



research report

Empathetic responses to environmental
art and their effect in cultivating pro-
sustainability attitudes



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EMPATHETIC RESPONSES TO
ENVIRONMENTAL ART AND
THEIR EFFECT IN CULTIVATING
PRO-SUSTAINABILITY ATTITUDES

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ABSTRACT

Research in psychology and behavioral studies has long indicated that psychological barriers and the complexity of climate change phenomena lead to apathy, distance, avoidance, or even denial - a type of “compassion fatigue” regarding nature and climate-change risks. Moreover, it was recently argued that sustainability research has neglected people’s emotions, thoughts, beliefs and identities and has focused on external phenomena and social structures; this possibly being part of why actions for sustainability have not had the necessary transformative capacity for system change. The aim of the present pilot study is to scientifically document and measure the effect of the empathy-sustainability arts in people’s beliefs and emotions. The mapping and measurement of empathic responses to artworks related to non-human others and nature has been approached through the use of philosophical and psychological tools and the collection of quantitative and behavioural data. The findings indicate that cultivating empathy through art could be effective, if we take into consideration the crucial role of building up a sense of efficacy. This can be achieved by the combination of interaction with empathic-artworks and experience-based education about how one’s actions can make a difference.

Keywords: Empathy, inanimate art, prosocial behavior, climate change, climate crisis

About the research: The research is part of the EMPACT project, co-funded by the Creative Europe Programme of the European Union.

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OVERVIEW OF THE STUDY

RESEARCH OBJECTIVE

Recent studies have begun to explore the idea that empathy may be the key to a game-changing move in communicating and acting upon environmental challenges. While empathic responses towards humans have long been a key theme of moral philosophy, psychology and social sciences, the role of empathy in sustainability research and development has been rather neglected.

The study adopts an innovative approach by addressing the role of empathy in advocating for the climate crisis at the speed needed, and suggests that exploring the empathy-sustainability relationship through the arts can bring significant advances to the promotion of sustainability actions and pro-environmental behaviours. To examine the cultivation of an empathic stance towards non-human beings and nature, the study examines artworks produced by artists within the context of the EMPACT project, and artworks by well-known artists.

The history of empathy

While empathy has roots in ancient Greek philosophy, its current meaning emerged in the 18th and 19th centuries. Originally associated with projecting oneself into objects ("Einfühlung" or "feeling into"), empathy later encompassed understanding other human beings (e.g. Lipps, 1903; Titchener, 1909, 1924). Scholars from various disciplines have offered definitions and critiques of empathy. Psychoanalysis through Freud sees empathy as distinct from identification and projection. Sociology and history philosophy (Simmel, 1892; Dilthey 1961) emphasize its importance for understanding the past, such as historical events and protagonists. Anthropology through Geertz (1983) highlights the cultural limitations of the concept (Stueber, 2014).

The multifaceted nature of empathy is highlighted through two main aspects: cognitive and affective. The cognitive aspect involves perspective-taking (understanding another's viewpoint) and imagination (imagining their emotional state). The affective aspect encompasses both empathic concern and personal distress. Recent research, however, indicates the existence of motor empathetic processes which may play a significant role in fully empathising with an emotional experience that refers to a shared emotional state of the observed other and the cognitively understanding of their emotional state. Thus, the aspect of motor empathy has been added to extend the multi-dimensional definition of empathy, and refers to the mimicry of motor behaviours of the observed other.

Research methods

This report implies the joint effort of and dialogue between psychology researcher methods and art theory principles to explore empathy and its positive footprint in fostering prosocial and pro-environmental behavior. For this report academic literature was reviewed on the topics of empathy and environmental thinking and behavior. For the experimental phase photographs and artworks were chosen to test for empathic responses. Descriptive and quantitative data were collected by using specifically designed

experimental tools for data collection and data analysis, providing insight in participants' empathy traits and behavioral responses regarding animal and nature abuse. The stimuli used for the experimental task consisted of photographs taken by collaborative artists and artworks by famous artists chosen from the VAPS dataset (see Fekete et al., 2022). In this way, qualitative data was collected in the form of pupillometry, facial expressions, attention and emotional heatmaps. Moreover, the quantitative data provided from a personality questionnaire focusing on empathic traits gave invaluable information regarding the level of empathic responses that underlies participants' behavior in everyday life.

Key Findings

The small-scaled study approached to gain insight into the level that empathy can influence prosocial behavior. The findings suggest that being able to feel into the negative emotion of an artwork may not be enough on its own to influence prosocial and pro-environmental behavior. Empathy-related arts have the potential to contribute to individual sustainability orientations and broader environmental sustainability, but this may depend on the level of empathic concern that is triggered within each individual. Thus, individual characteristics and past experiences must be considered when examining the influence of empathy induced by arts in enhancing empathic stances towards nature and non-human suffering and advancing broader environmental sustainability.

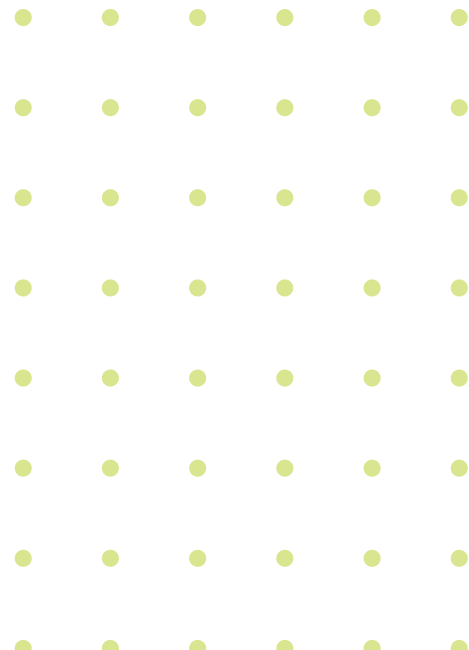
Policy considerations

The pilot study was approved to be in accordance with ethical standards of the Cyprus National Bioethics Committee (CNBC) (EEBK EP 2024.01.174) and the Declaration of Helsinki that promote and ensure respect for all human participants, while protecting their health and rights, by both the CNBC and the Cyprus University of Technology.

LITERATURE REVIEW

WHAT IS EMPATHY?

Empathy allows us to step into another person's shoes and understand their experiences and thoughts from their perspective. It feels like encountering a completely different view of the world, which is not originating from ourselves. There are three categories of experiencing empathy: cognitive empathy, affective empathy, and motor empathy. For many years the scientific community was aware of cognitive and affective empathy. Cognitive empathy involves perspective-taking, whereas affective empathy refers to “feeling” the emotion that the other feels. These two aspects of empathy are considered to be intertwined, rather than two separate entities (Davis, 1983). For example, imagining someone's situation can actually trigger emotions of empathy within you. In fact, some researchers, like Baron-Cohen and Wheelwright (2004), even suggest it might be impossible to completely separate these two aspects of empathy in experiments. Recent research indicates the existence of motor empathetic processes which may play a significant role in fully empathising an emotional experience that is shared while observing other agents and cognitively understanding them. Therefore, the aspect of motor empathy has been added to extend the multi-dimensional definition of empathy, and refers to the mimicry of motor behaviours of the observed other (Bekkali et al., 2021).



FEELING WITH ARTWORKS: EMPATHY AND AESTHETIC EXPERIENCE

Works of art tend to evoke strong experiences in the viewer. Clearly, viewing a work of art does not necessarily evoke emotions, even if this was the artist's intention (Carroll 1999). However, the reception of many works of art requires our emotional response in order to understand the work more fully (Robinson 2004, 186). For example, a reader's failure to feel any kind of sadness and sympathy for Anna Karenina makes it difficult to understand the sense of utter isolation and despair that drives Anna to commit suicide. For example, a reader's failure to feel any kind of sadness and sympathy for Anna Karenina makes it difficult to understand the sense of utter isolation and despair that drives Anna to commit suicide. For Aristotle, moreover, the plot of a tragedy is successful and contributes to an understanding of the nature of human actions when the audience feels pity for the sufferings of the heroes of the tragedy, recognizing that similar sufferings may also be suffered by them (Poetics, 1453a-b). It is, in other words, through the emotional involvement of the spectators that tragedy acquires whatever epistemic value it has.

Feelings of connectedness and estrangement with an artwork are possible due to the interplay between the artwork itself, the viewer's background and experiences, and the psychological processes involved in perception and interpretation. This is why when engaging with a painting or sculpture you sometimes can feel that you are sharing experiences with it, meaning that you have the sensation of feeling with it, of empathizing. At other times, you distinctly know you are not sharing any experiences, and therefore any experiences you undergo genuinely appear to emanate from the artwork and belong strictly to it. Any connection we may feel with art might not be as unusual as it seems. Our ability to empathize with others and to connect with artworks share some key features, suggesting a common foundation in empathy. Interestingly, both appreciating art and empathizing with someone else involve a unique emotional experience that can be quite moving and captivating. Setting aside their practical purposes, these experiences are characterized by heightened alertness, focused attention, and a deep emotional and intellectual engagement (Markovic, 2012; Vessel et al. 2012). In fact, perception of an artwork involves the embodied visual exploration of an artwork in physical space and progressively structures and organises visual experience through perceptual feedback from body movements made in response to the artwork (Brinck, 2018.)

