



Article

The Emotional Experience of Flowers: Zoomed In, Zoomed Out and Painted

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Abstract: People have an ancient and strong bond to flowers, which are known to have a positive effect on the mood. During the COVID-19 pandemic, sales of ornamental plants increased, and many turned to gardening, possibly as a way to cope with ubiquitous increases in negative mood following lockdowns and social isolation. The nature of the special bond between humans and flowers requires additional elucidation. To this means, we conducted a comprehensive online mixed methods study, surveying 253 individuals (ages 18–83) from diverse ethnic backgrounds and continents, regarding their thoughts and feelings towards photos of flowers, nature scenes and flower drawings. We found that looking at pictures and drawings of flowers, as well as nature scenes induced positive emotions, and participants reported a variety of positive responses to the images. More specifically, we found associations of flowers with femininity, and connotations to particular flowers that were affected by geographical location. While nature scene photos induced positive reactions, flower photos were preferred, denying a mere substitution of nature by flowers and vice versa. Drawings of flowers elicited less positive emotions than photos, as people related more to the art than to the flower itself. Our study reveals the importance of ornamental flowers and nature in our life and well-being, and as such their cultivation and promotion are essential.

Keywords: well-being; ornamentals; survey; flowers; nature



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1. Introduction

The relationship between human and flowers is ancient, but it has not been fully elucidated, in terms of its embodied and cultural elements. We are living in an era where we are beginning to pay the price of intense disruption between human and nature on many levels, including the social isolation created by COVID-19, and the price of climate change and diminishing natural resources.

COVID-19 has resulted in significant mood disruptions, such as, increased tension, depression, anger, fatigue, and confusion, and reduced vigor [1]. Although numerous lock-downs in spring of 2020 led to a decline in flower and plant sales due to restrictions on visits to stores and garden centers [2,3], alternative routes for ornamental plant trade and horticultural activities were quickly created [4]. This led to a significant increase in retail sales of ornamental plants, and millions of people became horticulturists for the first time [5–7]. This suggests that people are particularly drawn to flowers and nature and feel the need to be surrounded by or to engage with them in the stressful times of

COVID-19, and invest efforts to gain comfort from them. A recent review has documented the positive impact that plants have on quality of life and well-being [8] as well as physical health [9]. However, it is unclear whether images of nature alone can elicit these positive reactions, or whether people need to be immersed in nature itself [10]. Viewing images of flowers led to recovery effects following a psychological stress [11].

In this context, understanding the mechanisms that enable the abiding positive relationships between human and flowers, and human and nature, is particularly relevant to our times.

Thus, in the current study we aim to deepen our understanding and exploration of the components of flowers and of nature-scenes that elicit emotional reactions in people, and to try to understand those reactions in different cultural contexts. This will help us elucidate the visual components that influence people when interacting with images of flowers and nature.

1.1. Flowers, Nature and Peoples' Affective Reactions

The strong attraction of people to flowers is very ancient and engendered domestication of ornamental plants driven by aesthetics and human culture [12,13]. Even though no obvious reward is apparent, people devote precious time and resources to cultivating flowers. A phenomenological study that examined the relationship between people and flowers found that there were multiple and interactive components that served as a source of pleasure which was connected to both a sense of interaction with and a connection to the natural world [14]. Flowers enhanced positive mood through sensory interactions, however, it is not clear whether it is the aesthetic or olfactory component, or possibly a combination of the two [15].

It is common knowledge that people react emotionally to external stimuli. However, flowers seem to elicit a special emotional response in humans, increasing positive affect, pro-social behavior, and affecting people's judgment. Flowers were found to evoke feelings of compassion, less negative mood in the mornings, and increases in energy, happiness, and enthusiasm at work in individuals exposed to fresh cut flowers in their home [15].

Flowers have been used in art therapy to assist sexually abused children express feelings and thoughts, process the traumatic experience and reduce anxiety [16]. Flowers had a positive effect on peoples' mood and their perception of others [17]. With flowers present in the room, pictures of other people were judged more positively than without flowers, and participants were better able to remember the room. A floral display was found to have a positive effect on feeling composed and confidence, however foliage display had a somewhat negative effect [18].

The effect of flowers also has been apparent in mood related changes of physiological measures. For example, looking at fresh roses led to a decrease in Oxy-hemoglobin concentrations in the prefrontal cortex [19] and an increase in the parasympathetic nervous activity [20,21], indicating physiological calming. Additionally, looking at peonies decreased systolic and diastolic blood pressure, heart rate, and pulse [22], all indicators of physiological relaxation. Furthermore, looking at black and white pictures of flowers induced happiness [23]. A previous study also revealed embodied implanted elements in the aesthetic enjoyment related to flowers [14]. Flowers encouraged people to make intimate connections among themselves [24,25], and elicit a helping behavior [26]. This effect does not seem to be unique to flowers but was also observed when exposed to natural environment, such as a park [27].

Nature is seen as an important element in stress reduction and improving well-being. People prefer buildings in which greenery is included [28] and the incorporation of nature in urban settings has restorative and stress reducing qualities [29]. Viewing greenery in images has also been found to reduce stress and improve mood, especially for individuals who are suffering from a negative mood to begin with [30]. Thus, if viewing nature and interacting with flowers are beneficial to well-being, we remain curious to examine if

viewing flowers, nature or drawings of flowers have a positive impact on mood, and if one is preferred to another, and why.

