

**An Empirical Aesthetics of the Sublime and Beautiful**

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## **Declaration and Ethics**

I, Young-Jin Hur confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Unless noted otherwise, all studies in the thesis have been approved by the Clinical, Educational and Health Psychology Research Department's Ethics Chair [Project ID No.: CEHP/2015/541].

## **Acknowledgement**

It is so easy to speak at length about why and how things happened in hindsight. Yet I am certain that this thesis would not have taken shape as it current is without Professor Chris McManus and my family. I am hugely indebted to their support and kindness. To attempt for an explanation of their importance would border rudeness, since by doing so I would most certainly leave out something. I can only be thankful. If this thesis can mean something to someone, I would also like to thank those readers.

## Abstract

The sublime and the beautiful are two of the oldest, most discussed categories of aesthetic experience. In their most basic of descriptions, the sublime refers to an aesthetic experience of fear and delight, and the beautiful refers to an aesthetic experience of pure pleasure. This thesis explores them empirically, theoretically informed by Edmund Burke's *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful* of 1759. Three questions are asked: (1) What are the physical characteristics of objects considered sublime, particularly size, height, colour, brightness, and contrast in photographs, and modality, style, and tempo in piano music? (2) What are the emotional characteristics of sublime experiences, especially in relation to fear? and (3) What is the relationship between judgements of the sublime and beautiful in various contexts? In 15 separate studies involving 768 participants, sublimity and beauty are related but separate experiences with distinct visual and auditory mechanisms. For images, although subjective sublimity and beauty ratings of images often show moderate correlations, sublimity is more influenced by presentation size than is beauty, while beauty is relatively more sensitive towards the presence of colour, and sublimity and beauty are both increased by higher presentation of images. Although subjective sublimity often correlates with subjective fear – a finding replicated in various studies and tasks – there is no evidence that physiological correlates of fear measured by skin conductance responses (SCR) and facial electromyography (fEMG) are activated at the same time as subjective sublimity. Together, these findings show that the associations of sublimity with size, height, and fear which are found in various cultures and languages, and especially in Burke's text, are realistic. Methodologically, the studies's use of large number of stimuli and participants makes the findings generalisable, which is often not always the case in the literature of empirical aesthetics. In conclusion, sublimity is an important and separate component of aesthetic experience, beyond the mere study of beauty alone, which merits further study in aesthetic science.

## Impact Statement

Aesthetic experiences are common and perhaps even inevitable in life. Judgements such as good/bad, like/dislike, or pleasant/unpleasant are surprisingly interchangeable with judgements of beautiful/ugly. Yet it would be an oversimplification to assume that all such judgements signify the same underlying psychological process. To explore the possibilities of different forms of aesthetic judgements, the present thesis examined a historically well-informed (and likely universal) pair of aesthetic experiences, namely the sublime and the beautiful, or a distinction between aesthetic experiences deriving from pleasure and from something more overwhelming and terrifying. The research adopted a wide spectrum of psychological research methodologies, ranging from psychophysics to psychophysiology, and from qualitative studies to controlled lab experiments.

Academically, the research informs past and ongoing philosophical debates on how the mind processes the sublime and the beautiful. Because the research explores ideas of deriving delight from negative emotions in both photographs and music, the research also shows close affinities to existing psychological frameworks including mixed emotions, empirical aesthetics, music psychology, and cross-modal interactions. An underlying examination throughout the thesis, whether people are similar to each other in their judgements of the sublime and the beautiful, also indicates an identification of the research with the psychology of individual differences.

The commonplace nature of aesthetic experiences provides opportunities for a wide range of real life applications of the research. Industries where aesthetic appeal lies at the core of their output may find immediate relevance to the thesis's findings on how the manipulations of an object's size, height, and colour, may influence aesthetic responses. For example, interior designers or architects may find it useful to understand how the size and height of an environment may influence the psychologies of those inside the room, especially if the environment is to be used for specific purposes (social gathering vs. an important announcement). Museum or gallery organisers may find value in how the lighting, viewing distance, or presentation height of an installation may interact with the content of the work to improve its impressions on viewers. Lastly, cosmetics companies may look into how different colours of makeup may produce different, yet still aesthetically appealing, impressions.

Finally, setting where aesthetic experiences are seemingly secondary to other functions, such as student accommodations, or restaurants, may find it useful in how, for example, setting the right type of background music may create the right type of mood, since music interacts with other modalities to create an overall aesthetic experience. Again, it is difficult to detach aesthetic experiences from everyday life, and it would be difficult to find a situation where aesthetic matters are categorically irrelevant. Insofar as people make judgements of their surroundings, those judgements also include an aesthetic component. That aesthetic judgements

can be consistently subdivided into different types, and their different characterisations analysed scientifically, is the message of the present thesis.

## **Publications, Presentations, and Awards**

### **Works in this thesis gave rise to the following publications:**

**Hur, Y.-J.**, Gerger, G., Leder, H., & McManus, I. C. (2018). Facing the sublime: Physiological correlates of the relationship between fear and the sublime. *Psychology of Aesthetics, Creativity, and the Arts*.

**Hur, Y.-J.**, & McManus, I. C. (2017). Representing the sublime in the VIMAP and empirical aesthetics: Reviving Edmund Burke's A Philosophical Enquiry into the Origins of Our Ideas of the Sublime and Beautiful: Comment on "Move me, astonish me... delight my eyes and brain: The Vienna Integrated Model of top-down and bottom-up processes in Art Perception (VIMAP) and corresponding affective, evaluative, and neurophysiological correlates" by Matthew Pelowski et al. *Physics of Life Reviews*, 21, 135-137.

Pelowski, M., **Hur, Y.-J.**, Cotter, K. N., Ishizu, T., Christensen, A. P., Leder, H., & McManus, I. C. (2019). Quantifying the if, the when, and the what of the sublime: A survey and latent class analysis of incidence, emotions, and distinct varieties of personal sublime experiences. *Psychology of Aesthetics, Creativity, and the Arts*.

The Times, *Edmund Burke goes from the sublime to the ridiculous* by Tom Whipple,  
19.11.2018

### **Works in this thesis were presented the following meetings/workshops:**

Visual Properties Driving Visual Preference Liverpool workshop (2019)

Interdisciplinary Workshop "The Sublime: Philosophical and Cognitive Approaches" at Institut Jean-Nicod, Paris (2018)

Perspectives in Neuroaesthetics Summer School (organised by the University of Vienna) (2018)

New York University Department of Psychology presentation (2018)

Penn Center for Neuroaesthetics lab meeting (2018)

International Association of Empirical Aesthetics (IAEA) Toronto meeting (2018)

Visual Properties Driving Visual Preference Liverpool workshop (2018)

UCL Postgraduate Peer Support Group Cumberland Lodge Conference (2018)

Experimental Psychology Society London meeting (2018)

UCL Postgraduate Peer Support Group Cumberland Lodge Conference (2017)

International Association of Empirical Aesthetics (IAEA) Vienna meeting (2016)

University of Vienna Department of Basic Psychological Research and Research Methods presentation (2016)

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UCL Faculty of Brain Sciences Postgraduate Research Symposium Prize (2018)

UCL Cecily de Monchaux Research Prize (2018)

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*We must make use of a cautious, I had almost said, a timorous method of proceeding. We must not attempt to fly, when we can scarcely pretend to creep. In considering any complex matter, we ought to examine every distinct ingredient in the composition, one by one; and reduce every thing to the utmost simplicity... my point in this enquiry is to find whether there are any principles, on which the imagination is affected, so common to all, so grounded and certain, as to supply the means of reasoning satisfactorily about them. And such principles of Taste, I fancy there are; however paradoxical it may seem to those, who on a superficial view imagine, that there is so great a diversity of Tastes both in kind and degree, that nothing can be more indeterminate.*

– Edmund Burke

*A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful (1759)*

**Chapter 1a. General Introduction and Thesis Outline**

## 1a.1. Aesthetic Experiences and the Sublime

### 1a.1.1. The Subtleties of Aesthetic Experiences

What is an aesthetic experience? In a way, the answer is simple. In its most rudimentary definition, an aesthetic experience denotes subjective pleasure, the sort of preference or beauty judgement one can casually make, say, at a bookstore or concert hall. In everyday phrases as “Oh, I really like this” or “This is beautiful”, or even in times when the experience is so minute and transient as to be registered consciously, an aesthetic experience seems to be associated with the gaining of pleasure in some way or another (Kubovy, 2000). It is not difficult to see why in the *Oxford English Dictionary (OED)*, for instance, ‘aesthetic’ is characterised as “[giving] pleasure through beauty” or being in alignment with “principles of artistic beauty or taste.”

Pleasure and beauty being the building blocks of aesthetic experiences, the measures of these variables, especially pleasure, have predominated in early empirical works on aesthetics. In one of the earliest works, Gustav Theodor Fechner (1801 – 1887) – otherwise known for his contributions to the birth of psychophysics – presented 10 rectangles of varying aspect ratios to 347 people, and studied which rectangles were most liked (Fechner, 1876). Through experimental studies, Fechner ultimately wanted to explore how the physical world can elicit pleasure. The logic is that whatever gives pleasure is also liked, and *vice versa* (Mather, 2013). That logic was followed by Daniel Berlyne (1924 – 1976), arguably Fechner’s successor in terms of influence on the development of the psychology of aesthetics (Cupchik, 1986). Despite Berlyne’s (1971) fascination in more complex psychological factors as novelty, curiosity, and arousal, Berlyne’s dependent variable, what he called *aesthetic pleasure*, was still conceptually bound to ‘hedonic’ value, pleasure, or preference.

Influenced by Fechner and Berlyne, and likely also aided by dictionary definitions, a recent wave of empirical works in aesthetics have since accumulated knowledge into the variants of beauty and pleasure to capture and represent aesthetic experiences. For visual arts alone, aesthetic responses have been generalised by measures of *pleasure or pleasingness* (Cupchik & Gebotys, 1990; Locher, Krupinski, Mello-Thoms, & Nodine, 2007), *liking* (Belke, Leder, & Augustin, 2006), *preference* (Vartanian & Goel, 2004), *aesthetic affect* (Ishai, Fairhall, & Pepperell, 2007), and *beauty* (Cela-Conde et al., 2004; Kawabata & Zeki, 2004). It is not uncommon to encounter studies where one measure assumes the other. In Reber, Winkielman, and Schwarz’s (1998) publication on perceptual fluency, for instance, people are asked to rate stimuli on a scale of *prettiness (or liking)* on one end and *ugliness (or disliking)* on the other. Even as recent as 2013, George Mather’s book *The Psychology of Visual Arts* conveys empirical aesthetics<sup>1</sup> as an exploration of “visual aesthetic beauty”, which is used interchangeably with “visual aesthetic preference.” In other words, whatever is pleasurable is also beautiful and

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<sup>1</sup> This is under the chapter name “Visual aesthetics and art.”

likeable, and works using these measures became to constitute what is called empirical aesthetics, or the scientific study of aesthetic experiences (and almost equivalently, the science of pleasure).

However, there are issues with the assumption that aesthetic experiences can be captured solely through pleasure-associated measures. For a start, the lack of differentiation between the various terminologies blurs comparisons between potentially different psychological processes, and hence Armstrong and Betweiler-Bedell's (2008 p. 306) criticism regarding the "inflation of the term beauty."<sup>2</sup> Crucially, aesthetic experiences entail a more complex emotional profile than initially thought. While aesthetic experiences may indeed be positive, like the experience of a sunset or romance, works by Damien Hirst (b. 1965), with installations of mutilations and carcasses, or horror films, demonstrate that negative emotions are very much part of aesthetic experiences (Palmer, Schloss, & Sammartino, 2013). These latter examples would certainly resist adjectives as *pleasant* or *beautiful*. In less extreme cases, even popular music may elicit complex and mixed emotions (Schellenberg & Scheve, 2012), and hence the popularity of sad ballads by Frank Sinatra or violent heavy metal music. If pleasure is an important component in aesthetic experiences, it certainly cannot be said to be the only one.

To demonstrate the spectrum of aesthetic experiences, consider two artworks depicting landscapes that are more or less matched in artistic merit via their continued positive receptions from audiences and professionals alike (Figure 1 and Figure 2). One is Joseph Mallord William Turner's (1775 – 1851) *Snow Storm: Hannibal and his Army crossing the Alps*, and the other, Claude Monet's (1840 – 1926) *Impression, Sunrise (Impression, soleil levant)*. Where both works depict humans embedded within nature and under the sun, Turner's work evokes fear, terror, drama, power, dynamism, and an overall devastation in its dark-hued grandeur. Monet's painting, on the other hand, illustrates the serenity of the everyday, through which lightness and joy with a hint melancholy shine through. These differences emerge despite the fact that both are aesthetically satisfying and likeable. Already, descriptions of aesthetic experiences using measures of pleasure or beauty are showing their limits.

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<sup>2</sup> The concerns seems unlikely to be just a recent phenomenon. In the preface of the first edition of his *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful* from 1757, Edmund Burke (1759/2008) notes of the "abuse of the word *Beauty*" (p. 1), and therefore calls for the need of a "sober and attentive investigation" (p. 2) of aesthetic emotions.

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Figure 1. (above) J. M. W. Turner, *Snow Storm: Hannibal and his Army crossing the Alps* (1812)

Figure 2. (below) Claude Monet, *Impression, Sunrise (Impression, soleil levant)* (1872)

### **1a.1.2. The Sublime and Beautiful**

Early aestheticians seemed aware of the difficulties of subsuming general aesthetic experiences entirely under pleasure and/or beauty. When Aristotle, for instance, refers in his *Poetics* on how

viewers are moved by (Classical Greek) tragedies through being aroused of fear and pity, such experiences paint a complex picture of multileveled emotions and psychological states. The aforementioned variables used in recent empirical works, e.g. *prettiness*, *pleasingness*, etc. are likely to misrepresent the aesthetic values inherent in these tragic tales of intense emotional circumstances.

While many theories have elaborated on the subtle psychologies of aesthetic encounters, none have been as extensively explored as the distinction between the sublime and beautiful. To summarise a universe of theories with its complicated historical developments in a sentence or two is nearly impossible. Yet the characterisations of the sublime and beautiful by Edmund Burke (1729 – 1797) both encapsulate systems of thoughts building up to Burke's 1759 publication *A Philosophical Enquiry into the Origins of Our Ideas of the Sublime and Beautiful* (1759/2008) and fascinations of subsequent scholars of the sublime and beautiful. Accordingly, in Burke's view, sublimity<sup>3</sup> represents a delight relating to infinity, terror, pain, vastness, power, and obscurity. Beauty, in contrast, arises through smoothness, smallness, delicacy, pleasure, and grace.

Burke's publication is in several senses unique in the literature of the aesthetics of the sublime and beautiful, not only in the depths of its philosophy and its phenomenological reflections, but also in the fact that Burke would never return to further extend this one-off work.<sup>4</sup> While the way sublimity and beauty are described as a pair of two contrasting aesthetic viewpoints is steadily reflected across times, languages, cultures, and across domains of arts and aesthetic activities, no writer, arguably until Burke or since then, has demonstrated this relationship as succinctly and realistically (i.e. reflected against everyday objects and events) as Burke managed. The sublime and beautiful thus render themselves as essential aesthetic experiences that are likely universal and relevant, and Burke's colossal contribution further enables systematic thoughts into them.