FEELING WITH ARTWORKS:

EMPATHY AND AESTHETIC EXPERIENCE

Movement-emotion concerns the kinetic qualities and patterns of implicit and explicit bodily responses in an artwork that evoke emotion and thereby shape the overall feeling and attitude of the viewer. The two processes make the viewer feel physically and emotionally moved by artworks and consequently recognize another psychological orientation than their own, thereby evoking feelings of insight or awe and prompting the viewer to reveal aspects of life unknown or original to them (Brinck, 2018; Gernot et al., 2018; Stamopoulou, 2018).

The findings in Gerger, Pelowski, and Leder (2017) provide evidence for recent arguments by art theorists supporting a close mirroring "empathy" of emotional content both in representational and abstract art, although it appeared most strongly in the representational category. Stavrova and Meckel (2017) examined the role of trait empathy in emotional transmission through non-social art object targets and found that high empathic participants were more likely to recognize and accurately assume the feelings in fantasy or reality that the "artists" were experiencing. Their results support that high empathic individuals' heightened sensitivity to the emotions of others is not limited to social targets (e.g., faces) but extends to products of the human mind, such as art objects.

THE EMPATHY- SUSTAINABILITY RELATIONSHIP

Psychology and behavioural studies have long indicated that psychological barriers and the complexity of climate change phenomena lead to apathy, distance, avoidance or even to “compassion fatigue” in the form of denial (Kyprianidou, 2019) on the social topics that include nature and climate-change risks. The idea that empathy may be a game-changing move in communicating and acting upon environmental challenges has been a lately approach by related studies in the field. In fact, it was not earlier than the recent decade when it was argued that sustainability research has focused on external phenomena and social structures at the expense of people’s emotions, thoughts, beliefs and identities (Ives et al., 2020). In that sense, one’s own internal productions and motivation may be a factor explaining why actions for sustainability have not had the necessary transformative capacity for system change. Ever since Aristotle, the arts have been associated with the arousal of empathic responses towards the suffering of others and, consequently, with the development of a compassionate stance. This perspective reveals questions regarding the ways in which engagement with works of art affect people in emotional ways so as to become more compassionate towards nature and non-human beings and thus affected in morally positive ways; and the way in which arts can help us move beyond the mere recognition of climate change and the unprecedented current environmental challenges and actually act on it.

Exploring the empathy-sustainability relationship through the arts can bring significant advances to the promotion of sustainability actions and pro-environmental behaviours through the arts (see Voreakou, 2019). Fortunately, there is a growing realisation of the need for the 21st century culture sector and artistic creation to be able to both address the complex issues pertaining to climate change, the overexploitation of nature and the global health crisis and, at the same time, to enhance their own resilience. Parallel to that, the covid-19 pandemic condition and the prolonged lockdowns enhanced the realisation that contemporary ways of living have undermined our sense of belonging to nature (Pritchard et al., 2020) and emphasised the need to redefine the relation of human kind with other species of animal kingdom and nature. The sense of belonging to nature is found to contribute to mental and emotional health (Windhorst & Williams, 2015) and it is possibly a means for personal growth and well-being.

THE EMPATHY- SUSTAINABILITY RELATIONSHIP

The field of arts and humanities has a crucial impact on helping us critically reflect on the ways ‘modern consumer and aspirational societies’ can facilitate or impede the attainment of sustainability. It reveals the importance of bringing forth an understanding of ‘core values that can be sustained and that are worth sustaining’ (Fischer et al. 2007). However, most believe that technological and engineering sciences alone can deliver the required solutions leading to the neglect of the role arts and humanities in the transition to sustainability, thus the transition to sustainability remaining slow and eventually exposing to failure (Neumayer & Joly 2021; O’Brien 2018).

According to environmental education research, a significant key to potentially resolving climate change revolves around the way we communicate with and relate to others, human and non-human (Dickinson et al, 2013). In this context, people’s climate change awareness may be more triggered by empathy for non-human others than their own self-interest. People seem more disposed to take action if the perceived threat involves some kind of beloved creature other than them, and this creates a window for compassion and change through the desire to protect non-human beings. This assumption provides a new powerful medium to talk about the actual implications of climate change and other environmental risks in a way that facilitates acting upon them and overcoming denial and inaction.

DEFINITION OF THE PROBLEM

We understand aesthetics of empathy and sustainability as a powerful tool in motivating artists and cultural players to care about and take responsibility for their fellow citizens, nature and nonhuman animals, and thus bridging our personal goods to the interests of others (Nussbaum 1996). We believe that transdisciplinary approaches to arts, aesthetics of empathy, sustainability and social-ecological change will provide artists with connections and knowledge needed to contribute to the theory and practice of communicating social-ecological change visually. It is true that empathy remains a much used, yet somehow vague and abstract concept (psychologist Daniel Batson has once listed eight definitions of empathy), especially in regards to the arts. Thus, we suggest that a twofold strategy is needed: on the one hand, an exploration of the mechanisms through which we may become first-personally related to non-human suffering and acquire experiential knowledge about climate change-related issues (Empathy for Nature and Non-human beings - 1st pillar). On the other hand, the artists' own emotional and empathic stance must be considered as a dimension of sustainable art and sustainability itself; in other words, artists must themselves become more empathic and resilient (Empathic and Resilient Artists-2nd pillar).

Despite the fact that the vast majority of public opinion in the EU sees climate change as a top priority and recognize that is at least partly caused by human activity, concern about climate change and willingness to adopt measures to fight is lower than expected (Poortinga et al. 2019; Crawley et al. 2020). Research also reveals important differentiation in attitudes towards climate change and in personal action between Eastern and Western European countries. Most importantly though, individuals seem to feel less personally responsible for tackling climate change, which is an extremely important indicator for evaluating people's willingness to fight climate change. Thus, the role of the arts in enhancing people's sense of personal responsibility for climate change and action taken becomes vital. As expert Lidia Varbanova, a member of NATFA's team (2013) moreover points, "the vast majority of organizations, online platforms, publications on CSR do not mention arts and culture [...] and there is certainly a need to explore closer and more pragmatic possible mechanisms of strategic partnership between the arts world and the corporate world and to suggest opportunities of taking arts on board when discussing CSR among stakeholders at all levels – from international to local and organizational one".

DEFINITION OF THE PROBLEM

The current pilot study follows this approach and focuses on the level that arts can help us empathise with nature (e.g. the burned forests of Southern Europe, the plastic polluted ocean and its creatures, with the drought land and all creatures harmed by human activity). It is an approach to fill in the gap between art and science in the investigation of empathy, suggesting that the representation of experiencing and understanding the world and concepts about nature and human life relies on the “same language” despite the use of different means. The importance of collaboration between arts and science in addressing topics of the modern society and world has been long supported (Briggs, 1992; Scheffler, 1997; Gage, 1999; Kemp, 2000; Wilson, 2002; Campbell, 2004; Blackwell, 2009; Liounis, 2009; Miller, 2012, 2014).

We suggest that exploring the empathy-sustainability relationship through the arts can serve social justice and eudaimonia in societies and bring significant advances to the promotion of sustainability actions and pro-environmental behaviours. Empathic responses towards humans have long been a key theme of moral philosophy, psychology and social sciences, however the role of empathy in sustainability research and development has been neglected (Brown et al. 2019). Empathy is usually taken as a relation involving emotional feelings between human beings or other anthropomorphised creatures (Maibom 2017). Taking this into consideration, work needs to be done in both thoroughly understanding what empathy towards nature may mean .



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PILOT STUDY
PILOT STUDY

PROCEDURE

Empathy allows us to step into another person's shoes and understand their experiences and thoughts from their perspective. It feels like encountering a completely different view of the world, which is not originating from ourselves. There are three categories of experiencing empathy: cognitive empathy, affective empathy, and motor empathy. For many years the scientific community was aware of cognitive and affective empathy. Cognitive empathy involves perspective-taking, whereas affective empathy refers to “feeling” the emotion that the other feels. These two aspects of empathy are considered to be intertwined, rather than two separate entities (Davis, 1983). For example, imagining someone's situation can actually trigger emotions of empathy within you. In fact, some researchers, like Baron-Cohen and Wheelwright (2004), even suggest it might be impossible to completely separate these two aspects of empathy in experiments. Recent research indicates the existence of motor empathetic processes which may play a significant role in fully empathising an emotional experience that is shared while observing other agents and cognitively understanding them. Therefore, the aspect of motor empathy has been added to extend the multi-dimensional definition of empathy, and refers to the mimicry of motor behaviours of the observed other (Bekkali et al., 2021).

