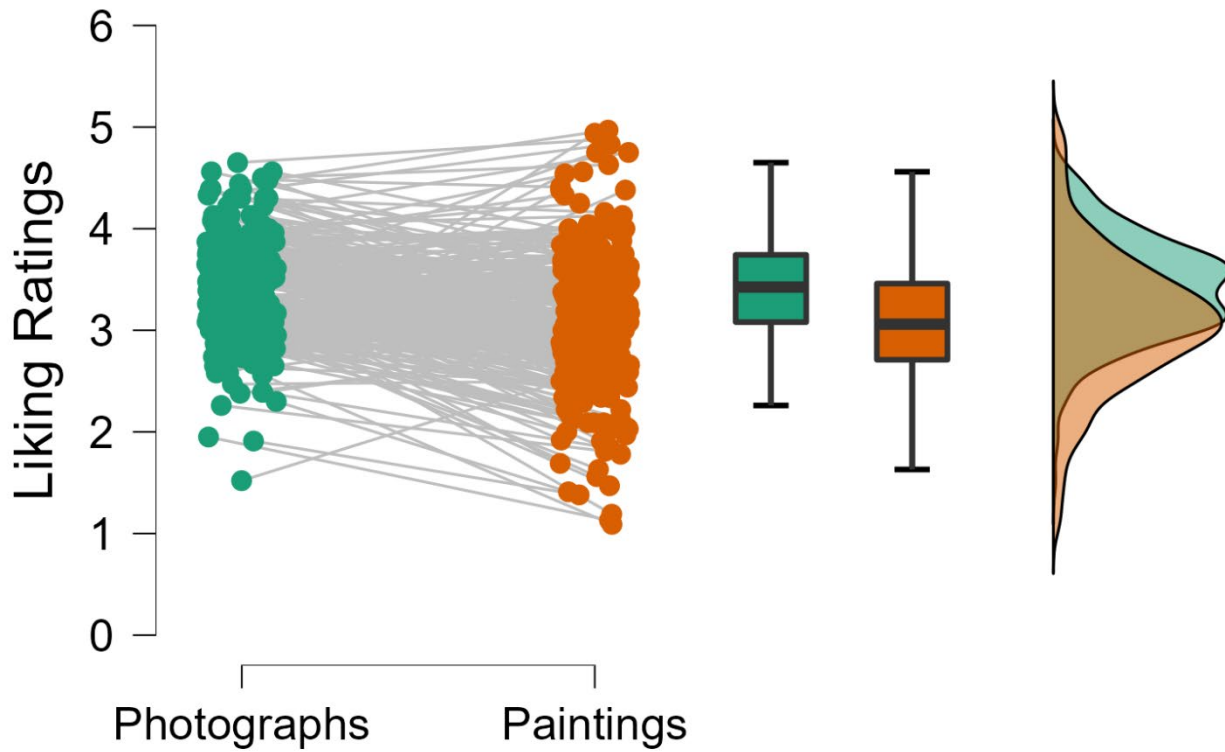


Figure 2.

Mean liking ratings for aggregated photographs and Picasso paintings, subdivided into those with people or landscapes (objects and scenes). Bars indicate standard deviations.

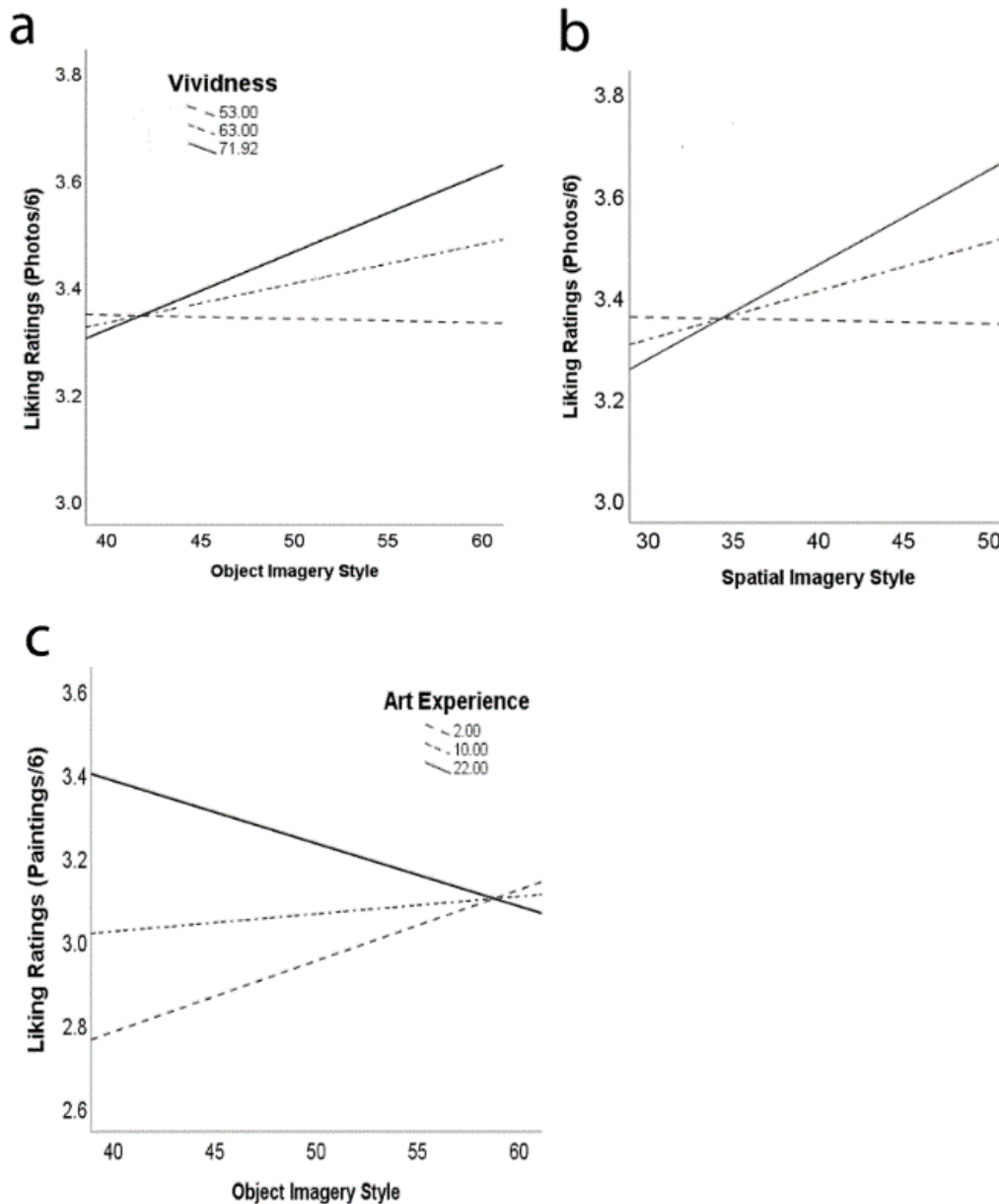


Figure 3.

The moderating effect of vividness of mental images (*Vividness*) on the relationship between the liking ratings for photographs and the (a) *Object*-oriented and (b) *Spatial*-oriented cognitive styles of mental imagery. (c) The moderating effect of *Art Experience* on the relationship between the liking ratings for paintings and the *Object*-oriented cognitive style of mental imagery.