With the introduction of the sublime, the appeal to the aforementioned Turner and Monet paintings, as well as many other forms of aesthetic activities can be explained. If there is any validity in the sublime, its presence informs that past empirical works in aesthetics may have been concerned with but one side of the coin of aesthetic experiences. The expanded scope through simultaneously considering both the sublime and beautiful thus encompasses new ways to understand how the human mind processes aesthetic experiences.

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<sup>3</sup> In the thesis, 'sublimity' is used interchangeably with 'the sublime.' The same interchangeability applies to 'beauty' and 'the beautiful.' Lastly, 'the sublime and beautiful' is used instead of 'the sublime and the beautiful', in reference to Burke's original title of his book, *A Philosophical Enquiry into the Origins of Our Ideas of the Sublime and Beautiful*.

<sup>4</sup> Burke would subsequently enter a decorated political career, being involved in the American independence and later in 1790 making a name through the publication of his arch-conservative manifesto *Reflections on the revolution in France*.



## 1a.2. The Present Thesis

### 1a.2.1. Aims of Thesis

Despite the richness of philosophical, literary, and artistic traditions of the sublime and beautiful, as well as the advantages of considering also sublimity for a better understanding of aesthetic experiences, the sublime and beautiful as a pair are rarely considered as a scientific object. The value of this thesis, then, lies on the set of reports being one of the first systematic empirical works on the joint psychologies of the sublime and beautiful.

Instead of approaching the complex phenomena of, as it were, *the* sublime as a singular entity, the thesis focused on questions based on the most fundamental, prominent, and potentially universal components of the sublime. Accordingly, the following research questions form the main aims of the thesis:

1. What are the general descriptions of sublime experiences?
2. How consistent are judgements of sublimity both within and between participants?
3. What physical properties of objects such as size, height, colour, brightness, and contrast, influence experiences of the sublime?
4. What emotions underpin sublime experiences? Specifically, what is the role of fear?
5. Are there physiological correlates of sublime experiences?
6. How do visual and auditory modalities interact to produce sublime experiences?
7. How do sublimity and beauty differ?

The specific reasons behind the selection of the questions, and how answering these questions are important in understanding the sublime and beautiful will become evident as the thesis progresses. Importantly, while not explicitly presented as a research aim, the thesis considers Edmund Burke's (Figure 3) *A Philosophical Enquiry into the Origins of Our Ideas of the Sublime and Beautiful* (1759/2008) as its central theoretical backbone. The grounds for this are that Burke's work represents one of the first psycho-physiological narratives of aesthetic experience. Still, to this day, Burke's empirical thoughts have rarely been tested empirically. In referring to Edmund Burke, it also becomes clear that the general dependent variable of the thesis is no longer the sublime *per se*, but the sublime as opposed to the beautiful.

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Figure 3. Studio of Sir Joshua Reynolds, *Edmund Burke* (circa 1769 or after)

### **1a.2.2. Chapters Outline**

In Chapter 1b the context of the sublime is presented with a conceptual literature review. By elaborating how sublimity is represented in linguistics, history, philosophy, and psychology, and by demonstrating how the sublime is still relevant to this day and in multiple cultures, sublimity is justified as an important object of scientific inquiry. Chapter 1c provides a link between theory and empirical realisations. Methodological and analytical limitations of past empirical works are discussed, and improvements are suggested. Here, the importance of linear mixed modelling as a way to analyse complex stimuli and responses in feasible experimental designs is brought up. The chapter also provides a more detailed scope of the thesis, thereby illustrating how big ideas as the sublime can be studied in empirical settings.

Chapter 1d introduces the first set of empirical data in studies which were pilots for the present thesis, preliminary forays exploring possible approaches. In Chapter 2, a pair of studies demonstrate that judgements of sublimity and beauty are distinguishable, and that they are reliable judgements within themselves. The chapter concludes with the *Aesthetic Hexagon*, a sublimity-beauty conceptual space that will permeate throughout the rest of the thesis.

The next four chapters form a group of empirical studies, all tested in largely similar settings but with differing stimulus manipulations. In essence, these chapters concern whether sublimity and beauty experiences can be moulded by changing the physical presentation of stimuli, after controlling for stimulus content. Given sublimity's close association with size and height in the literature, Chapter 3 explores how the changing of presentation size and height of photographs may differentially affect experiences of sublimity and beauty. Chapter 4 presents

the role of colour (vs. black and white monochrome) on sublimity and beauty ratings, given colour's previous association with beauty. In Chapter 5, potential visual mechanisms of the size effects are further elaborated with the considerations of visual angle and viewing distance. Two additional colour variables that occur in philosophical descriptions of the sublime and beautiful, namely brightness and contrast, are also considered. Beyond visual stimulus, music is introduced in Chapter 6. Musical cues as modality, style, and tempo are considered to predict sublimity and beauty experiences in music. The chapter further explores cross-modal interactions between visual and musical stimuli, specifically on the predicting of overall sublimity and beauty experiences when both visual and musical stimuli are simultaneously present.

The following chapter has both been published in the peer-reviewed journal *Psychology of Aesthetics, Creativity, and the Arts*. Chapter 7 is based on a substantial online survey (around 400 participants) that asks three questions, namely “does everyone experience the sublime?”, “what are triggers of sublime experiences?”, and “what emotions do people report in sublime experiences?” Various emotional and cognitive measurements are collected, in addition to answers to open-ended questions. The study is one of the first of its kind to elaborate on the nature of the sublime, based on free recall and from people who report knowing little of the philosophical discussions regarding the sublime.

Fear is a centre of debate in theories of the sublime. Although the literature (especially Burke) presents sublimity as an aesthetic delight of fear, there is little empirical evidence for the role of fear. Chapter 8, also published in the *Psychology of Aesthetics, Creativity, and the Arts*, touches upon this crucial debate. In a set of multiple studies, subjective ratings of sublimity of photographs are both correlated with subjective ratings of fear and with physiological markers relating to fear (i.e. fEMG & SCR). Chapter 9 can be seen as an extension of the two preceding chapters. Analysing rating data of emotional images, free word association data, and free word generation data, the emotional characters of sublimity and beauty are compared. The thesis concludes with Chapter 10, a general discussion chapter.

In all, the thesis provides a preliminary set of empirical findings concerning what physical object characteristics trigger sublimity and beauty, and what emotions and cognitions these experiences entail. In doing so, the sublime and the beautiful are painted as an important pair of aesthetic experience, beyond the simplistic equation of an aesthetic experience being equal to pleasure. Table 1 presents an overall structure of the various studies.

### **1a.3. Chapter Summary**

Early empirical works in aesthetic experiences often depicted aesthetic experience as a form of subjective pleasure. For instance, Gustav Fechner and Daniel Berlyne, significant contributors in the development of empirical aesthetics, assumed aesthetic experiences to be studied through pleasure, beauty, and liking. However, with closer observations into everyday aesthetic

experiences, from pop music, exhibitions, to Greek tragedies, it becomes evident that the scope of aesthetic experiences actually entails a wider spectrum of emotions and psychological processes.

In light of these realisations, the consideration of the sublime, a delight that roots from fear, terror, and power, opens up new doors to understanding how the human mind achieves aesthetic experiences beyond pure pleasure or beauty. The fact that the sublime and beautiful have been discussed as a contrasting pair of aesthetic emotions historically in Western philosophy, that they are observed in multiple cultures around the world, and that their influences are pervasive in multiple domains of human experiences, makes the sublime and beautiful important theoretical markers for a realistic understanding of human aesthetic experiences.

The thesis provides one of the first systematic studies into the sublime and beautiful, and the relationship between the two. There are two groups of research aims. Firstly, object characteristics that shape sublime and beautiful experiences are explored – these include stimulus manipulations regarding size, height, colour, brightness, contrast, and the presence of other modalities. Secondly, the emotional natures of the sublime and beautiful themselves are explored. These aims are uncovered in around ten separate empirical studies.

Table 1. Structure of empirical studies in the thesis

Study number	Chapter	Collaborators	Data collection date	Participant numbers	Design and task	Stimulus type and number ( <b>N of newly selected stimuli for the study</b> )*	Study's main purpose
1	1d	<i>none</i>	Dec. 2015	4	Lab setting; image rating	96 ( <b>96</b> ) National Geographic + 96 ( <b>96</b> ) architecture photographs	Primary exploration into sublimity rating and stimulus collection
2	1d	<i>none</i>	Jan. 2016	8	Lab setting; image rating	48 ( <b>0</b> ) National Geographic photographs	Primary exploration into sublimity-beauty judgement relationship and stimulus collection
3	2	Chaniphat Pattanapeeradej <sup>§</sup> ; Jessie Lim Jie Sin <sup>§</sup> ; Nathan Too <sup>§</sup>	March 2016	49	Lab setting; image rating + word association	48 National Geographic ( <b>0</b> ) + 48 IAPS** photographs ( <b>48</b> )	Reliabilities of sublimity-beauty judgements
4	2	<i>none</i>	July – Oct. 2016	39	Lab setting; image rating + word association	12 ( <b>4</b> ) National Geographic + 33 ( <b>13</b> ) IAPS photographs	Reliabilities of sublimity-beauty judgements; individual differences

Study number	Chapter	Collaborators	Data collection date	Participant numbers	Design and task	Stimulus type and number (N of newly selected stimuli for the study)*	Study's main purpose	
5	3	Chris Hallam-Evans <sup>§</sup>	Nov. – Dec. 2016	32	Lab setting; image rating + word generation	9 (0) National Geographic + 21 (0) IAPS + 30 (30) researchers-generated photographs	Effects of stimulus size and height on sublimity and beauty judgements	
6	4	Adam Baiza <sup>§</sup> ; Emily Pye <sup>§</sup> ; Oscar Nagy <sup>§</sup> ; Tabitha Backhouse Spriggs <sup>§</sup> ; Theodora Mircea <sup>§</sup>	March 2017	39	Lab setting; image rating + word generation	19 (0) IAPS + 5 (0) National Geographic + 36 (0) participants-generated photographs***	Effects of stimulus size and colour on sublimity and beauty judgements	
7	5	Yvette Garfen <sup>§</sup>	Nov. 2017 – Jan. 2018	39	Lab setting; image rating + word generation	34 (4) IAPS + 8 (0) participants-generated + 60 (60) researchers-generated photographs	Effects of stimulus visual angle, viewing distance, brightness, and contrast on sublimity and beauty judgements	
8	5	<i>aggregated data of Studies 5, 6, 7, and 9</i>						Effects of stimulus visual angle, brightness, and contrast on sublimity and beauty judgements
9	6	Radvilė Medeišytė <sup>§</sup>	Nov. 2018	39	Lab setting; image rating + word generation	7 (0) IAPS + 29 (0) participants-generated photographs & 36 (36) music clips	Sublimity in music and music-photograph cross modality effects on sublimity and beauty judgements	

Study number	Chapter	Collaborators	Data collection date	Participant numbers	Design and task	Stimulus type and number (N of newly selected stimuli for the study)*	Study's main purpose	
10	7	Alexander Christensen; Prof. Helmut Leder; Katherine Cotter; Dr. Matthew Pelowski; Dr. Tomohiro Ishizu	July – Dec. 2016	402	Online survey; recalled event rating + free recall	<i>none</i>	Exploration into the subjective meaning of sublimity	
11	8	Dr. Gernot Gerger; Prof. Helmut Leder	June. – Nov. 2016	76	Lab setting; image rating	192 ( <b>192</b> ) participants-generated photographs	Sublimity-fear rating relationship and stimulus collection	
12	8	Dr. Gernot Gerger; Prof. Helmut Leder	Jan. 2017	41	Lab setting; image rating + word generation	72 ( <b>0</b> ) participants-generated photographs	Sublimity-fear physiological (fEMG & SCR) relationship	
13	9	<i>aggregated data of Studies 3, 4, 5, 6, 7, and 9</i>					90 IAPS photographs	Emotional profiling of sublimity and beauty based on image rating data
14	9	<i>aggregated data of Studies 3 and 4</i>					112 words/phrases	Emotional profiling of sublimity and beauty based on word association data

Study number	Chapter	Collaborators	Data collection date	Participant numbers	Design and task	Stimulus type and number (N of newly selected stimuli for the study)*	Study's main purpose
15	9	<i>aggregated data of studies 5, 6, 7, 9, and 12</i>				<i>none</i>	Emotional profiling of sublimity and beauty based on word generation data

*Note.* All studies involved myself and primary supervisor, Prof. I. Chris McManus. Collaborator names are in alphabetical order. At the time of collaborations, A. Christensen and K. Cotter were affiliated with University of North Carolina at Greensboro's Department of Psychology, Prof. H. Leder, Dr. M. Pelowski, and Dr. G. Gerger, with University of Vienna's Department of Basic Psychological Research and Research Methods, and Dr. T. Ishizu was affiliated with University College London's Faculty of Life Sciences. Total number of participants: 768. Total number of photographic stimuli: 571.

\*"IAPS" refers to International Affective Picture System (Lang, Bradley, & Cuthbert, 1997). \*\*"(N of newly selected stimuli for the study)" follows the chronological order of data collection. \*\*\*"[P]articipants-generated photographs" refers to Study 11 – this was the only study that asked participants to bring in their own stimulus.

§ Undergraduate students completing student projects from the BSc Psychology programme at University College London.



**Chapter 1b. Literature Review: The Sublime, Then and Now, and in Psychology**

## 1b.1. The Sublime, a Relevant Past

### 1b.1.1. The Beginning; the Etymology of the Sublime in English

There is something elusive about the word *sublime* in English. While one commonly hears of the sublime visions of Caspar David Friedrich's paintings (Piening, 2018), the same adjective also finds itself in describing anything from a dish of macaroni cheese (Schneider, 2017) to the "sublime safety" of a snooker game (Eurosport, 2019). It does not help when reviews on book covers ever so often contain the singular sweep of "sublime." One is expected to assume the sublime to entail what is generally good. Yet still, words such as *subliminal* or *sublimation*, which seem undeniably derived from *sublime*, entail specific meanings distant from goodness.

The diffuse adaptation of the term *sublime* and its variations over a wide range of context reveals a complex history of the word, as evinced in the *Oxford English Dictionary* (*OED*). Exploring the *OED*, variations range from *sublimable* to *sublimy*, numbering some two-dozen or so entries. In their extensive study of the etymological development – or more aptly, etymological confusion – of *sublime*, Cohn and Miles (1977) seem most content with the view of the word being a Latin compound of *sub-* (change of position from below to above) and *līmus-limis* (sidelong or oblique). Thus, the sublime indicates a rising movement that follows a diagonal slope.

Cohn and Miles (1977) pose that the meanings this group of words have come to signify in English can be categorised roughly into four groups, namely (al)chemical, emotional-aesthetic, psychoanalytical, and psychological meanings. The (al)chemical meaning predates all derivatives of *sublim-* words, such that the verb *to sublime* and its variations, e.g. *sublimate*, can be found in alchemy textbooks from around 1400, or the late Middle English period. Such usage of the words, indicating 'to purify', is still adopted in chemistry.