The pilot study aimed to investigate the main questions of the research program. It began by providing the volunteers with written detailed information about the purpose of the program, the instructions of the experimental task and any other information they asked for regarding the purpose of the program and the data collection. As long as they agreed to continue with the experimental task, they were sent the url to get started. The task began with a standard check of the participant's sitting position, the brightness and the head position to ensure the accuracy in the recording of pupil size and eye movements. This was conducted by the iMotions application that captured eye tracking and facial expression data from the participant's computer camera. After completing the necessary checks, demographic-type questions appeared (e.g., age, gender, educational level of each participant, his/her relationship with art, and his/her love for nature). Finally, the following question appeared: "How likely is it for you to make a donation to an organization that is actively involved in environmental issues?" and the participants had to give their answer on a 5-point Likert scale, where 1 was for "not at all" and 7 for "very much".



DESIGN PROCEDURE

Then the experimental task started with a pre-calibration (30s), followed by a fixation cross (500ms), then the first image appeared for 6000ms, followed by a new fixation cross and the next image. The experimental task lasted 12 min. The pictures were 20 in total, consisting of 10 photographs and 10 paintings, both depicted animals (50%) and landscapes with mountains and plains (50%). The presented pictures were neutral to negatively valenced, in the sense that they depicted negative consequences of human intervention (e.g., captivated wild animals, smoke on a mountain, dried plains, etc.). All paintings come from the VAPS dataset (see Fekete et al., 2022), a dataset of paintings weighted on factors such as emotional valence, emotional arousal, familiarity, liking, etc. The photographs were taken by artists within the framework of the EMPACT program.

After all pictures were repeated 5 times, the question "After participating in this study, how much willing are you to make a donation to an organization that is actively engaged in environmental issues?" was presented again and participants responded on a 3-point Likert scale from 1 "less than before" to 3 "more than before" once again. The experimental task ended with a post-calibration (10s) and then a new internet page opened with the Toronto Empathy Questionnaire which took about 2 minutes to complete.

For more details about the experimental timeline please see Figure 1 below:

DESIGN

EXPERIMENTAL TIMELINE

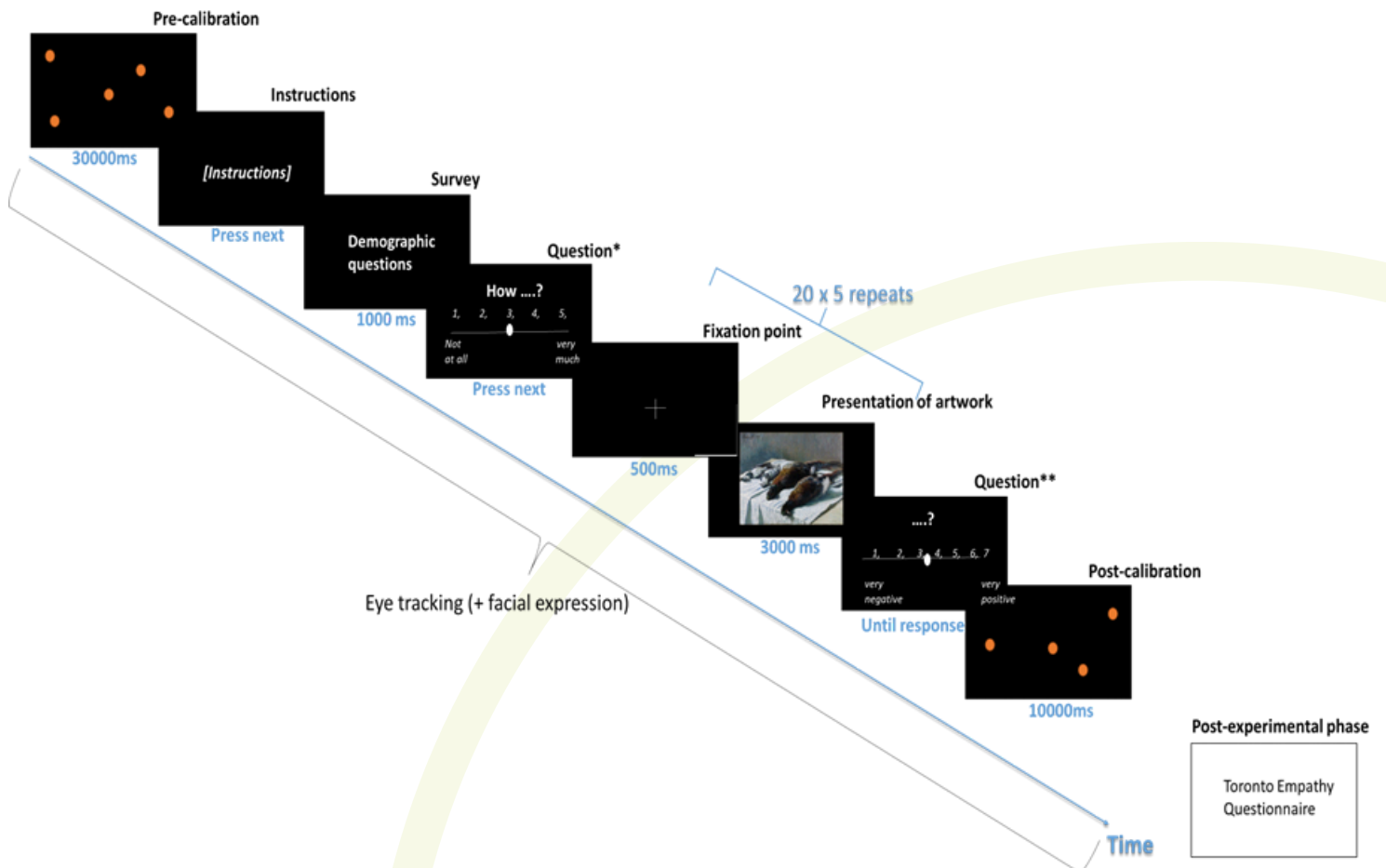


Figure 1. Experimental timeline. The figure shows the timeline of the experiment. Eye tracking and facial expression data was collected throughout the experiment. The experiment started with a pre calibration phase, followed by the instructions and the demographic questions. Afterwards the question “How likely is it for you to make a donation to an organization that is actively involved in environmental topics?” appeared. The answer was provided on a 5-point Likert scale (1=not at all, 2= maybe a little, 3= somewhat, 4= maybe a lot, 5= definitely). Before the presentation of every picture a fixation point was presented, this pattern was repeated 5 times for every one of the 20 pictures. At the end another question was presented “After your participation in this study, how much willing are you to donate to an organization that is actively engaged to environmental topics?” “. The answer was provided on a 3-point Likert scale (1=less than before, 2= same as before, 3= more than before). By completing the experimental task participants were directed to an online empathy questionnaire.

PARTICIPANTS

ELIGIBILITY CRITERIA

Neurotypical Greek-speaking volunteers were eligible to participate. There were no age or gender restrictions, as well as no other demographic restrictions.

PARTICIPANTS' CHARACTERISTICS

Participants were approached within the framework of the Cyprus University of Technology and University of Limassol by sharing a relevant announcement through the institutional email, which was sent to students, while they were encouraged to share this announcement with their personal circle of acquaintances.

All in all, 24 neurotypical volunteers participated in this pilot study. Data from 2 individuals were removed because of poor quality in the collected eye tracking data, while data from 3 other individuals were not successfully processed from the iMotions platform because of a technical issue. Thus, data from 19 participants (12 female, 7 male) were eventually used for the statistical analysis (mean age= 29.210, SD= 0.5).

The pilot study was in accordance with ethical standards of the Cyprus National Bioethics Committee (EEBK ΕΠ 2024.01.174) and the Declaration of Helsinki that promote and ensure respect for all human participants, while protecting their health and rights. Research practices conformed to generally accepted scientific principles and were all based on a thorough knowledge of relevant scientific literature. All participants provided written informed consent at the start of all study visits and were blind to the hypotheses of the present pilot study.

EXPERIMENTAL TOOLS

EMPATHY TRAITS QUESTIONNAIRE

The Toronto Empathy Questionnaire (TEQ) was used to define the empathic traits of the participants and based on them they were classified in order to investigate a possible correlation of the responses and gaze behavior with the degree of empathic competence. TEQ is a self-report measure designed to evaluate empathy as a primarily emotional process, distinguishing it from cognitive empathy or the more cognitive aspects of taking another's perspective, since it primarily focuses on the emotional reactions of individuals in response to the experiences of others, capturing the affective component of empathy through a series of brief, straightforward items.

The questionnaire includes 16 items in total, which gauge their immediate emotional responses to situations that depict someone else's emotional state. Items are not designed to reflect deliberative or moral reasoning, but more spontaneous empathetic reactions. For example, participants rate their agreement with statements that describe feelings of concern or distress when encountering others in emotional need, thereby assessing the instinctive and emotional components of empathic responding.

The TEQ is widely used in psychological research and clinical settings to measure empathy among various groups, including adults and adolescents. Its utility extends to studies examining the role of empathy in social behavior, mental health, and even neurological conditions.

EXPERIMENTAL TOOLS

EMPATHY TRAITS QUESTIONNAIRE

Moreover, the TEQ has been validated through research that confirms its reliability and consistency across different populations and settings. This validation supports its effectiveness as a tool for not only assessing empathy but also for exploring its implications for interpersonal behavior and psychosocial functioning.