1.2. Photograph vs. Art (Painting or Drawing)

As outlined above, flowers and nature have a strong impact on people. The question is if this effect can be elicited from images of flowers and nature only? Indeed, flowers and nature have been the source and inspiration for many paintings over the years [12], e.g., Monet painted about 250 different paintings of water lilies! Ambrosius Bosschaert is considered the pioneer of the Dutch highly valued still flower paintings, as they provided a permanent image, that in opposition to real flowers, do not decay [31]. While the still painting of flowers was posited as a means to document and capture a specific point in time of the life cycle of flowers, the modern study of neuro-aesthetics, focuses on understanding the physical and emotional response to creating and viewing art. Viewing art, as described by the embodied simulation theory is seen as a relational encounter between the viewer and the remnants of the creator, thus it is an intersubjective experience, through which two conscious beings meet [32]. This means that, in terms of embodied aesthetic experiences, flowers and images of flowers can enhance relational connection to the world and its beauty, and also to other people who have created images of flowers. Thus, flowers enhance creative behaviors, through a wish to visually depict them, decorate with them, and give them as gifts.

The mechanism of evoking an emotional response differs between photographs and paintings because photographs at large represent true physical constructs of nature, and artists have always used nature as a base or as a “teacher” to create works that reflected their feelings, emotions, and beliefs [33].

In previous studies [14,23], we used flowers’ photographs to explore the impact of flowers on people. To the best of our knowledge, there are no studies that have compared the emotional response elicited by flowers compared to scenes of nature, and by flowers that are drawn compared to photographs of flowers.

1.3. Cultural Aspects of Flowers

In continuation of the social relational and connective role of flowers in society described above, specific plants and especially flowers are strongly connected to discrete cultural aspects of societies, leading to different significance across countries [34]. For example, in Japan, cultural norms state that the person belongs to nature (macrolevel), so the person acts in ways that do not violate harmony with nature and feels bad when picking a flower is simply suggested (microlevel). The act of picking a flower takes on different meanings as a function of how relating to nature is culturally organized [35]. According to one study [36] in Japan people’s moral emotions and justifications for flower picking modulated flower-picking behavior and intentions.

While on the one hand flower preference and behaviors are clearly culturally contextualized, there is also a universal level of choice, for example, such as the universal predominance of roses and lilies for cultural events. This universal component which was identified in our previous publication, where, although differentiation among cultural backgrounds was observed in our previous survey [23], the results clearly indicated a universal concept of “floweriness”, expressed by the positive reactions of the participants towards all presented flowers, independently of cultural significance. Thus, the concept of “flower” of all sorts, raised positive emotions.

The current study does not focus on examining cultural differences in responses to flowers and nature, but rather on a “universal” relationship between people and flowers found in different cultures. Therefore, our study sample will include a wide variety of people who differ in age, ethnicity, and living environment. However, we do not want to completely neglect cultural effects and will therefore examine the influences of culture in an exploratory manner through qualitative analyses of survey responses.

1.4. Research Questions (RQ)

Previous research has indicated that flowers and nature can touch peoples' emotions and inspire creative art valued by many. In this systematic study we wanted to examine whether peoples' emotional reactions towards flowers, nature and flower drawings differ. We sought to answer the following research questions: Is our relationship to flowers special? Are flowers just a representative of nature or do we have a special bond towards flowers? Specifically, we asked:

RQ1: Is the emotional response to flower photos different from the response to nature photos?

RQ2: Is the emotional response of people different when viewing photos of flowers compared to viewing drawings of flowers?

RQ3: What do people like more: photos of flowers or drawings of flowers?

To this end, we conducted a comprehensive online survey involving people of different ages and ethnic backgrounds from various continents. The survey was conducted during the COVID-19 confinement period giving us the opportunity to study people's reactions towards flowers and nature during a stressful time in their life. No specific criteria were applied to select the participants. Links to the survey was disseminated by mail and social media by the authors and all completed questionnaires were used for the study.

This paper firstly explores the literature on peoples psychological and culturally constructed reactions to different flowers and nature scenes. We then present our cross-cultural quantitative data and its analyses, and then our cross-cultural qualitative data, integrated these two sets. Finally, we discuss the implications of these findings in relation to the research questions.

2. Methods

Overall, this study used a mixed methods approach. Its central method was quantitative, aiming to capture statistical data showing major reactions of different groups to different pictures presented in the online questionnaire. The second method was qualitative, aiming to explore significant themes in these different reactions through the associations of participants. The qualitative data thus help to explain the results found in the quantitative data and add details to help understand people's reactions as well as explaining differences among them.

2.1. Participants

Data from $N = 253$ participants were collected. After excluding incomplete data sets a total of $N = 235$ (189 women, 46 men) participants were included for further analysis. Participants' age ranged from 18 till 83 with an average age of 42 years old ($M = 42.29$; $SD = 18.87$). Participants originated from 19 different countries that could be roughly divided into four geographic regions: Europe $N = 59$; North America $N = 46$; Israel $N = 37$; and Japan $N = 93$.

2.2. Study Design

We tested our research questions in a within-subject design: participants had to rate photos of flowers, nature images and drawing of flowers, that were presented online in the questionnaire in randomized order.

2.3. Material

2.3.1. Images

Three different categories of images were used in the study (see Figure 1):

- (1) Flower photos ($n = 6$): Photos of cultivated ($n = 3$) and wildflowers ($n = 3$). Cultivated flowers are flowers that can typically be found in a flower shop. These flowers are not usually seen in nature. They are domesticated and are usually larger and hold more petals than their wild counterparts. Wildflowers on the other hand can be seen in nature in their natural environment. Our criteria for choosing the flowers' pictures

- were (1) that the different flowers would be more or less familiar to people around the world (2) that they would all have a radial symmetry, and yet be visually different from one another (3) that they would be different colors.
- (2) Nature photos ($n = 6$): Nature scenery without urban or cultivated parts. Nature landscapes were selected to represent different topographies, such as mountain, plains, greens and forests.
 - (3) Artwork ($n = 3$): Drawings of different flowers.