The (al)chemical meaning had repercussions in developing fields of sciences. By the eighteenth century, *sublime* was adopted in medical studies, to indicate respiratory difficulties, and later, muscles attached near surfaces. In geology, *sublime* was used to mean 'more problematic', with *sublimate* being used to signal mineral deposit. It is likely that Sigmund Freud's twentieth century psychoanalytical term *sublimation* was born from this tradition of neologism. Freud's *Sublimierung*, here, signifies the abandonment of lowly and sexual desires for higher, often social causes. The English word *subliminal*, with its psychological meaning of 'subconscious', was created by a nineteenth century British scholar in his translation of the German phrase *Unter der Schwelle*.<sup>5</sup>

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<sup>5</sup> Ward (the creator of the word) was informed from his Latin education to create *subliminal* from *sub-* (below) and *-līmin/limen* (threshold). Yet Ward's disregard of the other *sublim-* words in English as well as ignorance of other interpretations of the Latin roots result in *sublim-* related words creating conflicting and sometimes opposite meanings in English. *Unter der Schwelle* itself is likely a derivative of *Bewusstseinschwelle* (consciousness threshold), a term from Gustav Fechner.

It only took around fifty years in Britain for the (al)chemical use of *sublimate* to have acquired a figurative meaning of ‘raised’ or ‘exalted’, heralding the emotional-aesthetic word meaning tradition of *sublime*. Cohn and Miles (1977) suppose that “[f]rom the alchemical meanings of purification and from the idea, again from alchemy, of elevation, came religious and secular meanings of purity and loftiness” (p. 295). In the seventeenth century, the *sublime* finds itself expanded into the territories of rhetoric, via the popular publication of Boileau’s *Traité du sublime* (1674), a French translation of the Roman-era treatise *On the Sublime* (Περὶ Ὕψους; *Peri Hýpsous*). The treatise, commonly ascribed to Longinus, highlights ways to astonish audiences via a style of rhetoric that evokes enthusiasm, passion, and transportation.

*Sublime* soon expanded to encompass not only the speaking style through which elevated thoughts were projected and aroused, but also the elemental forces of nature that would create similar lofty experiences. In the eighteenth century, *sublime* became to signify the feelings of loftiness themselves, untethered from the constraints of speech and nature (Monk, 1935). The history of *sublime* as emotional-aesthetic meaning thus denotes a steady progress from a specific style and medium – e.g. the grand literary style as proposed by Longinus – to a generalisable experience of grandeur itself. One could state that “the sublime has moved from the object to the subject” (Cohn & Miles, 1977, p. 296).

As such, *sublim-* words in English have come to signify four seemingly unrelated meaning groups, namely (al)chemical, emotional-aesthetic, psychoanalytical, and psychological meanings. Yet it should be noted that such confusion arising from the mix-up of four different concepts under the same shape of *sublim-* words is a unique problem of the English language. In German, the four word meanings were mostly kept as separate, as *sublimieren*, *Erhaben*, *Sublimierung* (often in italics, and as a proper noun), and *Unterbewusste*, respectively. Summing up, *sublime* approximately translates from Latin as ‘a rising movement that follows a diagonal slope.’ In English, the word has entered the vocabularies since around 1400, and has become to represent four groups of meanings, namely (al)chemical, emotional-aesthetic, psychoanalytical, and psychological meanings. In the next section, various subtleties underlying the emotional-aesthetic meaning of *sublime*, the word meaning central to the present thesis, is explored.

### **1b.1.2. The Sublime in Eighteenth Century Britain**

It is no exaggeration to suggest that eighteenth century Britain oversaw one of the most fecund developments of emotional-aesthetic theories of the sublime. The themes discussed during an approximate arc from John Dennis (1658 - 1734) to Archibald Alison (1792 – 1867), encompass sublimity’s relevance in rhetoric, literature, poetry, painting, sculpture, music, biblical criticism, architecture, music, and on natural scenery.

The contribution of these debates are three-fold. Firstly, having liberated the sublime from Longinian literary theories to have it encompass anything that “summon[s] up in some

shape or form notions of elevation or grandeur” (Ashfield and de Bolla, 1996, p. 9), these debates expanded the general scope of aesthetic experiences. As such, “the importance in art of the unbeautiful and the normally painful, as well as on ecstasy and ‘transport’” (Monk, 1935, p. 233) were considered, as long as some form of grandeur was associated with these experiences. Consequently, these debates would predict the picturesque in landscape design and Gothic literature.

In a broader sense, it could be argued that discussions of the sublime also marked a prototype of aesthetic discussions *per se*. Even before Alexander Gottlieb Baumgarten’s official coinage of “aesthetics” (*Ästhetik*), British theories on the sublime as those by Francis Hutcheson, Lord Shaftesbury, and Joseph Addison pre-echoed, aesthetic sentiments under the terms “taste” or “philosophical criticism.” Edmund Burke’s work would, in turn, inform the most influential of German thinkers of aesthetics, notably Kant, Schopenhauer, and Nietzsche. It is not surprising, then, that aesthetics as we know now, was “most fully explored under the rubric of the sublime” (Ashfield and de Bolla, 1996, p. 2).

Lastly, in the reflection of notable aesthetic feelings, and in self-referential inquiries as “what is it that moves me?”, eighteenth century Britain saw the first set of systematic inquiries into the nature of subjective experiences linked with beauty. These studies – some more than others – can thus be argued to have set the foundation for psychological theories of aesthetic phenomena (Hipple, 1957).

Below, a number of key debates and themes that would shape the landscape of theories of the sublime are presented. Some themes are presented in condensed forms, as they will be expanded upon in later chapters. These themes will become key areas of the thesis, in the shapes of assumptions and research questions.

**1b.1.2.1. “...from the object to the subject”; the object vs. the subject in the sublime.** The aforementioned quote by Cohn and Miles (1977), that “the sublime has moved from the object to the subject” (p. 296) was modelled after Monk (1935), who assumed eighteenth century British debates on the sublime to be a continual progress toward Kant’s subjectivity. Ultimately, Kant’s mission was to prove that “objects must conform to our cognitions, rather than our cognitions to objects” (p. 4-5). Such was Monk’s subjectivity.

In a sense, such delineation fits the general mood of British thinkers’s focus on the inner feelings of sublime feelings and associated psychologies. Yet as Hipple (1957) argues, all these British aestheticians “are concerned with the response of the mind to the qualities and relations of objects in nature and art” (p. 7). In the view that these thinkers were concerned with the relationship between cause (object) and effect (subject), an object is never an object unless a subjective agency, via perception, judgement, or emotion, registers it. Likewise, it would be absurd to think that objects cannot precede changes of subjective states. An object without

subject is empty; a subject without object is blind. Thus it would be an overstatement to grant importance to one over the others.<sup>6</sup>

It is not surprising, then, that Kant would be still refer to sublime-typical physical objects (e.g. grand nature) that elicit the sublime. Alison, who according to Monk's thinking, would be the closest to Kant's subjectivity, starts his *Essays of Taste* with "Taste is, in general, considered as the Faculty of the Human Mind, by which we perceive and enjoy whatever is beautiful or sublime in the works of Nature or Art" (Hipple, 1957, p. 159). In both cases, subjective states start with an object.<sup>7</sup> As such, it is rare that the supposed "autonomous subjectivity" is fulfilled at all (Ashfield & de Bolla, 1996). Lastly, even before the claim of objectivity of Longinus's sublimity, the *OED* suggests that as far back as around 1484, *sublimity* was used as a subjective experience denoting exaltation. The semantics of the sublime at no point excluded either the object or the subject. The object-subject simplification of Cohn and Miles (1977) and Monk (1935) justifies a less casual claim of doubt. As such, the simultaneous consideration of the object and subject, by the re-formulation of their relationship as cause and effect, seems most fitting.

**1b.1.2.2. The sublime and beautiful.** The sublime is by no means the only aesthetic experience. Joseph Addison (1672 – 1719) lists among the three pillars of aesthetic experiences as: greatness (sublimity), beauty, and uncommonness (novelty). Arriving at the likes of William Gilpin (1724 – 1804), Uvedale Price (1747 – 1829), and Richard Payne Knight (1751 – 1824), the sublime and beautiful stood aside the picturesque. Alexander Gerard Gerard (1728 – 1795) has a similar list, where novelty, sublimity, beauty, imitation, harmony, ridicule, and virtue become central to his inquiry on the internal senses that trigger the powers of the imagination.

These variegated aesthetic dimensions notwithstanding, the sublime and beautiful are the common denominator between most treatises (Cohn and Miles, 1977). Writers like Burke take the matter to the extreme, to the degree of considering the two as exhaustive and exclusive as aesthetic entities.

The two experiences often assumed an aesthetic delight of an opposing type – one governed by harmony, polish, and cool pleasure, the other, by terror, transcendence, and admiration. Monk (1935) views that opposition as being symbolic of the tension between "the formalism and restraint of the neo-classic" (p. 235) and the Romantic desire for a more rough-

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<sup>6</sup> On Monk's assumption, Costelloe (2012) likewise argues that Monk's view "is a somewhat superficial gloss on a considerably more complicated and nuanced canvas."

<sup>7</sup> See also, "the object itself, appears only to serve as a hint, to awaken the imagination, and to lead it through every analogous idea that has place in the memory" (Monk, 1935, p. 149). In fact, at no point does Alison deny the importance of object qualities themselves. For example, he claims that large objects themselves are not sublime – but when paired with fear. Large objects seem to be an important condition of the sublime.

edged palette of experiences. Once the dichotomy is achieved, the true meaning and effect of the sublime and beautiful can be felt in the presence of the other.

**1b.1.2.3. Fear and delight.** What distinguishes the sublime from the beautiful is sublimity's Romantic tendency to find delight in what is seen as unpleasant. The possibility of fear as a source of delight became a major arena of debate. On the one hand, by proclaiming validity of his "delightful horror" as a universal experience, Burke located himself as the guardian of one side of the camp. One of the early figures of the sublime, Dennis, too was a proponent of the idea that sublime experiences stimulate thoughts of death, reflecting on his dangerous mountaineering experiences in the Alps. Similarly, Gerard, assimilated terror to sublime experience through astonishment. For these writers, fear played an important role in arousing strong emotions, especially of shocking and belittling kinds.

On the other hand, thinkers such as Joseph Priestley (1733 – 1804) and John Baillie (d. 1747), the latter with the oft-quoted phrase "solemn sedateness" in depicting the sublime, argued fear had little place for true sublime experiences. Burke's inherent contradictions do not help. Where Burke considers physiological pain as a precondition of sublime experiences, his psychological explanation is firmly rooted on the fact that delight happens from the escaping of pain, via a negative pleasure.

Still, there is no denying the presence of fear in discussions of the sublime – readers of the sublime are ever so often confronted with the fact that sublime objects, in their vastness and implied power, are often frightening (Costelloe, 2012; f, 2019). Des Pres (1983) outlines that even for Longinus, in the 1<sup>st</sup> century AD, who is otherwise not known for associating fear with sublimity, contains ample details of what may trigger dread and fear-related responses. Of the twenty-one examples Longinus quotes as representative of sublimity, in "all but two of these examples, the content of the poetry being quoted is blood, battle, rage and leaping flames, cleaving swords and piercing spears ... mutilation, disfigurement and annihilation" (p. 136). As such, fear is central to understanding eighteenth century British theories of the sublime.

**1b.1.2.4. Size and height.** While the sublime in no way presents a phenomenon wholly homogeneous across thinkers, a number of traits commonly occur in most descriptions of sublime objects. Costelloe (2012) finds two key elements, namely magnitude and height. In the case of size, writers as Dennis, Shaftesbury, and Addison saw "great" or "grand" as being tantamount to the sublime. It further goes without saying that the very etymology of sublimity implies something of height, or vertical motion. Addison's illustration of sublime objects, "the Prospects of an open Champaign Country, a vast Desert, a huge Heap of Mountains, high rocks and Precipices, or a wide Expanse of Waters" (Monk, 1935, p. 57), strikes an affinity with those of Gerard's a century later, "the Alps, the Nile, the ocean, the wide expanse of heaven, or the immensity of space uniformly extended without limit or termination" (Costelloe, 2012, p. 65).

The assumption of this similarity is that “an object and the idea of an object produce the same emotions” (Monk, 1935, p. 48).

**1b.1.2.5. Colour, brightness, and contrast.** There are also some subtle object characteristics. Close reading of Burke’s *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful* (1759/2008) or Mark Akenside’s (1721 – 1770) *The Pleasures of the Imagination*, for example, reveals the importance of colour on beauty but not sublimity. Citing the same sources, darkness, and especially darkness with a dash of light, and thus high contrast, are often seen as symbolic of sublime object features.

**1b.1.2.6. Sublimity of non-visual modalities.** The sublime has often been discussed in modalities outside the visual domain and its visual imageries. In the case of Burke, smell and taste, too, can have sublime characters, a view that would subsequently be rejected by Baillie. Attention was especially given to the auditory domain, as music (Baillie, Beattie, Gerard, Jacob, Price, & Webb) and sound (Alison, Burke, & Blair). Of these, the sublimity of music would have its own long history beyond eighteenth century British philosophy, in the form of musicology. Specifically, musicologists would emphasise musical devices that would induce psychological effects similar to those that would be elicited by sublime objects (Fend, 1993; Korstvedt, 2000; Kramer, 2009; Wurth, 2009), e.g. vastness (chorus), complexity/difficulty (fugue), shock (percussion), and negative emotionality (dissonance).

**1b.1.2.7. Summary of 1b.1.2.** Summing up, eighteenth century Britain saw a prolific discussions on the sublime, one of its largest contributions being the separation of the sublime from Longinus’s oratorical traditions. There were numerous discussions mapping out the psychological effects of objects on subjective states as emotions, often in the framework of comparing the sublime against the beautiful. While most writers agree on the importance of size and height of objects, important discussions evolved around the involvement of fear and various non-visual modalities, especially music.

### **1b.1.3. An Extended Story of the Sublime; Beyond the West, and in Present Times**

There is little reason to assume that the sublime is an eighteenth century thought confined to erudite discussions in the West. Konečni’s (2011) account of the 17<sup>th</sup> century Japanese thinker Miyamoto Musashi’s exaltation upon his first encounter of Mount Fuji is exemplary of how sublime experiences via the grandeur of nature are recorded in countries and times foreign to the those of Burke, Kant, or Longinus. Clewis’s (2019) survey of sublimity further identifies sublimity-like states in the likes of the Indian sage Bharata Muni’s *Nāṭya Śāstra*, the 11<sup>th</sup> century Northern Song dynasty theorist Guo Xi’s *The interest of lofty forests and springs*, and the 15<sup>th</sup> century Noh theorist Zeami Motokiyo’s writings. These accounts share with later

British evaluations of the sublime their underscoring of experiences that transcend common logic and understanding, and that are elevating with a tinge of fear and uncertainty.<sup>8</sup>

An alternative yet powerful evidence of the universality of sublimity is the simple availability of vocabulary signifying sublimity across languages. These words likely exist, because the majority of people of a certain language group sympathise with concepts related to sublime experiences over an extended period of time, thereby maintaining the words in the vocabulary. This linguistic constant can be detected even in communities with a relatively limited vocabularies. In Marjorie Shostak's anthropological study of sub-Saharan Africa, she noted that the word *kua* among the !Kung San people of South-western Africa symbolises the experience of awe, fear and respect (Shostak, 1983).