EXPERIMENTAL SOFTWARE

The iMotions software was used to design/program the exercise test. The experimental task ran through iMotions Online version on each participant's computer, which uses the iMotions WebET 3.0 for eye-tracking and facial expression data collection. In order to run the experimental task that the computer should have had a built-in camera or a connected web camera. The application checked for the participant's position and the lighting of the room, and specifically, how clearly their eyes were detected from the camera. Only when they passed these checks did the experimental trial begin.

In general, the pipeline consists of three algorithms: processing, calibration, and mapping, which utilize deep learning networks to estimate the gaze from the recording. All steps happen on webcam videos collected during stimulus presentation and hence, eye tracking data is not extracted in real-time.

EXPERIMENTAL TOOLS

EXPERIMENTAL SOFTWARE

The processing step extracts the respondent's gaze position expressed in the camera coordinate system, relying on deep learning models to estimate the gaze position from the webcam video. The models used in this processing step are pre-trained on thousands of faces using accelerated deep learning algorithms.

As recommended the experimental task also included calibration slides, since the calibration step is based on the recordings when the respondent was gazing at specific calibration markers. To calibrate the algorithm, sample pairs of gaze position retrieved in the processing step and expected gaze location are matched from the software. The mapping model used is a non-linear RBF-based regression model.

Following, the model that was determined in the previous calibration step is then used to map the gaze position on the screen in raw (x,y) coordinates on each stimulus frame, based on the gaze data identified in the processing step. The result of this step is a gaze point for each frame of the webcam recording.

DATA ANALYSIS

Preprocessing of the raw data included raw continuous ratings from perceivers and targets being preprocessed as an emotion measure per image in iMotions Software for Windows (version 10.0.0.5). For data noise reduction purposes, data that were within the window size of 3 samples moving average were processed. Subsequently, first-order autocorrelations were removed from the continuous ratings using the Yule–Walker method. For each video, we correlated perceiver ratings of the possibility to donate for an environmental organisation, empathy traits, demographics (including their environmental sensitivity profile), and their willingness to donate after participating in the study, resulting in a correlation coefficient r that defined the perceiver's raw empathic response influenced by the imaged (affective score per image).

The primary eye gaze measure is the percentage dwell time within the defined areas of interest (AOIs; i.e., eyes, mouth, and face as a whole for animal images and mountain, plants, and trees for nature images) per image, in which dwell time is defined as the total amount of time spent looking within an AOI and includes all types of eye movements. Dwell time is interpreted as the level of interest in an AOI, with greater dwell times indicating greater levels of interest. This data was calculated automatically within the iMotions platform and extracted for further analysis.

Similarly facial expression data, attention heatmaps and emotional heatmaps were processed through Affectiva AFFDEX within the iMotions platform and a summary of all respondents was extracted.

Scores for the TEQ were calculated for each participant separately and a summary of the sample's empathic traits was extracted. A series of descriptive analyses were run in order to examine the general tendency of the sample for empathic responses to artworks (paintings and photographs) and whether this inactive engagement with emotionally loaded artworks could lead to changing one's behavior, such as making him more willing to donate to an environmental organization.

RESULTS

QUANTITATIVE DATA

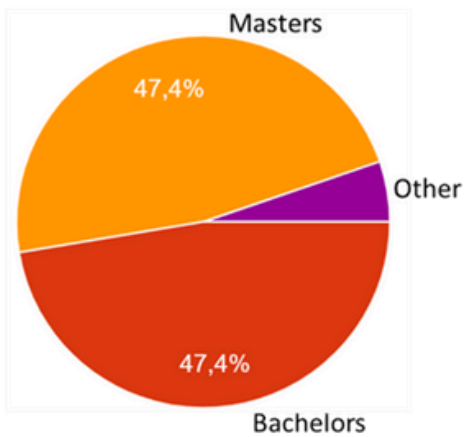
TEQ scores revealed that almost all participants (17) had higher than normal empathy (mean TEQ score= 50,7). None of them graduated from school of Fine Arts, 9 participants were Bachelor graduates and 9 owned a master's degree, while 1 answered "other" (SD of answers was 0.78). Regarding the question whether they would call themselves nature lovers, 2 replied "maybe not", 10 "maybe yes", 5 "definitely yes", while 2 did not want to give an answer (SD= 0.91). In the question about their level of sensitivity for environmental topics the majority showed to be "somewhat sensitive" (9 participants) to "quite sensitive" (7 participants), while only 1 participant reported himself/herself as being little sensitive and 2 participants as "very sensitive" (SD= 79). In the question "How likely is it for you to make a donation to an organisation that is actively involved in environmental topics?" 6 participants answered "a little", 7 "somewhat likely", 5 "very likely" and only 1 "definitely" (SD= 0.91). Finally, after completing the experimental task, participants shared their willingness to donate to an environmental organisation, the majority (14 participants) stated that their willingness to donate remains the same as before their participation in the experimental task and only 5 participants expressed that they were more willing to donate than before (SD= 0.43).

For better interpretation of results see percentage charts below:

QUANTITATIVE DATA

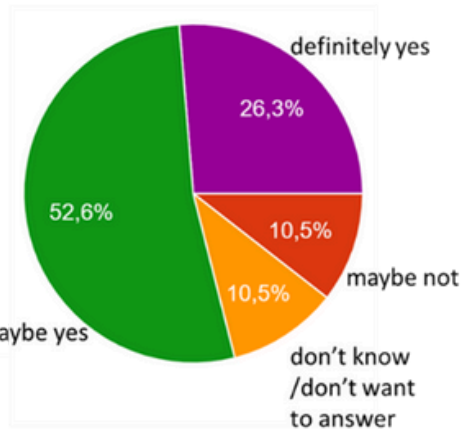
PERCENTAGE CHARTS

Highest degree level
19 answers



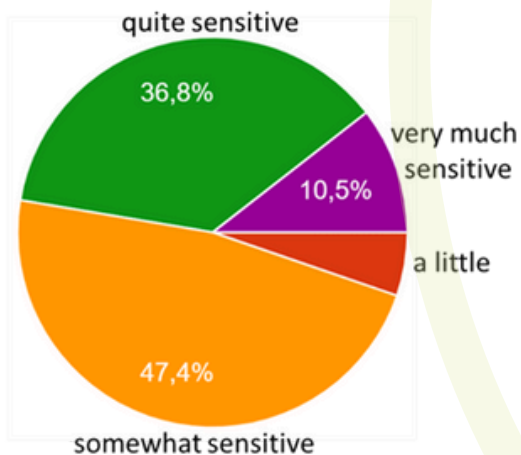
- High school degree
- Bachelor
- Masters
- PhD or Doctorate
- Other

nature lovers
19 answers



- not at all
- maybe not
- don't know / don't want to answer
- maybe yes
- definetely yes

sensitivity for environmental topics
19 answers

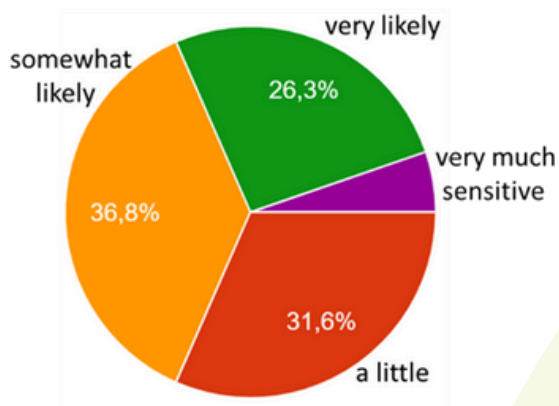


- not at all
- a little
- somewhat sensitive
- quite sensitive
- very much sensitive

QUANTITATIVE DATA

How likely is it for you to make a donation to an organisation that is actively involved in environmental topics?

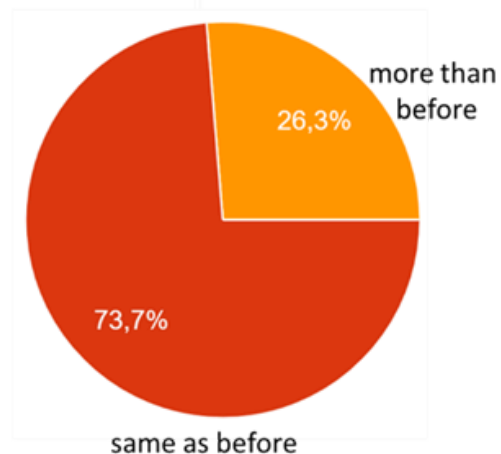
19 answers



- not at all
- a little
- somewhat likely
- very likely
- definetely

willingness to donate to an environmental organisation after the experiment

19 answers



- less than before
- same as before
- more than before

FACIAL EXPRESSION DATA

ATTENTION HEATMAPS



Post processing of respondent data run through Affectiva AFFDEX, a specialized sensor data processing system within the iMotions platform. The attention heatmaps revealed that in artworks depicting alive animals (e.g. in a cage), participants were more likely to attend to the area of the face and especially near the eyes of the animal, whereas in pictures where there were depicted dead animals, they seem to mostly explore the body or the woods on the body of the dead animal (Figure 2). On the contrary, in nature pictures, participants show to explore more background details of each picture and focus more on details like the rubbish, the burned tree, the houses in the dried nature etc., indicating that the unpleased or unexpected details of the picture (i.e., the rubbish in a garden full of green trees, the trees in between rocky mountains, etc.) are grasping their attention (Figure 3). In both animal and nature categories, focus patterns seem not to differ based on colour saturation and contrast of the picture. Important to mention is also the fact that in all pictures the attention was mostly focused near the centre of the presented picture.