Figure 1. Images used in the survey and their scores on the 7-point Likert-type rating scale (see Methods) represented as bar charts. Images are presented by groups. Flowers: (a) white and red dahlia, (b) blue hydrangea, (c) white lisianthus, (d) white marguerite, (e) pink cosmos, (f) yellow leopard plant. Nature: (g) tree and mountains (Kamikochi, Japan), (h) trees with open landscape (Kushiro swamp, Japan), (i) greens and woods (Kamikochi, Japan), (j) yellow flowers (Okkaido, Japan), (k) red flowers and greens (Negev, Israel), (l) yellow flowers (Negev, Israel). Art representing flowers: (m) lotus, (n) *Ornithogalum* and (o) sunflowers. Y axis represents the average score obtained for each image on a scale from 1 to 7 (see Methods).

2.3.2. Survey

In order to obtain our study goals, we designed an anonymous survey to understand how individuals worldwide experience and are emotionally affected by viewing photos of flowers, nature and artwork of flowers, at this time of social distancing. SurveyMonkey (<https://www.surveymonkey.com/>, accessed on 1 April 2020) was used for data collection and images were presented in randomized order using SurveyMon-

key's randomization tool. The English version of the survey can be found at this link: <https://www.surveymonkey.com/r/QGM3DHN>.

Links to the survey were disseminated by mail and social media by the authors and all completed questionnaires were used for the study. The overall gender and age base that this created is defined in the methods. We used the snowball method of recruiting participants [37].

Participants answered questions tailored to gauge how the different images affects mood, indicated their liking and familiarity with the presented images. The survey consisted of an introduction, main study, and a final part.

Introduction: We collected demographic data regarding gender, country of residence, age, education and socio-economic status. We also asked participants to rate how much they agree or disagree on a seven-point Likert scale with the following statements related to social distancing and isolation: (1) Social distancing is an important part of my daily life right now. (2) I am satisfied with the social contacts I have in my daily life. (3) I am satisfied with the amount of time I can spend outdoors. Furthermore, participants rated their current affective state on three dimensions using 7-point Likert-type rating scales: positive/negative; calm/excited; tired/awake.

Main study part: Fifteen images (see Figure 1) were presented one by one in randomized order and participants had to answer seven questions about each image. On 7-point Likert-type rating scales participants evaluated image familiarity and liking; and their emotional impression of the image on the dimensions unpleasant/pleasant; calm/excited; tired/awake. Questions about emotional impression are based on the valence-arousal model of emotions [38]. The dimension tired/awake was added based on a previous study by [39] showing that calm/exciting and tired/awake appear to be two different emotional properties that are not correlated. Furthermore, participants were asked to provide free associations for each image and chose a keyword out of five (inspiring, annoying, boring, peaceful, pretty) to describe the image. The keywords were chosen based on the valence-arousal model of emotions representing different degrees on the model's unpleasant/pleasant and calm/excited dimensions: Inspiring: positive-exciting; Annoying: negative-exciting; Boring: negative-calm; Peaceful: positive-calm. The keyword "pretty" was added because it was the most often used keyword to describe flower pictures in a previous study [23].

2.4. Statistical Analysis of Quantitative Survey Data

Data were analyzed using Generalized Linear Mixed Models (GLMM) with the fixed-effect factors: image category, gender and geographic region. Because of the large age range of participants and an expected effect of familiarity with the images (e.g., images showing familiar flowers or landscapes might be generally rated as more positive), familiarity ratings and participants' age were added as covariate in the analyses. GLMM have the advantage that repeated effects variables can be added, allowing to relax the assumption of independence of the error terms and avoiding biased standard errors and significance tests that would result from traditional regression-based approaches in such cases [40]. A p -value of less than 0.05 was considered as threshold for significance testing. Since the data set contained repeated measures, participant ID was added as random factor to account for the relationship between data from the same participant. Correlations with social distancing measures and images ratings were small ($r < 0.20$) and negligible, and were therefore ignored in further analyses.

2.5. Qualitative Methods

Our qualitative data strategy was phenomenological, to capture experiences of people when viewing the different flowers and nature images. This helped us to understand the participants' questionnaire evaluations and choices in a more contextualized and nuanced way as in mixed methods research [41,42].

Our research protocol was to include a paragraph space in the questionnaire for people to write down any associations, or thoughts about the different flowers that they were viewing.

Our data sources included these texts for 100 participants, who added their own self-defined phenomenological reactions to each of the 15 images. These included sentences, explanations, and single words. Our analyses categorized these associations into central themes in relation to each flower, drawing of a flower, or image of nature.

Validity was reached through peer analyses of the qualitative data by three of the researchers, coming from different fields, and also through their triangulation with the quantitative data sources. Trustworthiness is based on the above triangulation, on counting associations to create the themes, and on the availability of these materials for further analyses [41].

2.6. Study Limitations

While we understand that the variations between the flower and nature images can have different visual impacts, our focus in this study, is on the cultural and phenomenological associations that the images elicit in participants from different groups.

This study's limitation is its more generalized character and lack of control of some of the visual elements. At the same time, its aim is exploratory, and further studies can more exactly explore the very interesting directions that the current results suggest.

3. Results

3.1. Quantitative Analyses

We first describe the results obtained for each picture, ranking them on a scale from 1 (lowest) to 7 (highest) reflecting how much they liked the picture and how familiar and how pleasant it looked to them. In addition, we assessed the level of emotions of the participants induced by the images as calm or excited and tired or awake (ranked from 1 to 7, respectively).

All pictures showing flowers and nature obtained the highest grade for the "Like" parameter, except for the white marguerite, for which "Familiarity" received the highest rank (Figure 1). On the opposite, all three art pictures received their highest grade for "Pleasant". Strikingly, these art pictures also obtained lowest grades for all parameters, compared to the flowers and the nature pictures. The participants were mostly familiar with the presented flowers, except for the dahlia (Figure 1, upper row), and much less with the nature and the art pictures. All pictures obtained somewhat low grades on the "Calm/Excited" axis (3.4 in average), suggesting that the images induced calm rather than excitement. In contrast, the overall average grade on the axis "Tired/Awake" was 4.6, denoting that the images include the participants to feel more "awake" than "tired". This result demonstrates that these two emotions are independent [39].