Still, one would be hard-pressed to argue that the experience of sublimity, which depends much on both external sources, would be immune to adaptation. David Nye, for example, suggests that nature is no longer a relevant source of sublimity for city-dwellers of the USA from mid-20<sup>th</sup> century onward (Nye, 1995). Instead, technology and manufactured novelties address the wonders of the new century; this, he calls the “technological sublime.”<sup>9</sup> In the art-world, Jean-François Lyotard (1924 – 1998) via Barnett Newman (1905 – 1970) challenges the European tradition of natural sublimity by implying that figurative art does not present an uncertainty intense enough (Morsey, 2010). In the abstract art of post-modernism, e.g. Barnett Newman, a sort of existential crisis is founded, whereupon the unrepresentable is presented, and the consequently unexperiencable is experienced. This fundamental irresolvability as the source of the sublime is shared among other post-modernists as Deleuze, Kristeva, and Jameson (Costelloe, 2012).

This is not to suggest that these post-modernists contradict the fundamental values of the sublime as established from centuries before. At the base of these views is the appreciation of something beyond rational capacity. Even the proposed irresolvability becomes a means to the final aim of “profound and violent affective response” (Costello, 2012, p. 119), something that eighteenth century thinkers of the sublime fought to uncover and portray.

Therefore, although sublime theories reflect eclectic personal views, more likely than not they complement rather than supplant one another in the understanding of sublime experiences. The sublime of the past is, thus (to quote Barnett Newman's 1948 essay, *The Sublime is Now*, in Morley, 2010) also the now. This may explain why mountaineers still exclaim at the wonders of mountains, just as Musashi's first experience of Mount Fuji, “this was

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<sup>8</sup> Later works, such as Nikolay Karamzin's *Letters of a Russian Traveler* from the 1790s, would expand British theories on the sublime to Russian literature and culture (Bilenkin, 1998). While Karamzin was likely accustomed to Western aesthetic notions, the accounts of his astonishment at the “terrifyingly great” (p. 611) Reichenbach falls have an uncanny resemblance with the fear-ridden sublimities of Dennis's Alpine hikes from a century before. Intriguingly, that Karamzin's accounts made a striking impression in his homeland Russia, shows how these accounts of lofty emotions toward grand nature must have resonated with those unfamiliar with Western aesthetic viewpoints.

<sup>9</sup> The term was originally coined by American historian Perry Miller (1905 – 1963).



the first time he had actually seen it... 'Magnificent,' he sighed, making no effort to wipe the tears from his unblinking eyes" (Konečni, 2011, p. 261). That Mount Fuji and mountains still attracts people today only adds to the timelessness of the sublime.

The experience of the sublime still fascinates people, as evinced by recent interdisciplinary projects and exhibitions. These include *The Art of the Sublime* (2008) and *The Sublime Object* (2007 – 2010) exhibitions, both held by the Tate in London, *The Big Nothing* (2004) at the Institute of Contemporary Art in Philadelphia, and *On the Sublime* (2007) and *Various Voids: A Retrospective* (2009), at the Guggenheim Berlin and Centre Pompidou in Paris, respectively.

Summing up, the sublime is hardly a mere fashion among British scholars from the eighteenth century. The sublime as a subjective experience is documented across the globe, and in different eras. Even if post-modern thinkers of the sublime may have redressed the sublime using sensibilities of new times, at its core the sublime remains a powerful and profound experience deriving from fascinations toward the very limits of the mind. The sublime still remains relevant.

## **1b.2. The Psychology of the Sublime**

### **1b.2.1. Edmund Burke's Contribution to a Psychological Study of the Sublime**

Where the metaphysically orientated works by Kant and Schopenhauer would conflate sublimity under the same principles of ethical inquiries or even use sublimity as a means to elaborate on higher moral systems, British writers were concerned with analysing the phenomenology of sublimity itself, uncoupled from abstract or ethical concerns. The psychological causes and effects were sought, with complex human experiences simplified and generalised using real life objects, nature, and artwork. This process and logic of inquiry of eighteenth century British thinkers, is what Hipple (1957) would call psychological, genetic, historical, and ultimately, empirical.

Of them all, Edmund Burke proved the most daringly empirical (Monk, 1935). In the first edition preface of *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful*, Burke's presents his book as "a careful survey of the properties of things which we find by experience to influence those passions" (Burke, 1759/2008, p. 1). Properties such as vastness, obscurity, angularity, vacuity, magnitude and light in buildings, and even sound and animal cries are treated as physical triggers of the sublime. Strikingly for its time, Burke turns to the body's physiology in explaining links between these stimuli and psychological responses. In Burke's attempt to link the physical world to emotions, Gasché claims, "Burke was the first to propose an uncompromising empiricist – that is, sensualistic – account of aesthetic experience... [Burke,] in the spirit of Isaac Newton, seeks to establish 'an exact theory of our passions'" (Costelloe, 2012, p. 24).

Jean-Marie Schaeffer, author of *Art and Aesthetics without Myths* (2015) proposes that one should turn to Burke instead of Kant, for psychological research of the sublime. In Schaeffer's views, Burke's relevance can be condensed to three (non-mutually exclusive) characteristics.<sup>10</sup> Firstly, Burke makes no concession for the need of a specialised faculty for aesthetic experiences. Unlike Hutcheson, Shaftesbury, and Reid who argue for a specialised faculty, i.e. *internal sense*, for the processing of beauty, Burke uses existing sensory capacities as sight, hearing, and touch to explain the workings of the sublime. Similarly, sublimity itself is explained by basic emotions, as pleasure and fear. Burke has effectively de-mystified the sublime. Secondly, because of Burke's focus on fundamental and existing human faculties of senses and emotions, the essence of Burke's sublimity can be somewhat detached from external considerations as moral and/or religious undertones (Dennis and Hutcheson) or personal associations (Lord Kames, Gerard, Alison, and Stewart). This enables Burke to find the crux of peak experiences solely within the human body, evinced by Burke's entirely original consideration of physiology as the main mediator of aesthetic experiences. Thirdly, Burke offers a mechanistic solution to sublimity, and he provides a list of independent simple cause-and-effects of stimuli and responses. For the likes of Kant, such manoeuvre is difficult; once an element is taken out for exclusive scrutiny, Kant's tightly knit metaphysical system risks robbing the shape and meaning of that incomplete component.

For Hipple (1957), Burke's views are analytical (simple components are extracted from a complex system), inductive (effects of isolated principles are observed), and experiential (the outcomes of simple laws are compared against the experience of complex objects involved).

In light of Schaeffer and Hipple, sublimity as described by Burke – more so than any of Burke's contemporaries – is remarkably compatible with modern psychological outlooks and methods. Basic faculties of the mind considered essential building blocks of Burke's system, as perception and emotion, have been studied extensively over the past few centuries in experimental psychology. Burke's analytical and mechanistic tendencies to find out simple cause-and-effect without overbearing his system with lofty considerations, are ideal for experimental designs.

Put together, Burke presents one of the most powerful empirical arguments for sublime theories. It is especially welcoming that many of Burke's assumptions in his *Philosophical Enquiry* align with assumptions of modern empirical psychology. While Burke's system is by no means free of defects, there is more than enough evidence to suggest – as Schaeffer has – that Burke presents himself a convincing contender for a starting point of psychological investigations on the sublime.

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<sup>10</sup> The views are a mix of Schaeffer's own and mine, based on personal correspondences.

### **1b.2.2. The Sublime in Recent Psychological Research**

Much of the existing psychological literature on the sublime has oft considered Burke as a philosophical reference point, even if they may lack clear-cut justifications for the choice of Burke over other thinkers (Keltner & Haidt, 2003; Konečni, 2005, 2011). Below, a literature review of how Burke's sublimity and in large sublimity is represented in psychology is presented.

**1b.2.2.1. Sublimity as an aesthetic emotion.** Early emotional models considered sublimity-like experiences as emotions associated with ambiguity, curiosity, and surprise (Ekman, 1992; Frijda, 1986; Izard, 1977; Lazarus, 1991), thus rendering sublimity as a complex emotion. Indeed, the treatment of sublimity as a powerful and complex emotion reflects the study of "passions" by Edmund Burke (1759/2008), who argued sublimity to be "productive of the strongest emotion which the mind is capable of feeling" (p. 39).

Recent theories specifically locate sublimity as a type of aesthetic emotion. In Scherer's (2005) reflection of emotional systems, aesthetic emotions such as awe, being moved, and ecstasy – sublimity-related experiences – do not follow the "adaptive action tendencies" (Frijda, 1986) that characterise utilitarian emotions as anger, fear, joy, disgust, and sadness. In other words, aesthetic emotions do not immediately link with survival and wellbeing values, and thus are independent from processes concerned with fulfilling bodily needs, motivational goals, or societal values. Likewise, sublimity-like experiences are often categorised as aesthetic emotions in recent aesthetic modes, such as by Marković (2012), Chatterjee and Vartanian (2014), Leder and Nadal (2014), Pelowski, Markey, Forster, Gerger, and Leder (2017), and Menninghaus et al. (2019).

This is not to suggest that sublimity is exclusively emotional. Pelowski (2015), for example, talks of sublimity-like states in terms of transformation and spiritual transcendence, akin to Aristotle's *catharsis* and later, Maslow's (1964) *peak experience*. McDougall (1910) interprets admiration – Burke sees admiration as a version of sublimity – as an experience of self-abasing submission, emphasising social functions. Then there is, Bullough (1912), who describes how the appreciation of things of "danger and practical unpleasantness" (p. 88) is often achieved through maintaining "objectivity", or *psychical distance*. As such, sublimity and sublimity-like experiences often entail social, cognitive, and even meta-cognitive mechanisms.

**1b.2.2.2. Earlier exponents – Keltner and Haidt, and Konečni.** Despite the presence of sublimity in broad psychological theories, systematic theorising into the psychological workings of sublimity have been rare.<sup>11</sup> It has only been in the past two decades that serious

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<sup>11</sup> One reason of the delay may be that two of the most influential books on the psychology of aesthetics, namely by Fechner (1876) and Berlyne (1971), effectively overlook aesthetic emotions as an area of study.

explorations of sublimity were carried out, particularly in the form of awe.<sup>12</sup> At the centre are two theoretical works published two years apart, both citing Burke's *Philosophical Enquiry* (1759/2008) as a major influence.

First to appear was Keltner and Haidt's (2003) essentially socio-cultural theory on *awe*. Awe is identified as a generalised experience of social hierarchy/dominance; the experience of being humbled by nature or great artworks is made possible by the everyday admiration one has toward powerful individuals. All cases of awe must feature two components. One is *vastness*, the perception of something being larger than the self. Size here also pertains to non-physical attributes such as social prestige or political power. The other is *need for accommodation*, the need to expand one's mental structures upon facing the vastness. Negativity as fear and confusion may be part of the process, yet not necessary.

The other significant work was Konečni's (2005, 2011) *Aesthetic Trinity Theory*. Konečni divides aesthetic experiences to three hierarchical levels, namely *aesthetic awe*, *being-moved*, and *thrills/chills*, in the order of increasing commonality of experience, and decreasing intensity. Aesthetic awe is a state of both joy and fear, an irreproducible experience of "the most pronounced, the ultimate, aesthetic response" (Konečni, 2005, p. 31). It is elicited by physically large, rare, and novel objects (i.e. *sublime stimulus-in-context*), and happens under the precondition that the viewers are aware of their existential safety. Where the states of being-moved (a weaker version of aesthetic awe) and thrills/chills (general physiological arousal) accompany space for personal associations and interpretations, there is little inter-personal variability in the trigger of a true experience of aesthetic awe.

A number of commonalities exist among both works. Both Keltner and Haidt (2003) and Konečni (2005, 2011) emphasise sublimity as an empirically testable aesthetic emotion. Further justifying their stance, both operate on evolutionary posits. For Keltner and Haidt, awe is an important mediator for the expanding of one's mental structures – a psychological flexibility essential for survival. Konečni (2005), on the other hand, sees the experience of aesthetic awe as a sign of desirable sexual selection; aesthetic awe is proof of the experiencer's emotional and intellectual sensitivity, and his/her economic and physical capacities to enable and endure supernatural encounters. Konečni's emphasis on universality further depicts aesthetic awe as a primordial form of human experience like other emotions. Both works cite Edmund Burke's *Philosophical Enquiry* (1759/2008), and thereby locate themselves as part of the long lineage of sublime theories.

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<sup>12</sup> Throughout the thesis, awe is considered as tantamount to sublimity. In the literature review, empirical works that fulfil at least one of the following conditions are selected: 1) use the word *sublimity* or *the sublime*, 2) use the word *awe* or its derivatives while citing the works by Keltner and Haidt (2003) or Konečni (2005, 2011), or 3) describe a sublime-like state while citing Burke's *Philosophical Enquiry* (1759/2008). Further explanations of the relationship between sublimity and awe are presented in section 1b.2.2.5.

Yet both works differ in four ways. Firstly, where Keltner and Haidt interpret awe as an emotion rooted on social dynamics and power perception, Konečni (2011) is firm in viewing his aesthetic awe as being elicited by “a non-sentient, non-social, non-interacting, object” (p. 248) notably nature, architecture, or music. Here, Konečni’s views are decidedly focused on the material world’s influence on the mind. Secondly, Konečni’s sublime objects tend to be detached from the everyday, as they tend to be rare and novel. There is an assumption that a novel sublime object will induce aesthetic awe regardless of cultural and individual backgrounds. The flexibility of Keltner and Haidt’s awe, however, allows awe to be elicited as long as there is a perception of vastness and the need to accommodate that vastness. In this framework, different people will find different things to be awe-inspiring based on one’s personal and everyday appraisals.

Thirdly, in Konečni’s (2011) view, aesthetic awe appears to happen automatically and with an uncontrollable sense of the “Wow!” (p. 249). On the other hand, for Keltner and Haidt, awe is a two-stage process of appraisal, with the connotation of sudden revelation not a necessity. Awe happens when the mind is cognizant, aware of its own smallness, and is willing to adjust the self – the locus of control is within the self. Fourthly, Konečni is careful in considering other sublime-like states. These include not only being-moved and thrills/chills, but also beauty. Konečni’s thoughts on the possibility of things being beautiful but not sublime is an insightful reflection of Burke’s treatise. This is something Keltner and Haidt skim over, as they seem to see beauty, for example, as an issue beyond their scope of interest. Konečni’s approach is therefore specifically aesthetic.

**1b.2.2.3. Subsequent empirical evidence of awe and aesthetic awe.** Empirical works have followed the publication of Keltner and Haidt (2003) and Konečni’s (2005, 2011). Keltner’s lab has been especially prolific, and has investigated the elicitors and consequences of awe. These works have verified, for example, that awe is a predominantly positive emotion, and when compared to happiness, is most pronounced by encounters of nature, music, and art (Anderson, Monroy, & Keltner, 2018; Shiota, Keltner, & Mossman, 2007). The importance of nature seems paramount. When students were asked to recall a moment of “profound sense of beauty” and awe, nature was cited 55% of the time (Cohen, Gruber, & Keltner, 2010). Likewise, when students were taken out into actual sites within the campus, the view of a Tasmanian eucalyptus tree elicited more awe than did a tall campus building (Piff, Dietze, Feinberg, Stancato, & Keltner, 2015). Even a 3-min video clip of threatening nature, e.g. volcanoes and tornadoes, seemed effective in eliciting awe compared to an emotionally neutral 3-min video clip of furniture (Piff et al., 2015). One way awe was particularly effectively elicited was when people viewed earth from outer space, a phenomenon known as the “overview effect.” This has been reported in both astronaut recollection and simulated space flights (Gallagher, Reinerman-Jones, Sollins, & Janz, 2014; Yaden, Iwry, Slack, Eichstaedt, Zhao, Vaillant, & Newberg,

2016). The feeling of spirituality appears a crucial mediator. As long as participants feel “spiritual”, awe can be elicited via means of science, yoga, and nature, as well as religion (Bonner & Friedman, 2011; Preston & Shin, 2017). Lastly, feelings of awe may also arise from another person (Bai, Maruskin, Chen et al., 2017; Shiota et al., 2007).