FACIAL EXPRESSION DATA

Animals

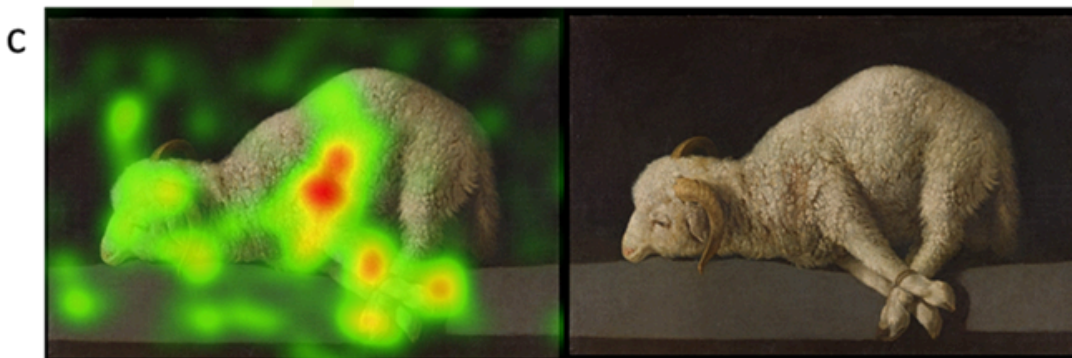
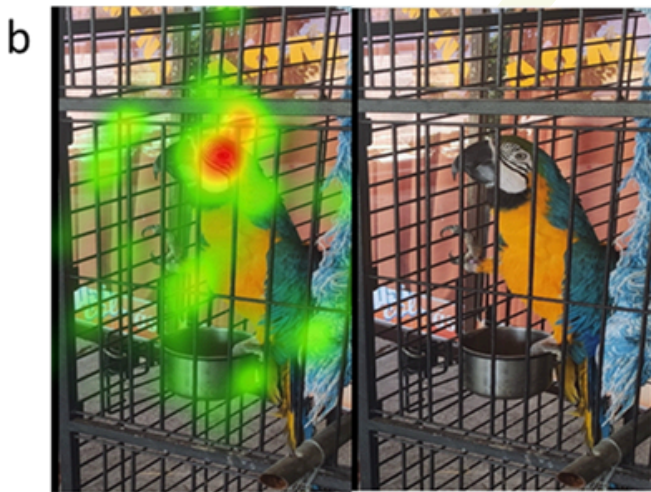
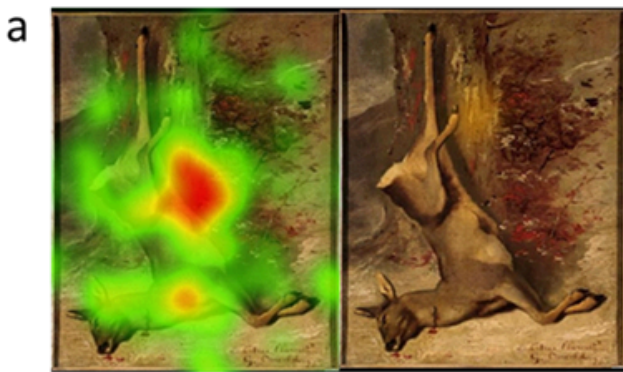


Figure 2. Attention Heatmaps for pictures with animals. The Heatmaps show the areas of attention focus of the 19 participants in artworks depicting animals. *Picture a* depicts the famous painting “The Deer” (1876) by Jean Désiré Gustave Courbet. *Picture b* is a photograph taken during the workshops of the project and was stored for the purpose of the present pilot study. *Picture c* depicts the famous painting “Agnus Dei” (1635-40) by Francisco de Zurbarán. When participants see pictures of dead animals, they are more likely to explore the body of the dead animal, in contrast to alive animals in which they are focusing more on the eyes area.

FACIAL EXPRESSION DATA

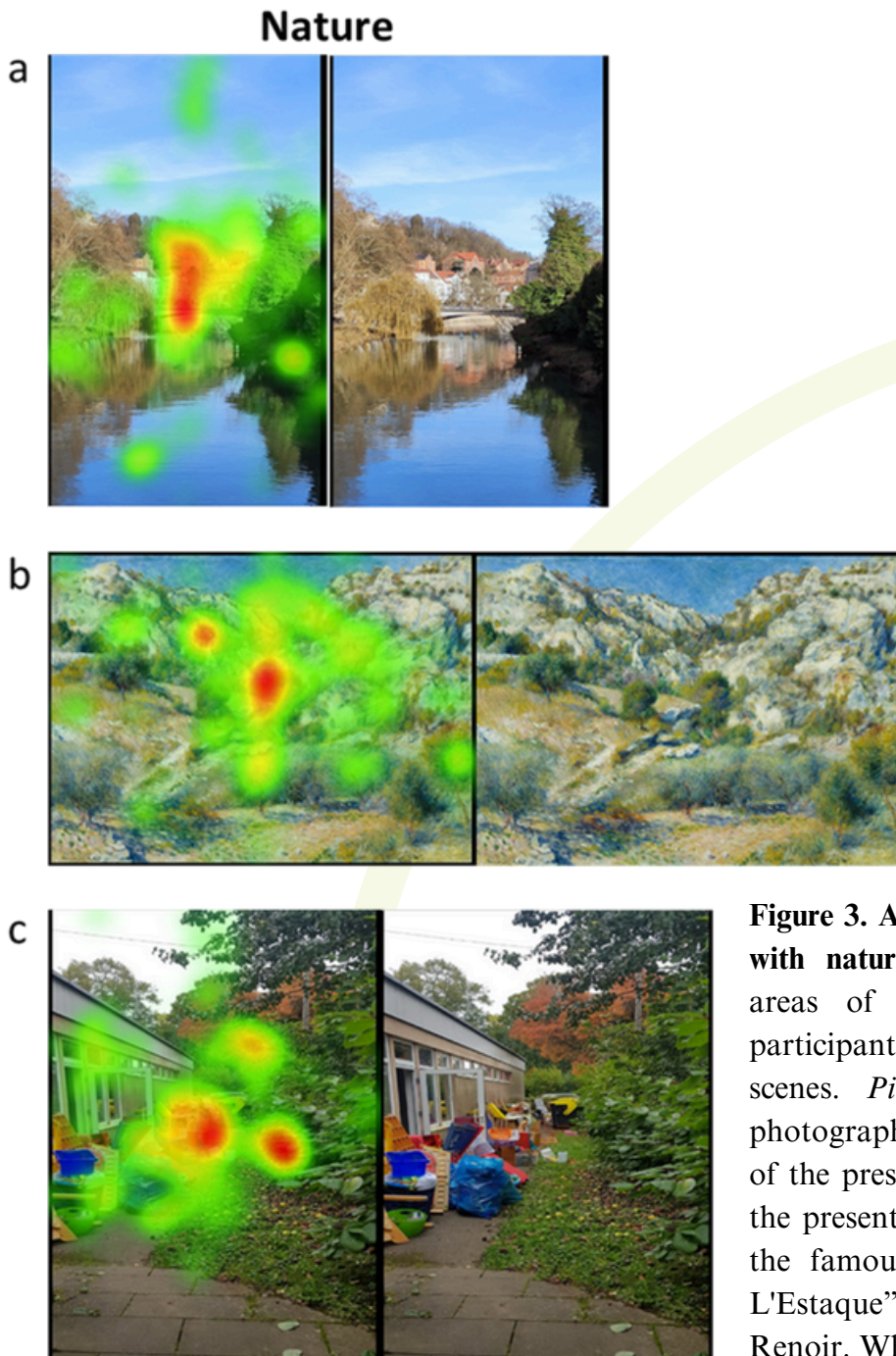


Figure 3. Attention Heatmaps for pictures with nature. The Heatmaps show the areas of attention focus of the 19 participants in artworks with nature scenes. *Picture a* and *Picture c* are photographs taken within the framework of the present project for the purpose of the present pilot study. *Picture b* depicts the famous painting “Rocky Crags at L'Estaque” (1882) by Pierre-Auguste Renoir. When participants see pictures of nature scenes, they are more likely to focus on details that are not in alignment with the background or scenery such as trees between mountains, house within the woods etc.