In a second step, we addressed key research questions, based on groups of pictures, as presented below.

3.1.1. Flowers vs. Nature: Is There a Difference in Emotional Response towards Flowers (Cultivated and Wild) Compared to Nature Photos (with and without Flowers)?

Our first research questions concerned the relationship with flowers and nature and included concerns as, "Is our relationship to flowers special?"; "Are flowers just a representative of nature or do we have a special relationship towards flowers themselves?" In order to address these questions, we first investigate the differences between the group of flowers and nature images.

Liking

Nature photos received higher ratings for Liking compared to flower photos. Region ($F(3, 7) = 5.902, p = 0.001$) and familiarity ($F(1, 7) = 493.633, p < 0.001$) had both a significant effect on Like-ratings. Age ($F(1, 7) < 1$) and Gender did not reveal a significant effect ($F(1, 7) = 2.385, p = 0.123$) (Tables 1 and S1).

Emotional Response (Valence)

Participants rated Nature photos as more pleasant than flower photos. Region ($F(3, 7) = 4.961, p = 0.002$) and familiarity ($F(1, 7) = 458.979, p < 0.001$) had both a significant effect on valence-ratings. Age ($F(1, 7) < 1$) and Gender did not reveal a significant effect ($F(1, 7) = 1.878, p = 0.171$) (Tables 1 and S2).

Emotional Response (Excitement)

Participants rated Nature photos as more calming than flower photos. Region ($F(3, 7) = 5.712, p = 0.001$) and familiarity ($F(1, 7) = 76.945, p < 0.001$) had both a significant effect on felt excitement. Age ($F(1, 7) < 1$) and Gender did not reveal a significant effect ($F(1, 7) < 1$) (Tables 1 and S3).

Emotional Response (Awake)

Participants rated Nature photos as making them feel more awake than flower photos. Region ($F(3, 7) = 6.397, p = 0.001$) Age ($F(1, 7) = 7.676, p = 0.006$) and familiarity ($F(1, 7) = 67.487, p < 0.001$) had a significant effect on Awake-ratings. Gender did not reveal a significant effect ($F(1, 7) < 1$) (Tables 1 and S4).

The words chosen most often for flower photos were pretty (N = 618), peaceful (N = 398), and inspiring (N = 216). The words chosen most often mentioned for Nature photos were peaceful (N = 789), inspiring (N = 337), and pretty (N = 163).

Participants seem to have a different emotional response towards flowers and nature. Whereas flower photos make feel participants excited, nature photos were made them feel rather calm, but awake (Table 1). This is also reflected in the word choices were a majority of participant chose "peaceful" as the keyword to describe nature photos, whereas "pretty" was most often chosen for flowers (Figure 2). Only a very small number of participants chose annoying for both flower and nature photos.

Table 1. Mean scores (on the 1 to 7 scale) and Standard Deviations (in parentheses) for the flower and nature images (see Figure 1). Familiarity is used as a covariate for each other item.

	Flower Images	Nature Images	<i>p</i> -Values
Familiarity	5.08 (2.15)	4.57 (2.13)	
Liking	5.54 (1.52)	5.68 (1.36)	$F(1, 7) = 42.788,$ $p < 0.001$
Valence (Unpleasant/Pleasant)	5.48 (1.46)	5.63 (1.34)	$F(1, 7) = 47.254,$ $p < 0.001$
Arousal (Calm/Excited)	3.52 (1.59)	3.18 (1.71)	$F(1, 7) = 55.285,$ $p < 0.001$
Wake (Tired/Awake)	4.68 (1.24)	4.77 (1.29)	$F(1, 7) = 12.562,$ $p < 0.001$

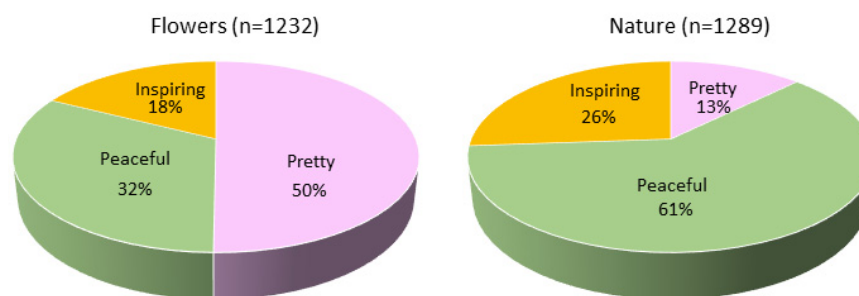


Figure 2. Occurrence (%) of the words most often chosen in relation to flowers (cultivated and wild) and nature (with and without flowers) images.

Flowers seem to stimulate people and are valued for being pretty. They also seem to evoke positive feelings similar to nature. Nature on the other hand seems to have a more calming effect and giving refreshment at the same time (e.g., feel awake).

Overall, participants across different geographic regions differed in their like and emotional ratings. Familiarity had a strong effect across all ratings. Age affected only ratings for Liking, but otherwise had no effect for the emotional ratings. Gender did not affect rating.

3.1.2. Flowers vs. Drawings of Flowers

Our second and third research questions concerned whether there was a difference in participant's reactions towards flowers and drawing of flowers. In order to compare the same number of flowers' photographs and flowers' drawings, we chose to compare only participants' ratings for the three flowers appearing first from left to right in Figure 1 with ratings for the three flower drawings. These three pictures were chosen because the flowers were from a cultivated environment, and thus more suited to comparison with the drawings than the wildflowers.