The physiological and psychological effects of awe have also been researched. Viewing an awe-inspiring photograph (panoramic view), as opposed to viewing a neutral photograph (household objects), increases respiration rate (Shiota, Neufeld, Yeung, Moser, & Perea, 2011). The sympathetic nervous system was also involved when people were shown awe-inspiring 2-min video clips of space with ominous music (vs. neutral control), via a decrease of heart rate (Gordon, Stellar, Anderson, McNeil, Loew, & Keltner, 2017).

Psychologically, awe has frequently been associated with a sense of being small – this has been demonstrated both in cases of stimulus-based elicitation and recall (Campos, Shiota, Keltner, Gonzaga, & Goetz, 2013; Joye & Bolderdijk, 2015; Piff et al., 2015; Shiota et al., 2007). These findings show support for the first of the two pillars of Keltner and Haidt’s (2003) original view of awe – perception of vastness. Need for accommodation, the other ingredient in the model, also finds support from findings that awe links to being more critical of weak arguments (Griskevicius, Shiota, Neufeld, 2010), being less gullible in following schematic scripts in a memory task (Danvers & Shiota, 2017), and being more willing to learn scientific facts (Valdesolo, Shtulman, & Baron, 2017).

Awe has also been linked with a decrease of materialism (Rudd, Vohs, & Aaker, 2012). Awe’s effect on altruism has received particular support. Awe-induced participants were more willing to help others (but not donate things) than those not awe-induced (Joye & Bolderdijk, 2015; Rudd et al., 2012). While awe relates to prosocial thoughts in general (Piff et al., 2015), this may be linked with the fact that awe induces humility (Preston & Shin, 2017; Stellar, Gordon, Anderson, et al., 2017), a sense of connectedness with others (Krause & Hayward, 2015; Shiota et al., 2007), and empathy (Prade & Saroglou, 2016; Zhang, Piff, Iyer, Koleva, & Keltner, 2014).

Empirical evidence in direct support of Konečni (2005, 2011) has been relatively scarce. Based on the earlier theoretical postulation, Konečni, Wanic, and Brown (2007) primed people to a photograph of the Great Pyramid of Giza, a sublime stimulus of physical vastness, rarity, and novelty. The sublime stimulus, however, failed to elicit greater levels of reported chills – assumed to accompany all experiences of aesthetic awe – in subsequent music pieces (Rachmaninov and Haydn) compared to when participants were primed to non-sublime stimuli (U.N. building, *Mona Lisa*, *Maddalena Strozzi*). In contrary, following Konečni’s (2005, 2011) view that the state of being moved is a weaker form of aesthetic awe, other works have demonstrated that experiences of being moved are indeed linked with chills. Wassiliwizky, Wagner, Jacobsen, & Menninghaus (2015) have, for instance, found reports of being moved to be a strong predictor of the probability of reporting chills, after taking into consideration of

between-participants and between-film clips variations. Benedek and Kaernbach (2011) have further demonstrated that piloerection (or goosebumps), the physiological response to chills, is closely associated with experiences of being moved.

**1b.2.2.4. Beyond Keltner, Haidt, and Konečni – awe in the context of other (aesthetic) emotions.** Awe is understood to be an aesthetic emotion with a network of antecedents and consequences. Yet what is awe's position in relations to other aesthetic and non-aesthetic emotions? On the one hand, awe has been seen generally as a positive experience, and there have been emphasis on how awe differs from positive emotions as enthusiasm, attachment love, nurturant love, compassion, amusement, contentment, pride, joy, and elevation/admiration (Danvers & Shiota, 2017; Piff et al., 2015; Shiota et al., 2007; Shiota et al., 2011). Such distinctness of awe has also received cross-cultural examinations. Where the Dispositional Positive Emotion Scale (Shiota et al., 2006) measures one's tendency for three independent positive emotions of awe, amusement, and pride, the three factors were replicated among samples from the U.S., Iran, Malaysia, and Poland (Razavi et al., 2016). In all, these efforts strengthen Keltner and Haidt's (2003) postulation that awe is an aesthetic emotion, which is both independent and pervasive.

On the other hand, recent works are attempting to differentiate awe from other aesthetic emotions. It was Konečni (2005, 2011), who first suggested the possibility of aesthetic awe as a separate – on a continuous gradation nevertheless – construct from states of being moved and chills. In this context, an increasing number of works are locating being moved as a distinct experience from awe (Menninghaus, Wagner, Hanich et al., 2015). For instance, Menninghaus et al. (2015) argues that awe has more to do with feelings of power and authority, whereas being moved represents attachment/bonding/empathy emotion. Alternatively, in Fingerhut and Prinz's (2018) views on the determinants of good art, being moved concerns personal values, whereas awe encompasses experiences that may be irrelevant to personal needs. Independently, Seibt, Schubert, Zickfield, and Fiske (2017) see being moved as being the primary term used to encompass concepts of awe.

In a sense, these views put awe to the test, as awe is argued to be just one of a wide set of possible aesthetic experiences. Beyond being moved, aesthetic emotions to which awe is compared against include admiration, adoration (Algoe & Hadit, 2009; Onu, Kessler, & Smith, 2016; Schindler, Zink, Windrich, & Menninghaus, 2012), wonder (Darbor, Lench, Davis, & Hicks, 2016; Fingerhut & Prinz, 2018), fascination, nostalgia, enchantment, insight (Schindler, Hosoya, Menninghaus, et al., 2017), and so on. Still more extreme, others have compared awe against constructs entirely new to the empirical aesthetics literature, such as *Kama Muta* (Zickfield, Schubert, Siebt, et al., 2018) or tears (Pelowski, 2015).

The omission of focused studies on awe's relation to beauty has been surprisingly rare, given that sublimity and beauty are the two most commonly compared aesthetic categories in

the aesthetics literature, e.g. Burke. Despite Konečni's (2005, 2011) awareness of this sublimity-beauty duality, Keltner and Haidt's (2003) trivialisation of beauty may have been a cause of the neglect.<sup>13</sup> That said, there is an increasing tendency for works to treat beauty and awe-inspiring experiences as an equally relevant pair of aesthetic emotions (Hur, Gerger, Leder, & McManus 2018<sup>14</sup>; Ishizu & Zeki, 2014), or at least to consider beauty in discussions of awe (Fingerhut & Prinz, 2017; Pelowski, Hur, Cotter, et al., 2019; Schindler et al., 2017). Ishizu and Zeki (2014) provide insightful physiological and neurobiological underpinnings of the comparison between sublimity and beauty.

To date, only one work, by Cowen and Keltner (2017), has discussed awe in the context of emotions *per se* – including both general and aesthetic emotions – and without exclusively limiting responses to researcher-picked emotional categories. Their conclusion, that “the boundaries between categories of emotion are fuzzy rather than discrete” (p. 1), is telling evidence of the complexity of aesthetic emotions.

**1b.2.2.5. Sublimity and awe.** In the preceding literature review, sublimity and awe were assumed interchangeable. This assumption can be attributed to three grounds. Firstly, both Keltner and Haidt (2003), and Konečni (2005, 2011) consolidate the fundamentals of their awe constructs around sublime theories, notably around Edmund Burke's *Philosophical Enquiry*. As such, recent theories of awe work directly in tandem with matters of sublimity. Conversely, Burke himself uses awe in depicting sublimity; this supports the view that the interchangeable nature of sublimity and awe is not a recent phenomenon. Going further back, while the English language often accommodates similar words meanings via Latin and Old Norse/Old English forms, sublimity owes its origin to Latin, while awe derives from Old Norse/Old English. It is then, not surprising that in more recent psychological literature on aesthetic emotions, awe and sublimity often appear interchangeable or at least under the same category of experience (Fingerhut & Prinz, 2018; Hur et al., 2018; Ishizu & Zeki, 2014; Menninghaus et al., 2019; Pelowski et al., 2017; Schindler et al., 2017).

This is not to say that the literature is free from confusion, especially when attempts are made to differentiate the two. For example, Shapshay (2017) considers awe as a general experience of exaltation, compared to sublimity's specific aesthetic sort of exaltation. On the other hand, Bethelmy and Corraliza (2019) see awe as “part of the conception of sublime emotion” (p.3). Where the former subsumes sublimity under awe, the other argues for the exact opposite.

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<sup>13</sup> Keltner and Haidt (2003) seem to treat beauty as a purely aesthetic pleasure and awe as a more complex socio-ecological emotion. It is disappointing that they go no further after, “[b]eautiful people and scenes can produce awe-related experiences that are flavoured with aesthetic pleasure. We cannot give here an account of what makes something beautiful” (p. 304).

<sup>14</sup> This paper forms the basis of Studies 11 and 12 of this thesis.



Such conceptual confusion should not deter the investigation of the existing experience of the sublime. For someone in some specific situation, sublimity may mean one thing, while for another sublimity may mean something else. The same thing applies for awe. Yet sublimity and awe, as is the case for basic emotions as fear and happiness, share more than they do not. Flexibility is inevitable, which may also explain why Keltner and Haidt (2003) and Konečni (2005, 2011) have adopted a prototypical model of awe. As such, variations are permitted, as long as some core instincts are activated.

It is possible psychological works on awe and sublimity have investigated a unified experience from different assumptions. Works that use the term *sublime* have been acutely aware of the philosophical histories of the sublime, picking up concerns from date back to the eighteenth century debates. These works, predominantly by Vladimir Konečni, Matthew Pelowski, Tomohiro Ishizu, Jesse Prinz, Semir Zeki, Chris McManus, and myself, have therefore focused on the roles of physical grandeur of objects, fear, nature and, importantly, artworks, on sublime sensations (e.g. Hur et al., 2018; Ishizu & Zeki, 2014; Konečni, 2005, 2011; Ortlieb, Fischer, & Carbon, 2016; Pelowski et al., 2017; Seidel & Prinz, 2017).

Works using *awe* – Michelle Shiota and Dacher Keltner, notably – approach sublimity with a focus on social and affective psychology approaches (e.g. Piff et al., 2014; Rudd et al., 2012). Awe research has especially yielded insight on social connotations (prosocial behaviour and cognition; interpersonal perception), and how sublimity differs from other emotions as pride and contentment. Awe research has considered most important of all, the role of appraisal on other psychological outcomes. That said, and perhaps pertaining to the inherent similarity between what awe and sublimity signify, more works on awe have started looking into the role of fear (Danvers & Shiota, 2017; Gordon et al., 2017; Piff et al., 2014) and nature (Anderson et al., 2018).

**1b.2.2.6. Summary of 1b.2.2.** Summing up, sublimity has been studied as an aesthetic emotion in psychology, with most serious work stemming from the last two decades. The first works, namely by Keltner and Haidt (2003), and Konečni (2005, 2011) are indebted to the empirically minded *Philosophical Enquiry* by Edmund Burke (1759/2008), and have helped bring evolutionary and theoretical significance to the sublime as an object of empirical research. Subsequent empirical support has shed light on the psychological workings of awe, especially on the triggers and psycho-physiological consequences. While research on awe continues to depict awe's uniqueness compared to other emotions, more recent works attempt to tease apart awe from other aesthetic emotions such as being moved and beauty. Lastly, there is enough reason to believe that sublimity and awe are interchangeable as terminologies, and attentive research into both may ensure that the phenomenon of the sublime is studied from varying perspectives.

### 1b.3. Chapter Summary

The sublime, originating from the Latin meaning of ‘a rising movement that follows a diagonal slope’, has existed in the English language since 1400, and has since become a term denoting experiences of exaltation. In eighteenth century Britain, the sublime became a source of concentrated philosophical debates, drawing upon various disciplines and fields of art. Specifically, it was at that time that topics still relevant to the sublime were discussed, from as broad an inquiry as “what moves humans?”, to matters concerning the difference between sublimity and beauty, the involvement of fear in sublime experiences, grand nature as a source of the sublime, and how large objects in general are sublime. It is promising that the sublime not only finds place in non-Western cultures, but also among present thinkers. To this day, the idea of sublimity intrigues minds as an experience that entails profundity overlaid with incomprehensibility.

In bringing sublimity to psychological research, a key influence has been the philosophical work of Edmund Burke’s *Philosophical Enquiry* (1759/2008), not least because Burke’s empiricism well suits methodologies from modern experimental psychology. Perhaps reflecting this suitability, Burke appears in two of the most important psychological works on sublimity, namely Keltner and Haidt (2003), and Konečni’s (2005, 2011) theories of awe. Of these two works, the former has especially accumulated empirical support for triggers and effects concerning awe. Since these publications, an increasing number of aesthetic emotions as being moved, chills, and wonder, have been studied, each claiming uniqueness separate from awe. While some see conceptual delineation between sublimity and awe, there are prevailing reasons to think that research into sublimity and awe look into experiences that perhaps are conceptually singular.

**Chapter 1c. The Sublime as an Object of Science; Methodological Concerns**

### 1c.1. Criticisms against the Sublime as a Topic of Scientific Inquiry

An increasing number of empirical works on the sublime (and sublime-like phenomena) notwithstanding, the scientific study of the sublime has often met with resistance. Some of the harshest criticisms came from philosophers.

This has been the case for the likes of Jane Forsey, James Elkin, Richard Rorty, Philippe Lacoue-Labarthe, and Terry Eagleton, with Elkin characterising the sublime as “anemic, bourgeois, elitist, feeble, ideological, ineffective, irrelevant, irresponsible, nostalgic, poor, and weak” (Costelloe, 2012, p. 1).<sup>15</sup> Even should sublimity retain coherence as a theory, there have been questions of sublimity becoming an object of science. Among these are views proposing that studies should measure cold cognitive preference, as strong aesthetic responses as sublimity, are difficult to be truly evoked in experimental settings involving multiple stimuli over multiple trials (Makin, 2017). The study of aesthetics has also been criticised for being “elitist” and being inherently subjective (Pearce, Zeidel, Vartanian, et al., 2016).

Yet with careful reading of philosophical works, there are unifying themes (Hipple, 1957). Then there is the question of whether a complex an experience as sublimity can be conceptually bulletproof at all. Sublimity is inherently multi-faceted involving various colours of emotions and cognitions. This diffuse core further reflects unique personal encounters, passed through multiple eras and geographic cultures. These variations notwithstanding, people still aggregate these diverse experiences under sublimity. Therefore, sublimity is phenomenologically valid. Similar thoughts reflect Russell’s (2003) view of fear:

There are no formal criteria for what is and what is not an emotion... There may be no one scientific model that applies to all cases of fear, and only to fear... Still, I believe that it is possible to develop viable alternatives that minimize the problems while emphasizing rather than denying the importance and reality of the events now considered emotions (p. 145-146).