FACIAL EXPRESSION DATA

EMOTIONAL HEATMAPS

By running FEA thresholding Aggregation during Affectiva AFFDEX post processing within the iMotions platform, respondent heatmaps were created according to the emotion detected from the built-in eye tracking system while participants were exploring the presented pictures each time. The emotional heatmaps were compared for the factors of positive, negative and neutral emotion, since the pictures themselves were weighted according to emotional valence (negative and neutral). The heatmaps revealed mixed emotions during the first presentation of artworks depicting alive animals which during the repetitions turned to become positive. By observing the areas linked with the initial negative and positive emotion we observe that when participants were focusing on the eyes of the animal, their emotion was labelled negative, whereas when they focused on other details of the head (e.g. the nose) the emotion was labelled positive. In the last repetitions, participants tended to focus on these “positive” details of the face as well as the background (Figure 4).

FACIAL EXPRESSION DATA



Figure 4. Emotional heatmap of a picture depicting an alive animal. For the figure, one of the pictures presented in the experimental task is used. Here, a photograph taken within the framework of the project is presented depicting an alpaca that looks directly at the camera. During the first presentation of the picture there were both positive and negative emotions noted from the eye tracking system. After some repetitions throughout the experiment, participants avoid to focus directly on the eyes and showing a tendency to focus on details of the picture that are linked with triggering of positive emotions.

FACIAL EXPRESSION DATA

EMOTIONAL HEATMAPS

Nature

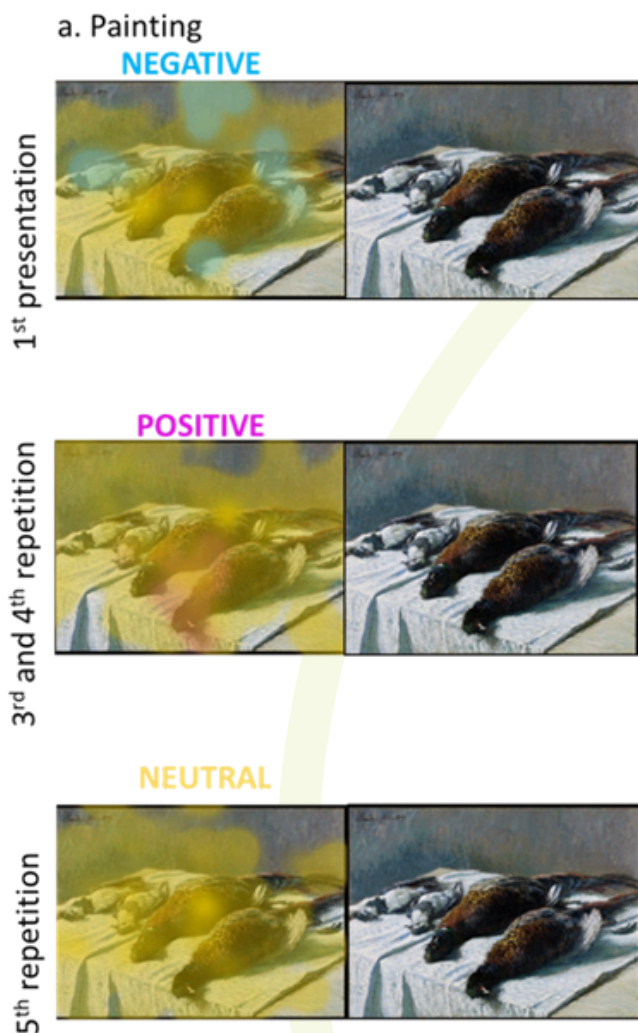
In pictures that depicted nature, participants were initially showing to feel or express negative emotion while focusing on a wider range of details within the scenery. Throughout the repetitions the emotion was turning into positive, while participants were focusing on specific details like the recycling bin or the mountains in the background. None picture ended up triggering negative emotion during the last repetition of each picture, and there was no specific emotional pattern observed, since the emotion was either captured to be more positive in some pictures, less positive or neutral. The eye gaze pattern indicates that the positive emotion in the last repetition was associated with areas of the picture that may be perceived as being more neutral or aesthetically beautiful (Figure 6).

Animals

When a picture with dead or captivated animals was presented for the first time, participants showed to express negative emotion, and focused on body details that may testify that an animal is dead, for example the feet, the neck, the hands. During the repetitions, however, participants focused mostly on the face and on some aesthetic details of the picture such as the light coming from the skylight, and these focus areas were linked with a felt or expressed positive emotion. On the last repetition, participants show to explore the picture without expressing or feeling any emotion (Figure 5).

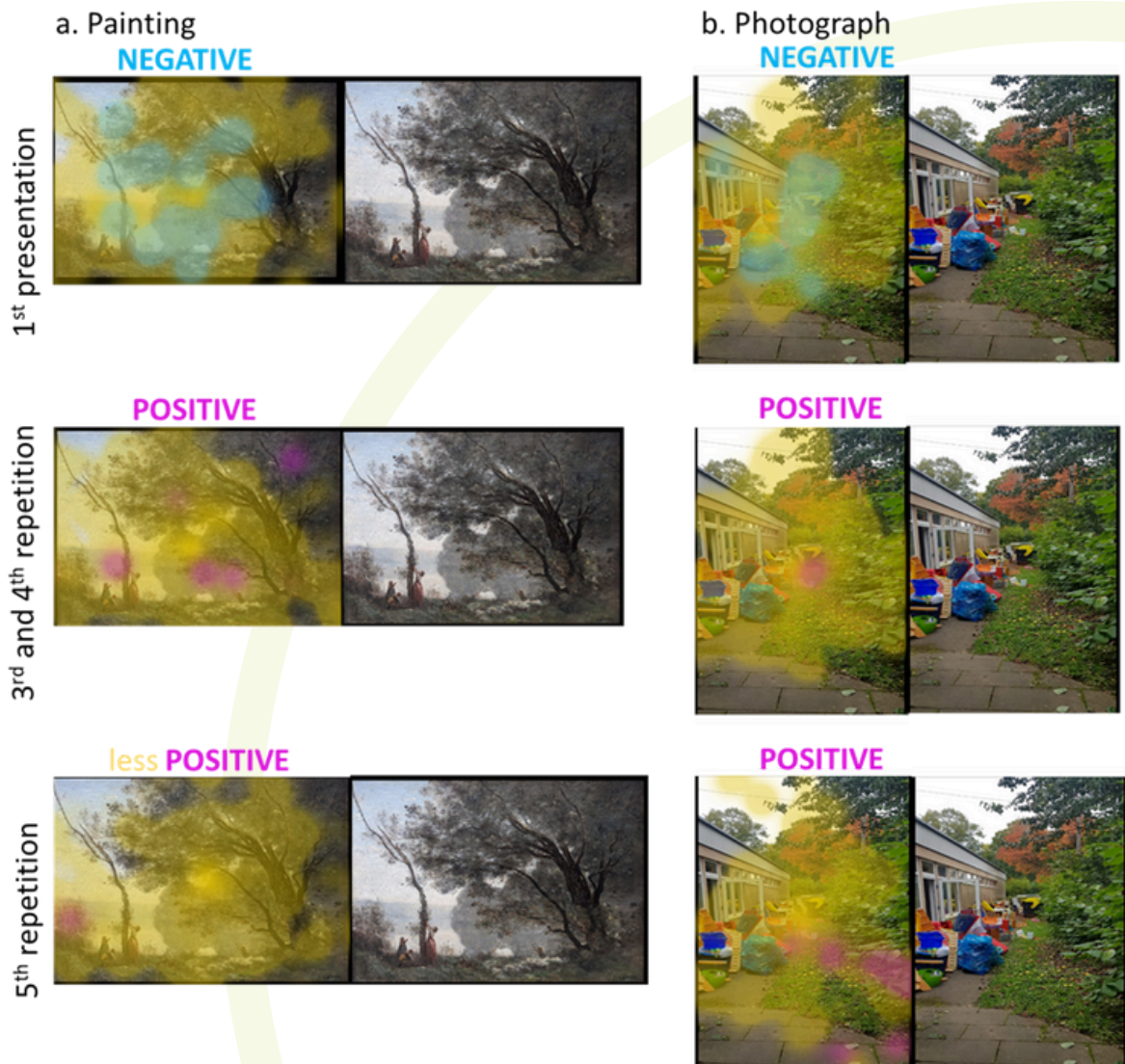
FACIAL EXPRESSION DATA

EMOTIONAL HEATMAPS ANIMALS



FACIAL EXPRESSION DATA

EMOTIONAL HEATMAPS NATURE



FACIAL EXPRESSION DATA

Figure 5. Emotional heatmap of pictures depicting dead and captivated animals. For the painting category, the famous painting “Still Life with Pheasants and Ploversone” (1879) by Claude Monet is presented, which is one of the pictures presented in the experimental task. For the photograph category, a photograph taken within the framework of the project is presented depicting an orangutang laying on a rock within a zoo cage. During the first presentation of both pictures there were negative emotions noted from the eye tracking system when participants focused on the body area of the animals. After some repetitions throughout the experiment, participants focus on the face area and aesthetic details of the picture. The last repetition is associated with neutral emotion in the whole picture area.

Figure 6. Emotional heatmap of pictures depicting nature sceneries.