Liking

Flowers received higher ratings for Liking compared to drawings of flowers ($F(1, 7) = 164.781, F < 0.001$). Furthermore, familiarity had a significant effect on Like-ratings ($F(1, 7) = 189.044, p < 0.001$). Region ($F(1, 7) = 1.709, p = 0.163$), Age ($F(1, 7) < 1$) and gender did not reveal a significant effect ($F(1, 7) = 2.019, p = 0.156$) (Table S5).

Emotional valence

Flowers were rated as giving a more pleasant impression compared to drawings of flowers ($F(1, 7) = 132.873, F < 0.001$). Furthermore, familiarity had a significant effect on valence ratings ($F(1, 7) = 159.518, p < 0.001$). Region ($F(1, 7) = 1.755, p = 0.154$), Age ($F(1, 7) < 1$) and gender did not reveal a significant effect ($F(1, 7) = 1.669, p = 0.197$) (Table S6).

Emotional arousal (excitement)

Flowers were rated as feeling more exciting compared to drawings of flowers ($F(1, 7) = 11.624, F < 0.001$). Furthermore, familiarity had a significant effect on excitement ratings ($F(1, 7) = 80.121, p < 0.001$). Region ($F(1, 7) = 1.023, p = 0.381$), Age ($F(1, 7) < 1$) and gender did not reveal a significant effect ($F(1, 7) < 1$) (Table S7).

Emotional arousal (awake)

Flowers were rated higher in feeling awake compared to drawings of flowers ($F(1, 7) = 163.824, F < 0.001$). Furthermore familiarity ($F(1, 7) = 2.852, p < 0.036$), Age ($F(1, 7) = 14.532, p < 0.001$) and region had a significant effect on arousal ratings ($F(1, 7) = 12.776, p < 0.001$). Gender did not reveal a significant effect ($F(1, 7) < 1$) (Table S8).

Viewing flower images was rated as being more pleasant than viewing flower drawings. Flower images were rated as making the participant feel more excited and awake as compared flower drawings. In general region, age, and gender did not seem to affect liking and emotional ratings. However, familiarity had an effect on participants' ratings.

Word associations

The words chosen most often mentioned for flower images were pretty (N = 301), peaceful (N = 202), and inspiring (N = 128). The words chosen most often mentioned for flower drawings were boring (N = 217), peaceful (N = 179), and pretty (N = 168) (Figure 3).

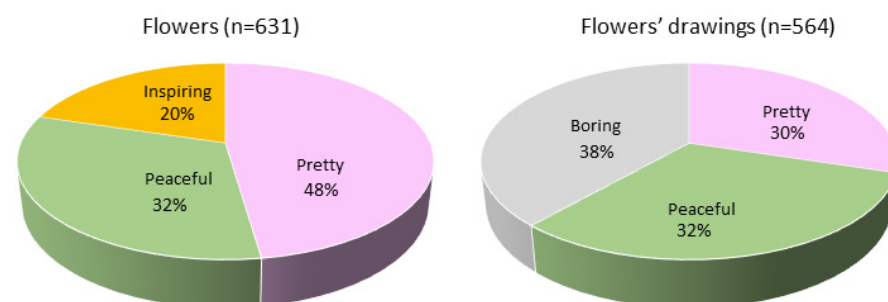


Figure 3. Occurrence (%) of the words most often chosen in relation to images of flowers and flowers' drawings.

Results suggest that the participants' emotional feelings towards photos of flowers were stronger compared to flower drawings and made them feel more excited and awake as well as evoking stronger positive feelings. Participants' word choices suggest that photos of flowers evoke different types of thoughts and feelings as compared to drawings of flowers (Tables 1 and S1).

3.2. Qualitative Analyses

As stated in the methods, these findings compile the central themes in the participants' free associations and open comments about each image. They are firstly described and then integrated with the quantitative findings.

3.2.1. Flowers

Theme no. 1: Overall love of flowers, regardless of type

Similar to our first study [23], the findings revealed no qualitative differentiation among the different flowers, and the theme of loving flowers, as a general category re-emerged

"I learned from the survey that I love flowers in all their forms of expression, it is hard to choose because I love them all. Any type of flower makes me happier".

Theme no. 2: Flowers are associated with overall feminine attributes in all cultures

The qualitative data showed strong differences in the type of associations that each specific flower generated, although all of these associations were feminine. For example, words to describe a more exotic type of flower (referring to the dahlia), related it to a seductive femininity included describing the flower as a *"warrior princess"*, *"unique-wild"*, *"exotic"*, *"intriguing"*. Compared to this, words to describe the more symmetrical and simple flowers (like the white marguerite) included associations such as a sense of *"purity"*, *"my mother"*, *"gentleness"* and *"fragility"*. We can claim that both of these dichotomous descriptions of femininity are central to cultural archetypes (or stereotypes) of the feminine. The difference was clearly related to the compositional elements of the flowers, such as shape, color, symmetry, repetition, etc., that triggered these two different types of associations.

Theme no. 3: Flowers associated with attachment to loved people and spaces

Maybe in continuation of the above, many of the associations around flowers connected to specific people as well as activities and spaces shared with these people. In other words, flowers were loved as themselves, but were also a symbol of a loved relationship, or space. They fostered attachment or were an expression of attachment. People associated flowers with weddings, with gifts from loved ones, with family events such as picnics or hikes as well as special trips together to see these flowers. The associations included mention of the pleasure of giving, helping to reconnect to people after suffering loss, remembering loved ones, and celebrating love relationships—as in romance and weddings, and enjoying the happy faces of people who receive flowers. *"I take them when I go to visit a grave, when I want to say thank you"*, *"When I miss my mother I send her flowers, it is a way to make someone feel special"*.

Flowers were also connected to family and loved one's spaces, such as grandparents or parents' gardens, national gardens, walks, parks in cities, as well as flower shops where people buy flowers for loved ones.

Theme no. 4: Attachment to flowers themselves, and caretaking of flowers.