Despite the inherent contradictions within the concept of emotions, especially on emotions that requires intense levels of arousal as fear (commenting on the criticism by Makin), there have been decades of fruitful research on emotions. If sublimity as a theory experiences demise, this is not to suggest that the sublime as a human experience, too, is undermined. It is the latter that concerns scientists of aesthetic experiences. The argument of conceptual inconsistency there is not sufficient a criticism.

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<sup>15</sup> This is no mere artefact of the past few decades. For example, even in Monk’s (1935) seminal survey, the author admits that unanimity for a singular view of sublimity was never attained. As a solution, some writers have generated multiple categories of the sublime. Des Pres (1983) and Zuckert (2012) each devised a dual-type sublimity model, the former allocating the division to naïve-serious, and the latter, to admirable-terrifying/thrilling. Where Wurth (2009) takes the category to four, Morley (2010) invokes no less than seven, i.e. the unrepresentable, transcendence, nature, technology, terror, the uncanny, and altered states. The list continues, and the same issue of the lack of a strict ontological system is re-encountered.

To cite elitism for a reason against aesthetics is far from the truth, as aesthetic appreciation is integral in human life (Lorblanchet, 2007), and happens automatically and subconsciously (Palmer et al., 2013). Aesthetic experiences can be said to be an extension to evaluation. What one evaluates, e.g. liking, is also an aesthetic judgement of beauty and pleasure. The commonplace of aesthetic experiences makes the study of them essential. Especially for sublimity, sublime emotions of grandeur, fear, terror, and energy often find themselves expressed in superhero, action, or war films. That anyone can be immersed in these emotions at local cinemas any time of the week, for an affordable price, is anything but elite.

Regarding the criticism of subjectivity, in psychology the subject is rarely independent of the measured experience. Memory and perception are never purely objective, as both represent the mind's processing of external information. Minds differ, and hence also follows the inevitability of individual differences. Besides, since most psychological fields include individual differences as a form of subjective variability, the presence of subjectivity as individual differences in sublimity is not a criticism.

To sum up, criticisms on the scientific study of sublimity have pointed out the supposed deficiencies of consistent theory, presence of subjectivity, and the fact that aesthetic experiences represent an elitist experience. Yet these criticisms are refutable.

## **1c.2. Methodological Limitations of Past Works**

This is not to say that the aforementioned empirical literature on the sublime is free from criticisms. Four prominent methodological shortcomings are presented.

### **1c.2.1. Issue of Stimulus Type**

While the aesthetic emotion of sublimity is at the centre of all aforementioned empirical works, there is a need to address how far the findings can be generalised. This is particularly relevant to the reality that there appears to be an untamed range of stimuli types involved. Just over the past decade, sublimity has been explored using photographs, short video clips, and virtual reality, with stimuli that represent scenes of nature, imagined human interactions, artworks, architecture, and music. Since aesthetic experiences constitute a broad range of possibilities that involve interactions with objects, scenes, or events that trigger some form of aesthetic response (Leder & Nadal, 2014; Palmer et al., 2013), one can envision future studies to broaden the scope of stimulus choices further.

If diversity within the phenomenology of the sublime cannot be a bad thing *per se*, there is little guarantee that the texture of sublimity through paintings (e.g. Fingerhut & Prinz, 2018), for instance, corresponds on a one-to-one basis with the sublimity of interpersonal interactions (e.g. Keltner & Haidt, 2003) or music (e.g. Konečni et al., 2007). A recent publication by Vessel, Maurer, Denker, and Starr (2018), for example, suggest that landscapes, architecture, human faces, and paintings are all processed in fundamentally different ways. Gombrich (1969)

assumed that the aesthetic processing of art requires knowledge, without which one would fail to “read” the work – but that is unlikely in the case for nature. This divergence of aesthetic processes between object domains may also predict why adjectives used for aesthetic descriptions differ substantially between types and modalities of objects (Augustin, Wagemans, & Carbon, 2012; Jacobsen, Buchta, Köhler, & Schröger, 2004; Knoop, Menninghaus, Wagner, & Jacobsen, 2016).

Sublime experiences in artworks vs. non-art objects, and in music vs. visual modalities, for instance, are not merely putative nor symbolic. Violation of such concerns may result in erroneous generalisations, as may be the case for Ishizu and Zeki (2014), for example. There, the authors discuss specific brain areas activated with sublimity but not beauty. While sublimity is elicited through photographs, beauty is elicited through paintings and music clips. The human mind responds sensitively to external stimulation, and if one is to explore psychological responses using particular kinds of stimuli, there is a need to address how far such findings can be generalised.

### **1c.2.2. Issue of Stimulus Number**

With the exception of a handful of studies (e.g. Cowen & Keltner, 2017; Hur et al., 2018; Ishizu & Zeki, 2014), most works in the stimulus-based empirical literature draw conclusive judgements using 1-3 stimuli per experiment condition. Statistically, a small number of stimulus compromises statistical power, even provided sufficient participant numbers (Judd, Westfall, & Kenny, 2017).

Ultimately, small stimulus number reduces the generalisability of findings. For example, in Experiment 2 of Seidel and Prinz’s (2017) work, the researchers reported that increasing the physical size of a Picasso painting increases people’s judgements of wonder of the painting. Based on the design, it is yet unclear if the same size effect would be retained had a figurative painting by William Turner or Michelangelo, or even a different painting by Picasso had been used. It is inevitable that complex stimuli as paintings produce complex variations of psychological impact. In the case of Seidel and Prinz, the size effect becomes questionable because it is ungeneralisable.

### **1c.2.3. Issue of Dependent Variable; Construct Validity**

It is commonplace that empirical works either ask participants for a single response of sublimity (e.g. Gordon et al., 2016) or a set of two responses consisting of sublimity and a non-aesthetic experience (e.g. pride; Shiota et al., 2007). Either case raises issues of construct validity. Although the researchers had aimed to capture sublimity as a unique aesthetic dimension, there is the danger that by having asked participants of an aesthetic emotion without a comparable aesthetic emotion, a generally positive aesthetic experience is captured instead.

It is true that an individual's open-ended subjective response is invaluable in any incipient field of empirical research. Yet methodological improvements are required to better solve the ultimate concern, which is to tease out sublimity as a unique as well as an aesthetic emotion. In order to align participants to such view of sublimity, either a characterisation of the sublime, or a clear reference to another comparable aesthetic experience can be provided in testing. Otherwise, participants may respond to *sublimity* as they would respond on other occasions to *beauty*, *being-moved*, or even *liking*. In a context where multiple aesthetic emotions are studied, it is crucial to not misrepresent sublimity as an umbrella term denoting general goodness (Hur & McManus, 2017).

A troubling variant derives from Eskine, Kacnik, and Prinz's (2012) work. Where participants were given a set of ten scales to rate stimuli, all but one of the items loaded onto a single factor via a factor analysis (oddly, the researchers discarded the left-over scale *imposing*, which may have represented the true sublime). Looking at what the authors called the 'sublime' scale, consisting of *inspiring*, *stimulating*, *dull*, *exciting*, *moving*, *boring*, *uninteresting*, *rousing*, and *forgetful*, there is a worry that responses to these scales would be highly correlated anyway. Similar to what social psychologists would call a 'halo effect' (Thorndike, 1920), participants may have given a coherent response to these scales that are abstract, vaguely positive (or negative, for reverse coding), and similar-sounding, judging that they either generally liked or disliked a stimulus. This is clearly a response bias, and it is possible that the 'sublimity' that Eskine and colleagues had measured, insufficiently captured sublimity as a unique aesthetic emotions.

#### **1c.2.4. Issue of Dependent Variable; the Consideration of Sublimity vs. Beauty**

The need for a reference emotion was mentioned as a solution to having sublimity represent a general, positive aesthetic experience. This reference should be an aesthetic emotion sufficiently discriminant from sublimity. Theories of aesthetics may provide a blueprint.

In the aesthetics debates in eighteenth century Britain, most writers validated the uniqueness of sublimity by comparing sublimity against beauty. Their ideas rested on the backdrop that beauty represents the neoclassical sensibility of balance and emotional cool, whereas sublimity represents the Romantic impulse of emotional abandon. It was not uncommon in the eighteenth century to read remarks similar to the following quote from Burke's (1759/2008) *Philosophical Enquiry*:

There is a wide difference between admiration and love. The sublime, which is the cause of the former, always dwells on great objects, and terrible; the latter on small ones, and pleasing; we submit to what we admire, but we love what submits to us; in one case we are forced, in the other we are flattered into compliance. In short, the ideas of the sublime and the beautiful stand on foundations so different... (p. 113)

By comparing sublimity to beauty, sublimity's limits as well as core characters are clear. The reference point of beauty provides an important cue. In empirical settings where participants do not have access to long philosophical passages, this reference point may provide the necessary information to make sublimity a unique and aesthetic construct.

This is not to say that beauty is the only possible reference point. A whole array of candidates exist, from wonder and being moved, touched, transformation, etc. However, in the sublimity-beauty comparison represents a pair of aesthetic experiences backed up by theories dating back centuries. While recent works citing Burke have made substantial strides toward a general understanding of sublimity, it comes as a misfortune that only a handful of them have pertained to the theory that Burke and his fellow thinkers had intended, by interpreting sublimity as opposed to beauty.

### 1c.3. Burke Revisited, and the Setting of Assumptions

Scientific enquiries of complex experiences as sublimity necessitates assumptions and theoretical constraints. Such theory "must require a definition of the sublime that is sufficiently rigorous and circumscribed to allow the concept to be 'testable'" (Konečni, 2011, p. 246). As such, required is a theory that is narrow and tangible, but not too expansive to allow everything.

To this end, the sublimity of Edmund Burke is revisited, in order to have his framework justified as the main backbone of the sublimity of the present thesis. The reasons for why Burke may suite scientific studies have been justified previously. One could further add the fact that Burke's characterisation of sublimity does not differ drastically from contemporary conceptualisations of the sublime.

What does the Burkean notion of sublimity entail? First and foremost, Burke's sublimity emphasises nature. This means that the present thesis predominantly focuses on natural objects (e.g. photographs of mountains), instead of artworks (e.g. paintings depicting mountains).<sup>16</sup> Burke's fascination of the physical world's influence on psychological outcomes also means that most studies are stimulus-driven.<sup>17</sup> By focusing on actual objects, abstractions of social scenarios are in most cases mitigated. Furthermore, physical manipulations of objects are prioritised over perceived physical properties. For example, when considering vastness, objects are physically enlarged. This is unlike cases where researchers are interested in perceived vastness of identically sized objects (e.g. Ishizu & Zeki, 2014). One of the most important assumptions is the consideration of beauty as well as sublimity, and both measures will be adopted in most tasks involved. Lastly, subscribing to Burke's study of passions, there is an explicit focus on felt aspects of sublimity rather than perceived aspects.

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<sup>16</sup> A crucial advantage of this focus is that natural objects often find place in sublime theories and views from around the world, such that people often consider grand nature as a core source of the sublime. This ensures greater generalisability. The postmodernist view of technological sublime or the Longinus's oratory-based sublimity, for instance, are hard to come by outside of the West.

<sup>17</sup> This is in line with Konečni's (2005, 2011) *sublime stimulus-in-context*.



Taking into consideration of methodological limitations, most studies involve multiple stimuli per experimental condition to increase generalisability. Following views that experts process objects differently to non-experts (e.g. Palmer et al., 2013), all participants are limited to non-experts.

Summing up, the present thesis explores the sublime based on Burke's conceptualisation of the sublime. It therefore follows that the thesis examines felt experiences of the sublime, based on the contexts of physical manipulations of natural objects and beauty.

#### **1c.4. Linear Mixed Modelling; a Complementary Method of Generalisability Enhancement**

##### **1c.4.1. Linear Mixed Modelling; Simultaneous Consideration of Multiple Random Effects**

Generalisability is a major issue in existing empirical works on the sublime, particularly studies adopting designs with small numbers of stimuli. The following section provides an analytical method, namely linear mixed modelling<sup>18</sup> (Judd, Westfall, & Kenny, 2012; Judd et al., 2017). Linear mixed modelling enables maximal consideration of random effects structures pertinent to multiple stimuli and participants, and thereby increases generalisability of fixed effects. Unless noted otherwise, this analytical method is used throughout the thesis.

Assuming the presence of at least one fixed effect (e.g. manipulation of photograph size) in predicting certain psychological outcomes (e.g. sublimity ratings), the increasing participant and stimulus numbers increases the power of analyses. Psychological outcomes as dependent variables are influenced by the natural heterogeneity that exist in humans and the stimuli they experience. Traditionally, such data are analysed in two ways, where either one type of variance is eliminated. This simplification of variance structure enables the data to align with a standard Analysis of Variance (ANOVA) format, from which a relatively straightforward calculation of *F*-statistics is possible, compared to partitioning all possible variances (Cornfield & Tukey, 1956; Winer, 1971).

In traditional ANOVAs, data are aggregated across stimuli, such that the participants provide the main observations. In the typical scenario, the random effects that occur due to participants are considered, but those that occur due to stimuli are ignored. In a broader sense, data aggregation is a common practice in psychology, as the elimination of variance across stimuli is easy to grasp both interpretation-wise and computationally. There have also been cases in empirical aesthetics where both aggregation across participants and stimuli are taken, yet in separate analyses (McManus, Cheema, & Stoker, 1993).

There are compromises in data aggregation across stimuli, because there is little guarantee that everyone (or everything) has (or evokes) identical psychological processes to certain fixed effects. It may be a solution to select just one participant or stimulus from the start,

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<sup>18</sup> Also commonly known as *multilevel modelling* or *hierarchical (linear) modelling*.

as many works in empirical aesthetics do indeed, and subsequently forgo concerns regarding data aggregation or variation control. That these methods ultimately limit generalisability, however, is unquestionable, as has been discussed before. At best, such manipulation represents case studies of a particular participant or stimulus. To eliminate variance either by analysis or design, in other words by data aggregation or by single-stimulus/participant selection respectively, cannot be a solution.

In this context, linear mixed modelling is an analytical method that handles multiple random effects simultaneously. While the handling of multiple random effects itself existed from the 1960s as theories (Clark, 1973; Green & Tukey, 1960), the theories were rarely realised until recent developments in computational capacities (e.g. Judd et al., 2012). With accessible technological advancements with software such as *R*, linear mixed modelling permits increasingly robust generalisability across both participants and stimuli for assessing statistically significant fixed effects.

First, it is important to uncover what random effects are effected by linear mixed modelling. In designs with multiple participants and stimuli, there are three types of basic random effects. They are as following:

- (a) Random variance attributed to participant mean difference: the degree to which people's average<sup>19</sup> responses differ.
- (b) Random variance attributed to stimulus mean difference: the degree to which stimuli's average responses differ.
- (c) Random variance attributed to the interaction between (a) and (b): the degree to which stimuli's average responses differ across people.

With an added fixed effect or manipulation condition, there are three additional random effect types to consider. The same logic follows additional fixed effects. They are as follows:

- (d) Random variance attributed to the interaction between (a) and fixed effect: the degree to which people's average responses differ between conditions.
- (e) Random variance attributed to the interaction (b) and fixed effect: the degree to which stimuli's average responses differ between conditions.
- (f) Random variance attributed to the interaction between (c) and fixed effect: the degree to which the average response differences between conditions depend on stimulus-participant pairs.

Linear mixed modelling additionally considers the following three covariates:

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<sup>19</sup> If not noted otherwise, average indicates the mean throughout the thesis.