For the painting category, the famous painting “Souvenir de Mortefontaine” (1864) by Jean-Baptiste-Camille Corot is presented, which is one of the pictures presented in the experimental task. For the photograph category, a photograph taken within the framework of the project is presented depicting a forest campus with a lot of plastic items and rubbish. During the first presentation of both pictures there were negative emotions noted from the eye tracking system when participants were piloting through the picture. After some repetitions throughout the experiment, participants focus on specific details of the picture such as the recycling bin that may be perceived as being more positive. The last repetition the positive emotions shows to be associated with neutral details of the picture.

DISCUSSION OF RESULTS

The present pilot study aimed to investigate whether empathic traits of individuals could work as an index for environmental sensitivity and action involved with it. Almost all individuals were categorized as higher empathic, and stated to be sensitive about environmental topics, but fewer than the half of them supported that it was very likely for them to make a donation to an environmental organisation, and after their passive interaction with the negatively valanced pictures only three were more willing than before to make a donation. These findings come to add another voice to the debate on whether empathy is crucial for motivating prosocial behaviors (Paulus, 2018; Zahavi & Rochat, 2015). On the one hand, empathy is believed to be a psychological capacity that is associated with motivation of prosocial behavior. In particular there is evidence regarding empathy motivating behaviors like helping and comforting others (Eisenberg, Eggum, & Di Giunta, 2010), and indeed empathy has been related with prosocial behaviors in children (Decety, Meidenbauer, & Cowell, 2017) and adults (Sze et al., 2012), as well as in some non-human animals (Bartal et al., 2016). However, this relationship is not that simple to indicate or explain since it is influenced by factors such as the social context (Maner & Gailliot, 2007), the type of and the measurements used for empathy and prosocial behaviors (Paulus, 2018), and some individual characteristics such as the gender (Mesch, Brown, Moore, & Hayat, 2011), early experiences with stress (Lim & DeSteno, 2016), and cognitive performance (Böckler, Tusche, & Singer, 2016). In fact, prosocial behaviors represent a broad overarching category encompassing a wide range of different behaviors that are likely motivated by multiple and different proximate mechanisms and thus, generalizing that empathy is the only corresponding key for such behaviors is a falsified conclusion (Davidov et al., 2016; Decety et al., 2016; Paulus, 2018). Recently it has been suggested that the relationship between empathy and prosocial helping and inhibition of aggression is mediated by empathy's effects on empathic concern, which occurs in response to empathic simulation of distress-related states like fear, sadness, or pain (Marsh, 2022). The present findings indicate that the ability to feel into one's emotions on its own does not posit an indicator for expressing prosocial behaviors like a donation.

Following, eye tracking and facial expression data showed that participants indeed "connected" initially with the negative emotion or neutral emotion of each picture but as they became more and more familiar with the pictures, their captured emotion was becoming more neutral, especially when they were seeing pictures of dead animals, and even positive. In particular, participants after a while tended to focus on details that were more neutral or aesthetically beautiful like the green leaves of a tree or the sunlight in the cage coming from the skylight. An explanation for this observation could be that highly empathic individuals may try to balance the intense negative emotions and regulate the discomfort by focusing on the positive details of stimuli or events.

Learning to respond to others' distress is an important interpersonal skill, but in some conditions, it can involve excessive cognitive perspective-taking, and may result in self-focused comforting responses or self-focused rumination about one's role in the observed distress (Tone & Tully, 2014). These may rise from misattributions of self-blame and guilt for others' distress (O' Connor et al., 2011; Zahn-Waxler & Van Hulle, 2012), leading to an excessive discomfort (e.g. empathic fatigue) for the empathic individual (Klimecki & Singer, 2011; O' Connor et al., 2011; Oakley, Knafo, & McGrath, 2012; Zahn-Waxler & Van Hulle, 2012) that has been also linked with withdrawal, avoidance of empathy-inducing situations, and depression (Schreiter et al., 2013, Tully et al., 2015).

On the other hand, the present findings may be due to the fact that the participants started to like the negatively valenced pictures because of the emotional arousal they felt while looking at them. Indeed, art theorists suggest that human beings tend to like more artworks that are loaded with negative emotions, and thus feel pleasure watching or interacting with present aspects of what it is like to be vulnerable, mainly reminding us of our corporeality and mortality. Moreover, in contrast to Immanuel's Kant claim (Critique of Judgment: paragraph 48) that disgust and satisfaction -and hence artistic beauty- come not along, examples from modern artists who delight in arousing disgust through their artworks, evident the existence of an 'aesthetic disgust,' (Robinson, 2014). According to Carolyn Korsmeyer (this refers to the arousal of disgust in a perceiver of an artwork, under circumstances where that emotion both apprehends artistic properties and constitutes a component of appreciation).

Nevertheless, empathy has been hypothesised to have a critical impact on the experience of artworks, specifically on the perception of beauty of visual art, as well as its meaning, creating deeply moving feelings not only for what is clearly observable but also for ineffable information that an artwork may "hide" (Agius, 2018). Existing theories of empathic response to visual arts posit the primacy of automatic embodied response to images based on mirror neuron mechanisms. Kesner and Horáček's (2017) paper discusses a more comprehensive concept of empathic response examining contextual and personal factors that shape empathic response to artworks that depict humans. Their proposed model hypothesises that a response to empathy-evoking visual artworks involves the dynamic interplay of two mutually interrelated processes: socioemotional/cognitive processing, related to the perception of the individual, and aesthetic processing, primarily concerned with aesthetic appreciation, judgement, and attention to non-social aspects of the image. This specific pattern of interaction is suggested to be determined by several sets of factors, such as the characteristics of the viewer, contextual variables that can cause priming, the multidimensional features of the image, and the aspects of a viewer's response. Finally, it is proposed to be facilitated by the interaction of functionally connected brain networks involved in socio-cognitive and aesthetic processing (Kesner & Horáček, 2017).

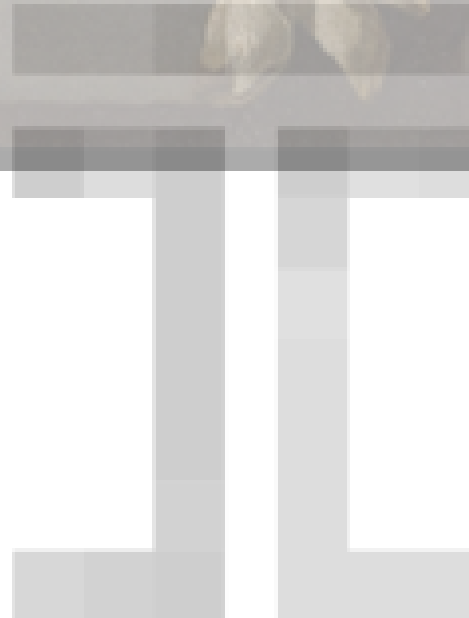
RESEARCH LIMITATIONS AND FUTURE DIRECTIONS

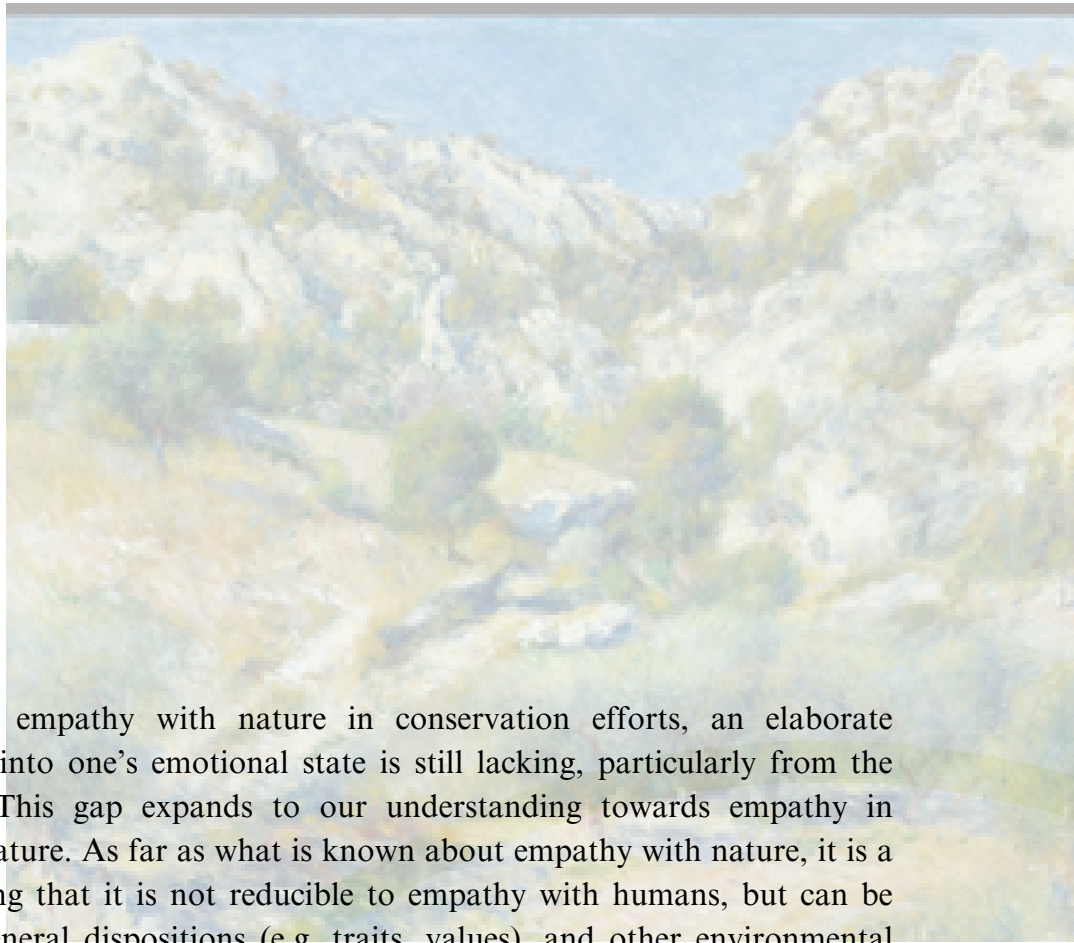
The present pilot study, did not test for familiarity and liking bias, which could facilitate as to better interpret the results of positive emotions after seeing a negatively valanced picture in repetition. According to Marsh (2022), empathy can be enhanced when a target is liked, familiar, an in-group member, and/or vulnerable (e.g., a child), while it can be inhibited when a target is disliked, unfamiliar, an outgroup member, and/or threatening. Thus, it would be informative if at the end of the experimental task the participants were asked to rate how familiar each picture was and how much they liked it. Another point worthy to mention is that we used a self-report questionnaire to categorize participants into empathy groups and validated their ability to feel into the emotion of the presented pictures based on the dichotomy negative/positive emotion, considering also the neutral threshold. However, we cannot ensure whether the felt indeed empathy for the presented stimuli at the moment they were looking at them, since we can only support the existence of an emotional arousal through pupil size dilation and expression of emotions through facial expression data. Future studies should leverage a combined experimental methodology, using classical physiological instruments such as electroencephalography (EEG) and skin conductance response (SCR), to examine whether there is a pattern of brain activation, gaze piloting, pupil size and empathy on-site.