Continuing this, a theme emerging from the above, in addition to using flowers as a way to create attachment to others, people search for attachment to flowers themselves and the taking on of a caretaker role, making sure they have water, a good temperature, etc., as in the following examples: *"I buy flowers regularly"*, *"I can't live without them"*, *"I choose routes that enable me to walk past flowers"*, *"I look after my flowers"*, *"I garden regularly"*.

Theme no. 5: Images of flowers arouse strong perceptual and sensory associations

A striking finding in terms of the type of words chosen to describe the flowers, even when experienced in the form of small on-line photographs in our questionnaire, were strong sensory and perceptual arousal. For example, people noted the *"great smell"* of

flowers, a “fresh feeling” a sense of “lushness”. Perceptual elements were strongly noted, such as colors, brightness and size. These sensory elements lead to strong positive body-experiences, expressed as “a treat for the eyes”, “I was surprised by the strength of my reaction to the color of a flower”, “The bright one made me perk up and fill with positive feeling, it was a real rush of feeling”, “They light up the room”.

Theme no. 6: Sensory experience of flowers as “aesthetic beauty” as creating a positive impact on mood, elevating or calming.

In continuation of the above sensory elements (Theme no. 5), then these sensory experiences were directly connected by participants to positive emotions:

These included “up” or arousal emotions, as seen in the verb formulations describing reactions in the following examples. “I enjoy the color palette, and I get excited about the flowers, “I feel pleasure in their beauty on a daily basis”, “their beauty brings me comfort, mainly the color creates sensations of pleasure”. This direct sensory experience is also translated into more abstract positive emotions, such as calming or focusing emotions, “For me the flowers expanded my soul and express a mindful state”. “You have to really look at them, this cares for the mind”. It seems that flowers and images of nature help to regulate emotions, arousing or calming one down, depending on what is needed in cultural and personal terms in order to feel positive emotions.

Theme no. 7: Differentiation in reaction to flowers based on cultural context (geographic region)

Throughout the associations, and side by side with the above-described universal elements, there were also clear differences in the types of associations that each flower arose, based on the different cultures we explored. These differences unsurprisingly manifested more in the qualitative data: For example, in one culture flowers are associated with family holidays, while in another the same flower will be associated with specific places, such as parks, national holidays etc. This includes relational associations, but also physical associations depending on where and when that flower grows in that country. In one country the flower may be associated with spring and in another autumn, in one, it is associated with nature and in another with parks or gardens. Some cultures associate flowers with specific national holidays, while others will focus on family groups. Flowers are associated with walking in the woods, or with visits to national parks, with grandparents, or war, or family meetings, with rainy season, or summer, with holidays, or walking to school, depending on specific culture and physical location.

3.2.2. Nature

Theme no. 8: Overarching differences between nature and flowers

The themes of the nature images divided into the same categories as those of the flowers; that is, we saw overall positive associations with nature, strong sensory arousal also from small images of nature, and clear cultural differences in associations around the nature, and based on the compositional elements of the nature scene (e.g., hills versus forests). For example, the Japanese participants associated specific nature scenes with specific names of places or heroes from movies. People from Europe associated fields and woods with family holidays and hikes.

Overall, the various nature scenes induced different associations, as described below:

Mountains (Figure 1, first image from left in the “Nature” section”) were described as both creating a sense of peace of and of calm, but also a feeling of being small and feeling the force of nature as opposite to human.

The green field (Figure 1, second image from left in the “Nature” section”) included associations such as “meditation”, “peace”, and also a sense of “vastness”, “openness” and “possibility”. It was described in terms of sensory reactions as “fresh green”, “space”, “largeness” and “serenity” but also has associations of “travel” and “movement”, and “expansion”.

Forests (Figure 1, third image from left in the “Nature” section”), interestingly, had both negative associations, of “getting lost”, “claustrophobic”, “scary”, “being alone”, “dampness”, and also positive elements, such as “hugging trees”, “appreciating trees”, “mystery”,

“positive solitude”, “richness”, “serenity”. Forests also created cultural associations like fairy tales, or Tolkien’s books. This included culturally specific memories of childhood walks, holidays, parents and children.

Open field with flowers (Figure 1, three images from right in the “Nature” section”), maybe because of these relational associations, created a feeling of calm, peace, safety, fun, euphoria, realization, happiness. This was reflected by aesthetic pleasure mentioned in flowers, the word “beauty” returned names of flowers, animals, insects, wind, light, “life soup”, “diversity”.

In general, we see that like flowers, the compositional elements of nature scenes are interpreted in the way that creates most positive self-regulation within that culture and at that time.

Interestingly, associations around images of fields that are covered with flowers, returned participants to a relational association, rather than to a nature association, for example of family holidays, community, friendship, mom. Thus, flowers are more relationally associated overall than nature images.

3.2.3. Drawings of Flowers

The qualitative themes of comparing art images and photographs of flowers repeat and strengthen the quantitative findings that the drawings of flowers as compared to photographic images of flowers, did not arouse positive emotions, sensory experiences or cultural associations, as did the pictures of flowers, but rather aroused an intellectual evaluation of the level of the art product itself, for example “this is not an interesting picture? Its aesthetic value is not high”. The art did not, in other words, arouse an embodied aesthetic experience or a set of cultural associations, but rather aroused an intellectual evaluation of the level of the art product itself. These reactions were the same to all types of art pictures regardless of variation in style of the art images used. Also, interestingly, many comments were about the art medium, rather than the content, of the flower, such as that the paint was thin or thick, that is, the flower element was subsumed inside the art element. People described the images as interesting or boring, as clever or kitsch, without relating to the flower element depicted. In other words, it seems that the art medium was a more dominant factor than the subject of flowers.