**(g)** Covariance attributed to the interaction between **(a)** and **(d)**: the degree to which people's differing average responses between conditions depend on people's average responses.

**(h)** Covariance attributed to the interaction between **(b)** and **(e)**: the degree to which stimuli's differing average responses between conditions depend on stimuli's average responses.

**(i)** Covariance attributed to the interaction between **(c)** and **(f)**: the degree to which stimulus-participant pairs with larger average responses also have larger average condition effects.

Note that standard ANOVAs, where data are aggregated across stimuli, only account for **(a)** and **(d)**. The ANOVAs do not account for **(b)**, **(c)**, **(e)**, **(f)**, **(g)**, **(h)**, and **(i)** in explaining a dataset's variance. Conversely, linear mixed modelling, in its full model, considers all nine components, thus enabling greater generalisability of fixed effects. It can be argued that the error term in the linear mixed model is more refined.

Figure 4, modified from Judd et al., (2017), represents a full linear mixed model. The dependent variable  $Y_{ijk}$  is predicted by the fixed effects  $\beta_0$  (fixed intercept) and  $\beta_1 c_{ijk}$  (fixed slope of condition), where,  $i$  represents individual participants,  $j$  individual stimuli, and  $k$  conditions.  $\alpha$  refers to random effects and  $\epsilon_{ijk}$  refers to the error.

$$Y_{ijk} = \beta_0 + \beta_1 c_{ijk} + \alpha_i^P + \alpha_j^T + \alpha_{ij}^{P \times T} + \alpha_i^{P \times C} c_{ijk} + \alpha_j^{T \times C} c_{ijk} + \alpha_{ij}^{P \times T \times C} c_{ijk} + \epsilon_{ijk}$$

Figure 4. A full linear mixed model

From this model, the aforementioned 9 variance or covariance components can be extracted:

- (a):**  $\text{var}(\alpha_i^P)$
- (b):**  $\text{var}(\alpha_j^T)$
- (c):**  $\text{var}(\alpha_{ij}^{P \times T})$
- (d):**  $\text{var}(\alpha_i^{P \times C})$
- (e):**  $\text{var}(\alpha_j^{T \times C})$
- (f):**  $\text{var}(\alpha_{ij}^{P \times T \times C})$
- (g):**  $\text{cov}(\alpha_i^P, \alpha_i^{P \times C})$
- (h):**  $\text{cov}(\alpha_j^T, \alpha_j^{T \times C})$
- (i):**  $\text{cov}(\alpha_{ij}^{P \times T}, \alpha_{ij}^{P \times T \times C})$

#### **1c.4.2. Fixed Effects Design and Further Enhancing Generalisability through Randomisation**

Unless noted otherwise, participants in the thesis are exposed to all fixed effect conditions in each study, and are thereby not nested within manipulation conditions. Thus, all fixed effects follow a within-participants design.

The situation for stimulus requires more subtlety. In some studies from the thesis (from studies 5 to 8), each participant views a random subset of photograph contents taken from a large stimulus pool. In most studies, the subset of stimuli are also randomly allocated to specific manipulation conditions for each participant.

Because each participant views a large set of stimuli that is most likely unique from other participants, and since those unique images are allocated randomly to manipulation conditions, any fixed effect reported across participants is unlikely to be due to specific stimulus characteristics. Therefore, the reported fixed effects can be said to be entirely independent of particular stimulus content, as well as participant. This subtlety in design provides an additional source of strength and generalisability of fixed effects, beyond the aforementioned random effects analysis via linear mixed modelling.

To demonstrate the advantages of the mentioned design, consider Experiment 2 in Seidel and Prinz (2017). Here, the authors present either a small or large version of Pablo Picasso's painting *Three Musicians* (1921) to participants, upon which the participants rate the version of the painting they see. The data are analysed by comparing the aggregated rating data of participants who looked at the small version of the painting, against the aggregated rating data of those who looked at the large version of the painting.

In the study's design, the size effect is entirely confounded with the single Picasso painting, and with the unique emotional and cognitive associates the painting evokes. It is possible that the particular Picasso painting, for unknown reasons, creates a uniquely strong presentation size effect. It may also be the case that different participants have different sensitivities to an object's presentation size, to a painting's presentation size, or to Picasso's *Three Musician's* object size. The aforementioned randomisation process considers such confounding potentials, and thus generates more power for fixed effects.

#### **1c.4.3. Analytical Method and Sample Code**

How to analyse data with random structures? Given the multiple levels of randomisation processes where fixed effects are allocated across participants, overall there cannot be said to exist any nesting across participants, targets, and fixed factors. One analytical heuristic is to assume fully-crossed designs, where every participant-stimulus pair is exposed to all conditions. The missing combinations from the theoretical fully-crossed design are treated as missing values.

All linear mixed modelling analyses in the thesis are computed using the *lmer()* function of the *lme4* package (Bates, Maechler, Bolker, & Walker, 2015) in R version 3.4.1 (R Development Core Team, 2008). Specifically, each linear mixed model is constructed with maximal random effects structure, in accordance with the guidelines by Barr, Levy, Scheepers, and Tily (2013) and Judd et al. (2017). This method reflects the way linear mixed modelling is implemented in empirical aesthetics works (Brieber, Nadal, Leder, & Rosenberg, 2014; Hur et al., 2018; Vartanian et al., 2019). In the event of convergence errors, higher order interaction terms in random effects are dropped (Judd et al., 2017). *p*-values at 95% confidence intervals for all fixed effects (Type II) and pairwise comparisons are obtained using the *lmerTest* package (Kuznetsova, Brockhoff, & Christensen, 2017). Pairwise comparisons are based on least square means. Unless specified otherwise, estimations of *t* and *F* statistics are based on the Satterthwaite approximation for degrees of freedom.

Below is a sample R code, where DV represents dependent variable and IV represents independent variable. The codes have been generated using the guidance of Judd et al.'s (2017) supplementary materials.

```
Model = lmer(DV ~ IV + (1+IV|Participant) + (1+IV|Stimulus) +  
(1|Participant:Stimulus), Data)
```

In the code, the “(1+IV|Participant)” indicates that there are differing baseline-levels of the DV (the intercept, represented by “1”) for each participant, as well as differing responses to the IV for each participant (“IV|Participant”). Likewise, the “(1+IV|Stimulus)” means that there are differing baseline-levels of the DV for each stimulus, as well as differing responses to the IV for each stimulus. The “(1|Participant:Stimulus)” means that the model also considers an interaction between the random effects structures of participant and stimulus.

### 1c.5. Chapter summary

Despite sublimity's prominence in philosophy, psychology, and in the everyday, sublimity as a scientific object has endured much scepticism. In particular, critical views often cite theoretical inconsistency, subjectivity, and elitism as reasons why sublimity cannot be studied as a science. However, these views can be rebutted by the fact that the sublime remains a profound psychological phenomenon that affects many, and that it differs little from other psychological objects as emotions or memory.

Perhaps one of the strongest arguments against the criticisms are the growing number of empirical works on the sublime. Nevertheless, there are important methodological shortcomings that many of these works seem to violate. In some way or another, these issues – the need to be more systematic with stimulus types, the need to increase stimulus number, and the need to be

sensitive with dependent variables – relate to generalisability. It is desirable to expand the generalisability of the findings by applying the manipulations to a great number of stimuli, as well as participants.

Conversely, it is also important to set limits, focusing on generalisations only relevant to what the specific design permits or to the specific theoretical interests. On this latter point of setting limits, Burke's views are revisited. Burke's empirical theories in contrasting sublimity and beauty based on stimulus-driven effects provide a suitable starting point for systematic psychological research on the sublime.

Generalisability of fixed effects may additionally be enhanced with the analytical method of linear mixed modelling. This is due to the capability of linear mixed modelling to simultaneously consider by-participant and by-stimulus variations. The advantages of linear mixed modelling are likely to be maximised when coupled with effective experimental designs.

**Chapter 1d. Studies 1 and 2: Pilot Studies**

## 1d.1. Introduction

The present chapter presents a set of two preliminary exploratory studies into sublimity and beauty judgements. In particular, within-participants reliability, between-participants consistency, and determinants of sublimity and beauty are explored. The two studies provided a general guidance into future research questions, and also provided data for subsequent stimulus selection.

Study 1 employed four participants to rate photographs for their evoked sublimity, explores whether people are similar to one another in their sublimity ratings. At the outset, this aim can be seen as a challenge to the phrase, “beauty is in the eye of the beholder.” But more relevant to theories of the sublime, the measure of individual differences also is an attempt to evaluate Burke’s claim that “[t]aste is common to all” (Burke, 1759/2008, p. 24).

The study further explores if certain photographic styles or contents (e.g. nature vs. architecture, number of people in photograph content, general blueness) evoke larger sublimity judgements. Architecture is considered, given the philosophical literature arguing that architecture may be an important source of the sublime, as well as nature (Burke, 1759/2008).<sup>20</sup> Object size being an important element of sublimity for Burke and other scholars of the sublime, the number of people indicate a marker of implied size of stimulus content. Lastly, the colour blue is often associated with piety, sincerity, and fear (Birren, 1950), concepts that can be considered related to sublimity. Blue’s significance is aided by the fact that many natural phenomena considered sublime (e.g. the sea, sky, mountains), appears to have a general contour of blue. Besides, when searching the web for ‘sublime paintings’ and ‘beautiful paintings’, sublimity, at least to the naked eyes, seems to imply a general blue hue (Figure 5).

Study 2, with twice as many participants as the first study, follows up on these questions, and additionally examines within-participants reliability. The importance of within-participants consistency is that it implies, at minimum, that participants have an understanding of a task involving complex aesthetic judgements – a crucial and fundamental methodological assumption that is often overlooked in empirical studies of sublimity (e.g. Ishizu & Zeki, 2012). The second pilot study provides other methodological updates, for example, the additional response measurement of beauty. If the simultaneous measurements of sublimity and beauty marks the palpable influence of Edmund Burke (1759/2008), Burke’s influence becomes even more evident with the focus on nature-related photographs rather than architecture-related ones in the second study. After all, while architecture is an important element of the sublime, the zenith of discussions concerning the sublime lies in the discussion of nature.

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<sup>20</sup> Burke dedicates a number of chapters, e.g. Part 2, Section 10, in describing the sublimity of buildings. Elsewhere, Joseph Addison, (1672 – 1719), also known as the first major British figure to write about the aesthetics of the sublime, believed that while grand nature is most sublime, of the arts architecture expresses sublimity the best (see Monk, 1935, p. 58, and Hipple, 1957, p. 21). Others who wrote much on the sublimity of architecture include John Baillie (d. 1747), Alexander Gerard (1728 – 1795), William Duff (1732 – 1815), and John Milner (1752 – 1826).



Between-participants agreement, within-participants reliability, and determinants of aesthetic judgements are important questions and assumptions for scientific inquiries in the sublime. While limited in generalisation power due to the small number of participants, these two pilot studies nevertheless provide important methodological and theoretical backdrops for forthcoming studies in the thesis.

**"Due to copyright restrictions the electronic version does not contain some images. They are, however, available in the printed version in the UCL Library"**

Figure 5. Google image search results of 'sublimity painting' (above) and 'beautiful painting' (below).<sup>21</sup>

## 1d.2. Study 1

### 1d.2.1. Methodology

**1d.2.1.1. Participants.** Four female participants ( $M_{age} = 18.75$ ,  $SD_{age} = 0.50$ ) recruited through the University College London (UCL) subject pool took part in the study, in return for course credit. All participants provided written consent prior to the start of the study.

**1d.2.1.2. Materials, design, and procedure.** The study took place in a standard experiment cubicle at the Experimental Psychology department at UCL, and was run via MATLAB 2015b (MathWorks, Inc., Natick, MA, USA) through using a desktop computer in the cubicles .

All participants rated the set of 182 photographs. Half of the photographs were from the National Geographic (NG) magazine's website (<https://www.nationalgeographic.com/>), and the other half were taken from the Royal Institute of British Architects (RIBA) Library archive websites (<https://www.architecture.com/image-library/>). The final selection of photographs aimed for content diversity, as can be seen in the example below (Figure 6). While themes of nature (e.g. landscape & animals) dominated the National Geographic photographs, there were also photographs with exclusive or partial human content. The RIBA photographs included a wide range of architectural photographs, including external to internal viewpoints, and from traditional designs to more modern ones.

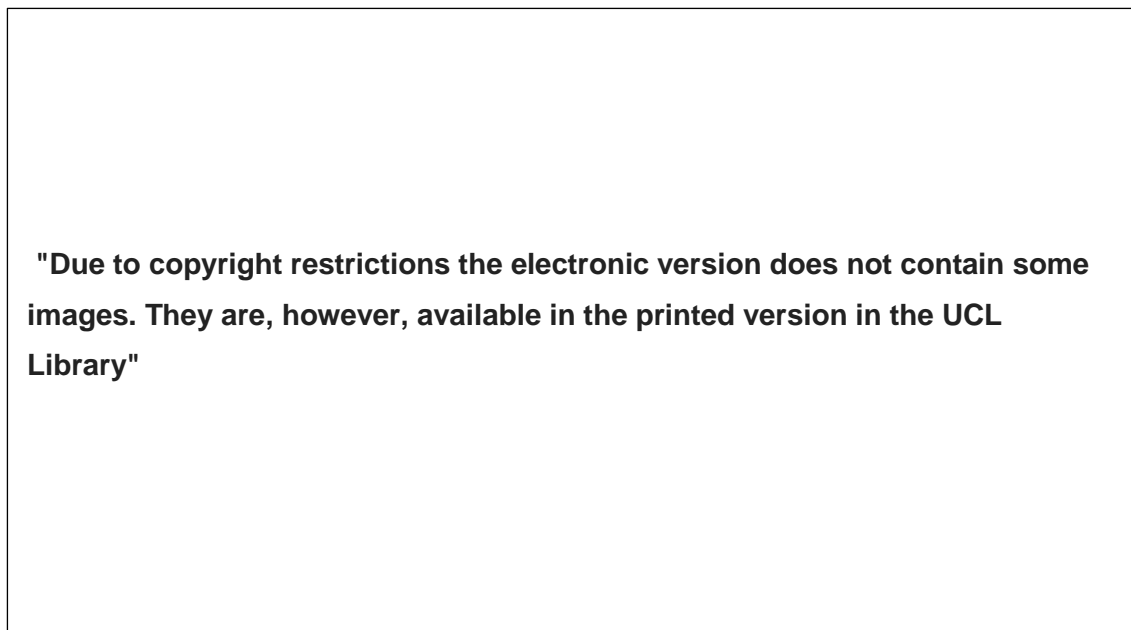


Figure 6. Sample stimuli (Study 1), consisting of National Geographic (above) and RIBA (below) photographs

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<sup>21</sup> Note how the 'beautiful' paintings seem to have more colour and saturation than the 'sublime' paintings. Also note the additionally suggested search options immediately below the search line. These elements, the psychophysics and conceptual associations of the sublime and beautiful, are subsequently elaborated in chapters 3 and 8, respectively. While in hindsight these characteristics are obvious, at this time of the PhD, the focus on blueness seemed to have overshadowed these observations.