Future research should also focus on which empathy-related aspects (i.e., promoters, inhibitors, and causally related outcomes of empathy, e.g. empathic concern) can boost prosocial behaviors. Some studies have already found empirical support by manipulating perspective taking in order to arouse participants' empathic concern toward certain natural entities in distress. In a very early study, this of Shelton & Rogers (1981), it was found that when participants took the perspective of a suffering whale, they exhibited stronger compassion toward whales in general and intention to protect them. Similarly, when participants took the perspective of some animals harmed by pollution, they became more concerned about the biosphere as a whole (Schultz, 2000; Sevillano, Aragonés, & Schultz, 2007). Berenguer (2007) extended these studies indicating that participants who had taken the perspective of a suffering bird or tree felt not only more compassionate but also more obligated to help it and nature as a whole. Precisely, when these participants accepted to allocate some money to student programs that favored an environmental cause (Berenguer, 2010).



Conclusion





Despite the primacy of empathy with nature in conservation efforts, an elaborate understanding of feeling into one's emotional state is still lacking, particularly from the personality perspective. This gap expands to our understanding towards empathy in inanimate elements like nature. As far as what is known about empathy with nature, it is a distinct construct, meaning that it is not reducible to empathy with humans, but can be affected by one's own general dispositions (e.g. traits, values), and other environmental concepts such as emotional involvement with nature. Some have identified the role of emotions in environmental promotion along with personality traits and personal experiences or values. The findings of the present study cannot exclude this perspective of empathy, although its influence seemed not to be as strong on its own. We propose that empathy training through empathic artworks as part of environmental education, could be an effective combination to promote prosocial (pro-environmental) behavior. Ideally, this could start from early childhood, with perspective taking exercises such as painting a canvas while "thinking like a mountain in the modern world".

However, on top of cultivating empathy, it is also crucial to build up a sense of efficacy because as also shown in the present pilot study, empathy may lead to overarousal when an individual feels handicapped to help change the observed situation, and thus lead to avoid the empathic stimuli that evokes distress. Efficacy enhancement, or empowerment, can be achieved through experience-based education about how one's actions can make a difference.

ANNEX

This appendix presents the images we employed for our study. It contains photographic artworks produced by resident artists of EMPACT project, photographs from the personal archive of the researchers, and paintings depicting landscapes and animals.



PHOTOGRAPHS FROM PERSONAL ARCHIVE

“PARROT IN A CAGE”. FROM PERSONAL PHOTOGALLERY



RECYCLING CAT”. FROM PERSONAL PHOTOGALLERY

ANNEX



“WHY?”. FROM PERSONAL PHOTOGALLERY



“WHAT IS FREEDOM...” FROM PERSONAL PHOTOGALLERY

ANNEX



“HUMAN AND PLASTIC”. FROM PERSONAL PHOTO GALLERY



“PLASTIC CAMP”. FROM PERSONAL PHOTO GALLERY

ANNEX



“HUMAN VERSUS NATURE”. FROM PERSONAL PHOTOGALLERY

ANNEX

PHOTOGRAPHICAL ARTWORKS



“SMOKE MOUNTAIN”. BY ANDRIA ZAHARIOU



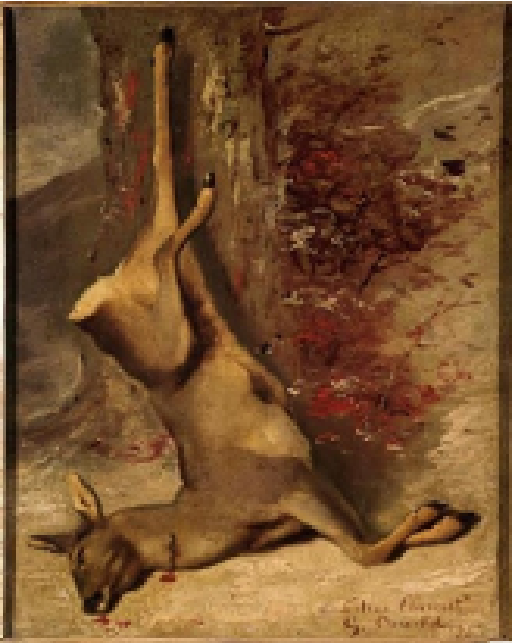
“COWS”. BY ANDIA ZAHARIOU



“RED PLANT”. BY ANDIA ZAHARIOU

ANNEX

PAINTINGS



“THE DEER” BY JEAN DÉSIÉRE GUSTAVE COURBET, 1876



“AGNUS DEI”
BY FRANCISCO DE ZURBARÁN,
1635-40



A BUTCHER'S COUNTER”
BY FRANCISCO JOSÉ DE GOYA, 1808-12

ANNEX



“HORSE RACE (DERBY OF 1821 AT EPSOM)” BY THÉODORE GERICAULT, 1821



“STILL LIFE WITH PHEASANTS AND PLOVERSONE” BY CLAUDE MONET, 1879

ANNEX



“RIESENGEBIRGS LANDSCAPE MIT AUFSTEIGENDEM NEBEL” BY CASPAR DAVID FRIEDRICH, 1810-20

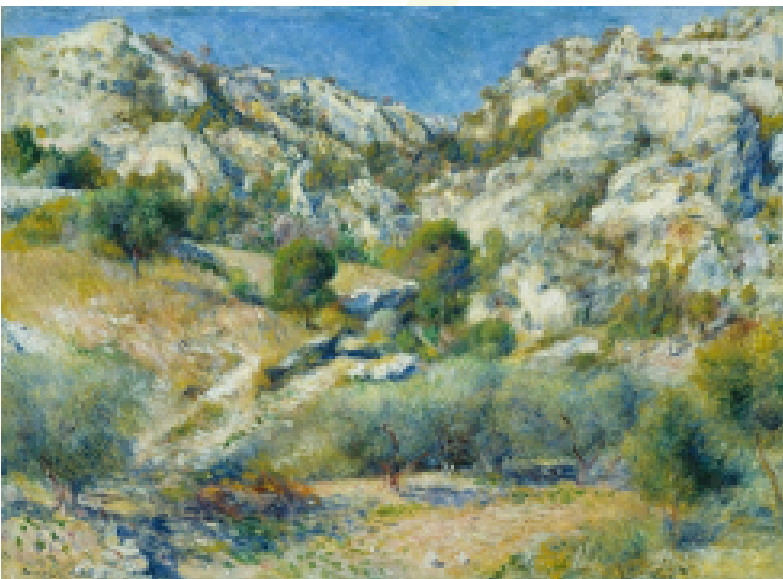


“MEMORY OF MORTEFONTAINE SOUVENIR DE MORTEFONTAINE)” BY JEAN-BAPTISTE-CAMILLE COROT, 1864

ANNEX



“BEECH TREES” BY GUSTAV KLIMT, 1903



“ROCKY CRAGS AT L'ESTAQUE” BY PIERRE-AUGUSTE RENOIR, 1882

ANNEX



“LANDSCAPE WITH PHILEMON AND BAUCIS” BY PETER PAUL RUBENS, 1620

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