4. Discussion

This research explored peoples’ reaction to flowers and to nature through comparing differences in reactions to viewing pictures of different types of flowers, nature and drawn flowers. Through this, we hoped to reach more specific understanding of how people react specifically to elements of different flowers and nature images. We will firstly discuss these different reactions, and then in our concluding thoughts, tie these differences together to create a deeper understanding of our overall reaction to flowers and to nature. We have divided our discussion into a few central points, as follows.

4.1. Flowers as Inducing Positive Emotions

The results of this study clearly show that flowers, even though represented only as virtual images, greatly affected the sensory experiences, and positive emotions of people across diverse geographical areas and multiple cultures. We saw a clear and overarching relationship between an aesthetic experience of a flower, and a positive mood. We also saw that flowers, based on their compositional elements and cultural associations, created either a calmer or more uplifted mood. Both were defined as “positive” (Theme 6). From this, it seems that the flowers help to regulate emotions in dual directions. Most importantly, this positive experience was connected to the sensory- aesthetic experience of the flowers, that is, to their perceived compositional elements such as smell, color, and shape, even when presented, as in this study, through small online photographs. To elaborate, it seems that flowers’ sensory impact is so strong that it is aroused also by memory of components such as smell, even when these senses are not actually experienced. As stated, this is

also connected to cultural associations. Thus, our findings strengthen the literature on the positive impact of flowers [15,17,23], but also help to deepen our understanding of what in a flower makes people happy, and also, what types of positive emotions flowers initiate in people. In order to reach this overall conclusion, our methods utilized additional comparative elements between different types and settings of flowers, such as comparing flowers and nature and flowers and drawn flowers. We will now elaborate on the more specific findings rendered from these comparisons.

4.1.1. Diverse Flowers

Firstly, we tried to understand the impact of the various flowers—in terms of quantitative analysis and our findings agree with the previously cited literature. This point is relevant for the flower industry, as it shows that people seem to respond positively to a general “floweriness” [23] rather than a specific type of flower. These findings go beyond the discussion in the literature of “trends” and fashions in flowers [43].

4.1.2. Cultural Differences

At the same time, people do not react the same to all flower types: There was a clear qualitative difference in reaction to flowers based on compositional elements that were translated into cultural associations. For example, flowers with more simple shapes and softer colors aroused different emotional reactions and associations to those that were more complex and exotic in shape and color (irrespective of if they were wild or cultivated). A contribution of this paper is to create a typology of cultural associations around different flowers. This can be relevant to the horticultural industry in different cultures and countries. An interesting question for further research is if the cultural association created the emotion or the other way round.

4.1.3. Flowers Are Feminine

While the flowers generated different qualitative reactions, it is interesting to note that all flowers, compared to our nature images, generated associations to do with femininity. This manifested as “feminine”, in the qualitative data that included different types of femininity, such as lovers or mothers and grandmothers. Even when participants related to the diversity of the flowers, they linked these considerations to different types of beauty that were associated with femininity. The quantitative data strengthened this direction, showing a large proportion of answers using the words “Pretty” to describe flowers. This finding, connecting flowers to femininity of different sorts, is interesting, as it resonates with the role of flowers in nature, where they attract pollinators through their attractive colors, smells, and shapes, as a way to assure the continuity of the species [12].

We saw that while both flowers and nature have strong cultural and sensory associations that are based on compositional elements, flowers are not the same as nature, they are not a metonym of nature, they appeal to something else within us. This was mostly expressed as feminine aesthetic qualities, such as enticement, or delicacy and may be associated with the role of flowers within nature. Above, we see that flowers are mostly perceived as pretty, that is they are a more aesthetic experience than nature. Thus, they are correlated to femininity because women are connected to aesthetic pleasure and to prettiness.

Like women create babies, the flowers develop into fruit, and they have to attract something, wind or bees or water, so that this can happen. Flowers have a specific relationship to us around propagation and continuation of species. Their aesthetic element is a means to this end, while nature in general is mostly peaceful or arousing.

So maybe people are reacting to this deep level? That goes beyond cultural conditioning to a deep level of propagation or continuation of the race. This idea is strengthened by the quantitative findings that while flower photos make feel participants excited, nature photos were made them feel rather calm, but awake. This excitation may be due to something more relational, more emotional and sexual in our reactions.

4.2. Reactions to Images of Flowers Are Qualitatively Different Than Reactions to Images of Nature

Another comparison that we undertook was between images of nature such as fields, woods, and mountains, as compared to flowers. Interestingly, these nature images were described using different adjectives as compared to the flowers. They aroused less associations around femininity and attachment rituals.

At the same time there were many similarities in people's reactions to nature images and flower images: like flowers, nature images created culturally contextualized associations that were also based on different compositional elements, such as mountains arousing awe, fields arousing a sense of peace, and woods arousing excitement and fear. That is, mountains created a sense of excitement, with people remembering challenging hikes fear, and awe, while open fields were more spiritual and uplifting. Woods were considered exciting, but also aroused fear, with associations to different fairy tales or getting lost. Hills created associations of challenge, and feeling small, while open spaces created feelings of freedom. This is similar to the findings of other research [44].

The most important similarity is that like the reactions to flowers, the qualitative data showed that viewing pictures of nature also aroused a range of positive emotions. Images of nature, created an overall positive reaction, that included a sense of expansion of experience, bringing either challenge and arousal, or peace and expansion of consciousness, based on different physical compositional elements of the nature scene. We found both calmness and arousal in relation to specific pictures of nature. Thus, the compositional elements of the nature images, like the flowers, enabled to regulate emotions and to reach positive emotional experiences-if a person needed to feel awe, he could look at a mountain, and if he needed calmness, he would prefer the picture of a field. The quantitative data however, showed a different emotional response towards flowers and nature. Whereas flower photos make feel participants excited, nature photos were made them feel rather calm, but awake. This is also reflected in the word choices were a majority of participant chose "peaceful" as the keyword to describe nature photos, where as "pretty" was most often chosen for flowers.

We see that people are aroused, calmed and moved by nature, that it is a huge resource for people, as reported in other research [44]. Understanding the emotions aroused by nature is important for fields such as nature therapy, but also for the current global struggle to maintain and look after nature rather than to ruin it. Establishing a value to human well-being could provide additional incentive for preservation.

What can we learn from this comparison between flowers and nature? It seems that both flowers and nature arouse positive emotions, but there are qualitative differences between these emotions. That is, flowers are not a substitute to nature, we do not experience nature through adding flowers to our houses, and nature is not a substitute to the experience of flowers. Flowers focus on relationships, attachment and caring between people, while nature seems to focus on a relationship with oneself and with the world. This is important information for flower growers, and also points to the important role of flowers as attachment based as transitional objects, to do with nurturing and caring. This is especially relevant in times when people are cut off from each other, times such as the COVID pandemic we are presently experiencing. Thus, the differences in reactions to nature and flowers help us to validate the relationship to flowers in a more nuanced way.

4.3. Differences in Reactions to Images of "Real" Flowers versus Art Images (Drawings) of Flowers

Comparing flowers' photos and drawings

In this comparison, we wanted to understand if emotional response of people is different when viewing photos of flowers compared to viewing drawing of flowers? In other words, we wanted to check if the idea or abstraction or aesthetic quality of a flower is what elicits a reaction, or a meeting with the flower itself (as close as possible)?

Quantitative and qualitative results suggest that participants' emotional feelings towards photos of flowers were stronger than their reactions to art depictions of flowers. The drawings elicited less joy than the photos, which made people feel more excited and

awake as well as evoking stronger positive feelings. The art was evaluated on a cognitive rather than emotional level, focusing on the merit of the art rather than the flower. For example, some artwork around flowers was defined as “boring”. How can we explain this difference? Without going into theories of aesthetic appreciation, it seems that artwork with flowers as the subject, as a mediated and processed interpretation of the flower, creates a gap from direct interaction with the flower. Something in the idea or gestalt of a flower, from an ecological perspective, even in a small photograph, manages to arouse a basic recognition or excitement that goes beyond aesthetic appreciation and appeals to the senses. One can imagine from this, that maybe people are indeed deeply embedded in, and thus aroused by, a deep basic connection to nature [45]. In other words, it shows a very strong connection between human and nature built in—we become attached to a flower immediately, and do not prefer the mediation of art.

4.4. Differences in Reactions to Flowers Based on Cultural/Geographical Considerations

The participant’s geographical region had a significant effect on almost all parameters among the comparisons performed in this study (Tables S1–S8). Different geographical regions were also associated with marked cultural differences, which most probably affected the results.

The qualitative data can show that the flowers are geographically and socio culturally situated in terms of specific associations, locations, meanings and interactions with flowers. This must be considered together with the overall universal element of flowers, based on gendered experience of flowers as “female” as well as on sensory reactions to compositional perceptual and sensory elements of and relational impact. Additional research should be conducted in order to further explore the impact of culture/geographical location on people’s reactions to flowers.

5. Concluding Remarks

Above, we described our findings regarding differences in peoples’ reactions to different types of flowers, to nature versus flowers, and to drawn images of flowers versus photos of real flowers. What have we learnt from this comparative study in terms of social implications of the effects of flowers on people?

Firstly, on a universal level that transcends socio-cultural differences, we saw that flowers and nature have uplifting and calming, but always positive psychological effects on people, even when only seen in a small photo. We saw that flowers as compared to nature scenes, interestingly, created more “relational” reactions, that is they were used to enhance communication between people and people and places. Compared to this, nature scenes created more general and broader types of positive emotions, for example, shifting between upliftedness or calmness. However, similar to flowers, we saw that while different cultural contexts created different types of reactions, all reactions to nature scenes were positive. Of note, drawn or artistic interpretations of flowers did not elicit these reactions, suggesting that people have a strong visceral reaction to nature itself, which situates them within it.

Social implications of these findings are similar to findings in existing literature, but help to focus on the social and cultural contexts in which flowers and nature become central to our well-being, to our connections with people, and to our connections to the physical and cultural spaces that we live within. This knowledge can be utilized to further enhance these connections. Activities involving flower cultivation and experiences in nature, even on the level of contemplation, are effective social methods to improve well-being [2,46]. We have seen the positive effect of nature on our everyday social interaction and existence. This provides an incentive to bestow and legislate special protection for nature as well as promotion of experiencing nature. In terms of the broad problems the world is facing today, enhancing this nurturing relationship can also help create awareness of environmental issues, where we each appreciate and respect each other, which is an essential challenge of this era.

This study revealed strong and deep bonds between flowers and people, which would have been apparent also if the study was conducted in a less stressful period than the COVID 19 lockdown. However, this specific period probably magnified this bond and led people to realize how important it was.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/horticulturae8070668/s1>, Table S1: Parameters of the GLMM for the dependent variable Liking in the comparison between images of flowers and nature; Table S2: Parameter of the GLMM for the dependent variable emotional valence in the comparison between images of flowers and nature; Table S3: Parameter of the GLMM for the dependent variable emotional arousal–excitement in the comparison between images of flowers and nature; Table S4: Parameter of the GLMM for the dependent variable emotional arousal–awake in the comparison between images of flowers and nature; Table S5: Parameters of the GLMM for the dependent variable Liking in the comparison between images of cultivated flowers and drawings representing flowers; Table S6: Parameter of the GLMM for the dependent variable emotional valence (pleasant) in the comparison between images of cultivated flowers and drawings representing flowers; Table S7: Parameter of the GLMM for the dependent variable emotional arousal–excitement in the comparison between images of cultivated flowers and drawings representing flowers; Table S8: Parameter of the GLMM for the dependent variable emotional arousal–awake in the comparison between images of cultivated flowers and drawings representing flowers.

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