The entire set of photographs appeared in randomised order, which was different for each participant, and each photograph was presented in landscape-orientation, with size 20.6cm × 27.47cms on the screen. Each photograph was rated for its evoked sublimity by having the horizontally-aligned number keys on a standard QWERTY keyboard pressed, from 1 (not at all) to 9 (very much so). A visual scale, preceded by “this is sublime”, appeared on the screen below the image in each trial to assist the rating process. Participants could view each image as long as they wished, and as soon as a button was pressed, the image disappeared and the next stimulus appeared after 0.5 seconds.

## 1d.2.2. Results

**1d.2.2.1. Between-participants agreement.** To what degree people have responded consistently to each another was first estimated by a set of bivariate correlations between the 4 participants. As can be seen in Table 2, although the correlation sizes are not large, all participants were consistent to each other at statistically significant levels.

Table 2. Correlation table: Four participants ratings (Study 1)

	Participant 1	Participant 2	Participant 3	Participant 4
Participant 1				
Participant 2	0.40			
Participant 3	0.34	0.34		
Participant 4	0.29	0.25	0.27	

*Note.* All coefficients are significant at  $p < .001$ . N of observation for each correlation was 182, representing the 182 stimuli.

Note, however, that Participant 4 seems to have a set of generally smaller consistency scores compared to the other scores, which could possibly indicate that this particular participant may be statistically different from the other three. In order to test this possibility, a Q-mode factor analysis was conducted on the data. In terms of data organisation, a Q-mode factor analysis transposes the rows and columns of a conventional factor analysis (i.e. R-mode factor analysis). Where the conventional factor analysis looks for principal components among items with participants as observations, the Q-mode factor analysis conversely analyses the participants, with items as observations. This makes the Q-mode factor analysis a tool for measuring correlation structures among participants, and hence has been used to detect systematic individual differences in previous empirical aesthetics works (McManus, 1980; McManus, Cook, & Hunt, 2010; McManus & Wu, 2013).

The Q-mode factor analysis, with principal components followed by a Varimax rotation, suggested one main factor. This can be seen in the scree plot in Figure 7, where there is a clear “elbow” after one factor (raw eigenvalues: 1.95, 0.78, 0.68, and 0.59). The first factor

explained 48.73% of the variance, followed by 19.44%, 17.06%, and 14.77%. As such, it is possible to statistically conclude that the four participants gave consistent responses as a single group.

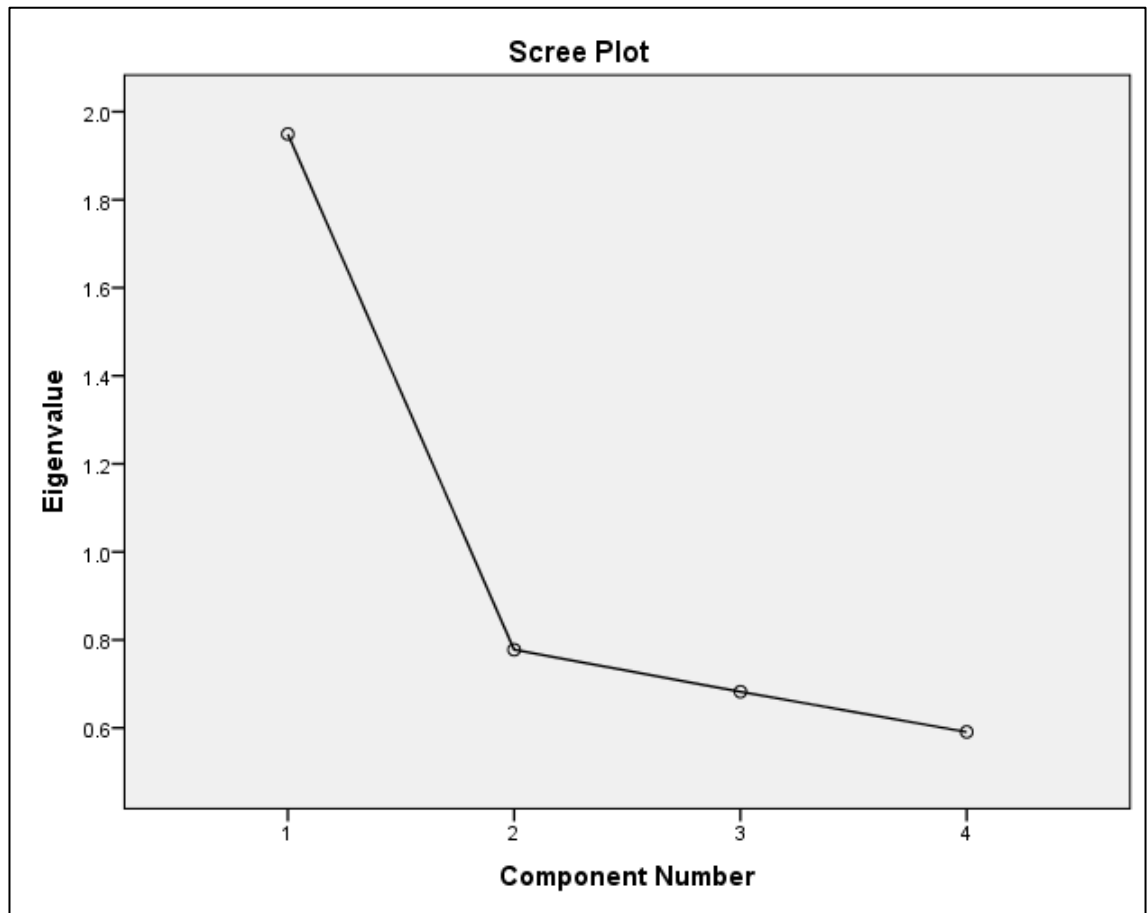


Figure 7. Screen plot of Q-mode factor analysis (Study 1).

**1d.2.2.2. National Geographic vs. RIBA.** With between-participants consistency confirmed, the four participants's responses were aggregated. Using the aggregated score, it was tested if there may be systematic differences between the ratings of the 96 National Geographic photographs and the 96 RIBA photographs. On average, the National Geographic photos scored 6.37 (*SD*: 0.94) on sublimity, and the RIBA scored 4.91 (*SD*: 0.94). The higher sublimity score for National Geographic was statistically significant,  $t(190) = 13.13$ ,  $p < .001$ ,  $d = 1.54$ . A histogram denoting the general spread of items can be seen in Figure 8.

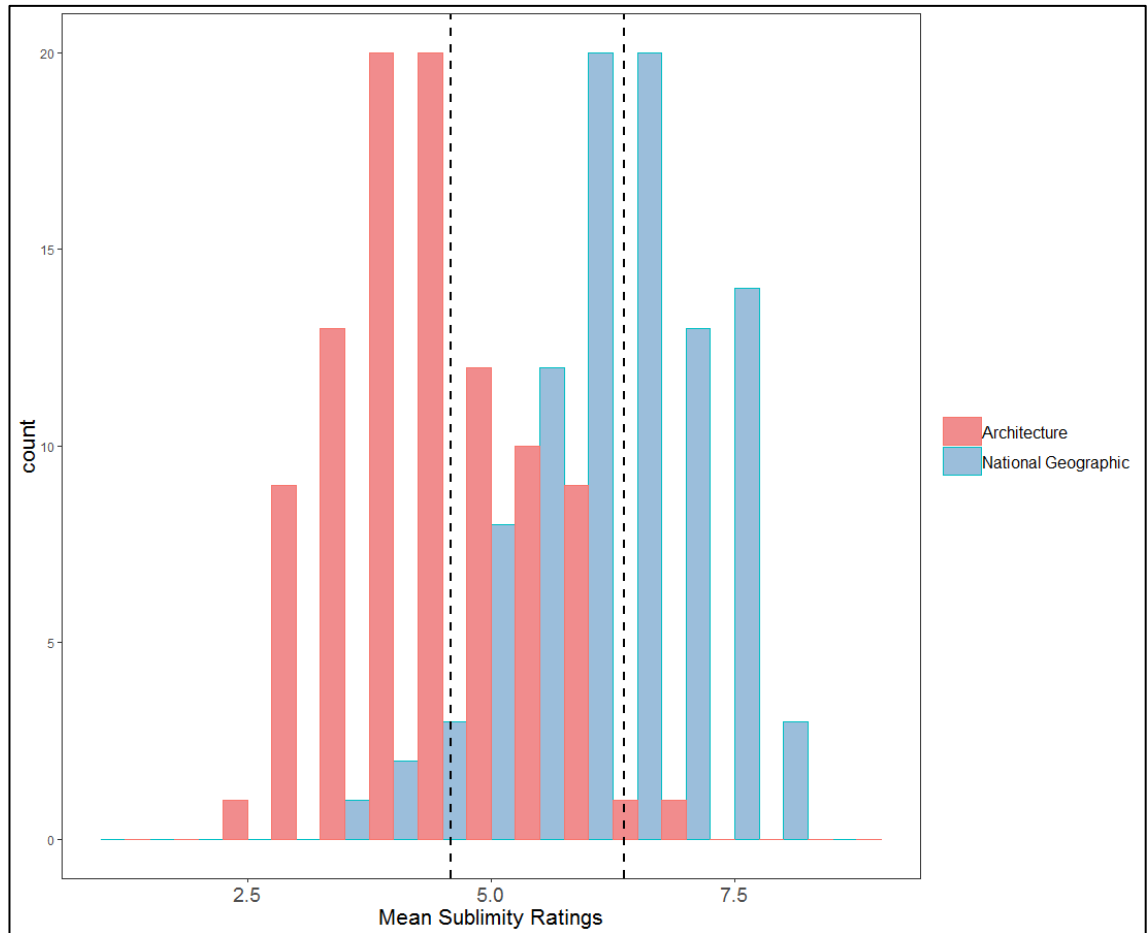


Figure 8. Histogram of NG and RIBA items. The dotted lines represent the mean values for each group (Study 1).

**1d.2.2.3. Determinants of sublimity.** What makes an image sublime? Beyond the factor of general stylistic content of photographs observed between NG and RIBA stimuli, the following four factors were considered: the presence of humans, the size of humans (among photographs with humans), presence of blue to the naked eye, and the presence of horizontal elements (indicating landscape).

To control for photograph style, only the NG images were used, and each variable was coded manually and dichotomously for each of the 96 NG photographs. The size of humans was simply divided into approximate ‘large’ and ‘small’ (note that given the exploratory nature of the study, the analyses were kept simple).

As can be seen in Table 3, there were important content-related predictors of sublimity. While the presence of humans made little difference, the presence of small humans, colour blue, and horizontal elements were likely to make a photograph sublime.

Table 3. Descriptive and inferential statistics (Study 1)

	<i>n</i>	mean	<i>t</i>	<i>p</i>
Human presence	<u>No</u> 53	6.50 ( <i>SD</i> : 0.79)	<i>t</i> (94) = 1.47	.15
	<u>Yes</u> 43	6.22 ( <i>SD</i> : 1.08)		
Human size	<u>Small</u> 30	6.55 ( <i>SD</i> : 0.95)	<i>t</i> (40) = 3.50	<b>0.001</b>
	<u>Large</u> 12	5.40 ( <i>SD</i> : 1.00)		
Blue presence	<u>No</u> 49	6.13 ( <i>SD</i> : 0.82)	<i>t</i> (94) = 2.61	<b>0.01</b>
	<u>Yes</u> 47	6.62 ( <i>SD</i> : 1.00)		
Horizontal element	<u>No</u> 52	6.03 ( <i>SD</i> : 0.95)	<i>t</i> (94) = 4.14	<b>&lt; .001</b>
	<u>Yes</u> 44	6.77 ( <i>SD</i> : 0.76)		

*Note.* The numbers in bold represent a significant difference at  $p < .05$ .

### 1d.2.3. Discussion

Study 1 was the first empirical and exploratory work of the thesis. Three main objectives were assessed, namely between-participants agreement, differences between photograph styles (National Geographic vs. RIBA), and the prediction of sublimity through photograph content. It followed that the 4 participants rated consistently to each other. NG photographs were generally more sublime than RIBA photographs. Lastly, the smaller the humans, the bluer, and the more horizontal elements could be seen in a photograph, the more sublime the photograph was. These findings, by demonstrating psychometric consistency, along with the presence of a potential set of predicting variables, justify sublimity as a valid scientific study.

Needless to say, there are numerous limitations to this initial exploration. Sublimity in itself may not offer the insight initially desired, given the generality of its everyday usage. It may be possible that participants simply gave ratings of “general goodness”, beauty, or liking. This is a crucial interpretational barrier.

To answer this concern, a second pilot study was run, this time, making these possible psychological processes more explicit. In the new design, participants rated photographs for their evoked sublimity, beauty, and liking responses. It was also important to accommodate a design that allow testing for within-participants consistency, given the unproved test-rest reliability of the aesthetic measures. With new methodological updates, some of the findings from Study 1, such as the role of blueness and human size, were further explored in Study 2.

## 1d.3. Study 2

### 1d.3.1. Methodology

**1d.3.1.1. Participants.** Eight participants (7 female,  $M_{age} = 22.75$ ,  $SD_{age} = 10.66$ ) recruited through the University College London (UCL) subject pool took part in the study. All participants provided written consent prior to the start of the study.

**1d.3.1.2. Design and procedure.** Design-wise, there were two big changes from Study 1. Instead of having participants rate each image for only sublimity, the new study introduced two additional response variables, namely preference and beauty. However, since sublimity and beauty are potentially related aesthetic judgements, it was desirable for participants to avoid rating images on those two variables within the same trial, in concerns that one response could leak into the other. Simultaneously, it was desirable to have two judgements for each trial. A single response could enable participants to consider that response as a “general goodness”, meaning that the unique psychology process underlying that response could be lost.

The second change was the consideration of within-participants reliability, i.e. test-retest reliability, for all response variables. That is, each rating variable was rated by each participant at least twice.

In an attempt to capture these aspects, each participant rated a set of images consecutively four times, with image order randomised for each set. Where each set formed an experiment block, in one block, participants rated preference and beauty for all images. In another block, participants rated preference and sublimity for all images. Half of the participants rated preference-beauty in their first experiment block and then rated preference-sublimity in the next block. Then, the entire rating process was repeated in the two subsequent blocks. The other half of the participants had the preference-beauty and preference-sublimity blocks reversed in order.

Rating procedures for each trial were largely similar to Study 1, with people rating images on linear 1 to 9 Likert-like scales using the upper number keys in a standard QWERTY keyboard. Regardless of the block, participants always rated preferences first (with the visual cue of “I like this” below the image). Once a button was pressed, the scale was immediately replaced with either a sublimity scale (“This is sublime”) or a beauty scale (“This is beautiful”).

Because of the importance of participants understanding the distinction between the sublime and beautiful, participants were given brief characterisations of the sublime and beautiful prior to the rating task. The characterisations followed the *Oxford Dictionaries*. Sublimity was characterised as, “Of great excellency, producing an overwhelming sense of awe or other high emotion.” Beauty was characterised as, “combination of qualities that pleases the aesthetic senses, especially the sight.”

**1d.3.1.3. Materials.** As was with the previous study, the new study took place in a UCL experiment cubicle, and run via MATLAB. Unlike the previous study, only 48 images were used, a subset of the National Geographic photographs from Study 1. The 48 images were selected to represent the entire spectrum of low to high sublimity, based on the previous study’s rating data. Some samples are presented in Figure 9. The top row represents images of high sublimity, the middle row represents images of middle-level sublimity, and the bottom row represents images of low sublimity.



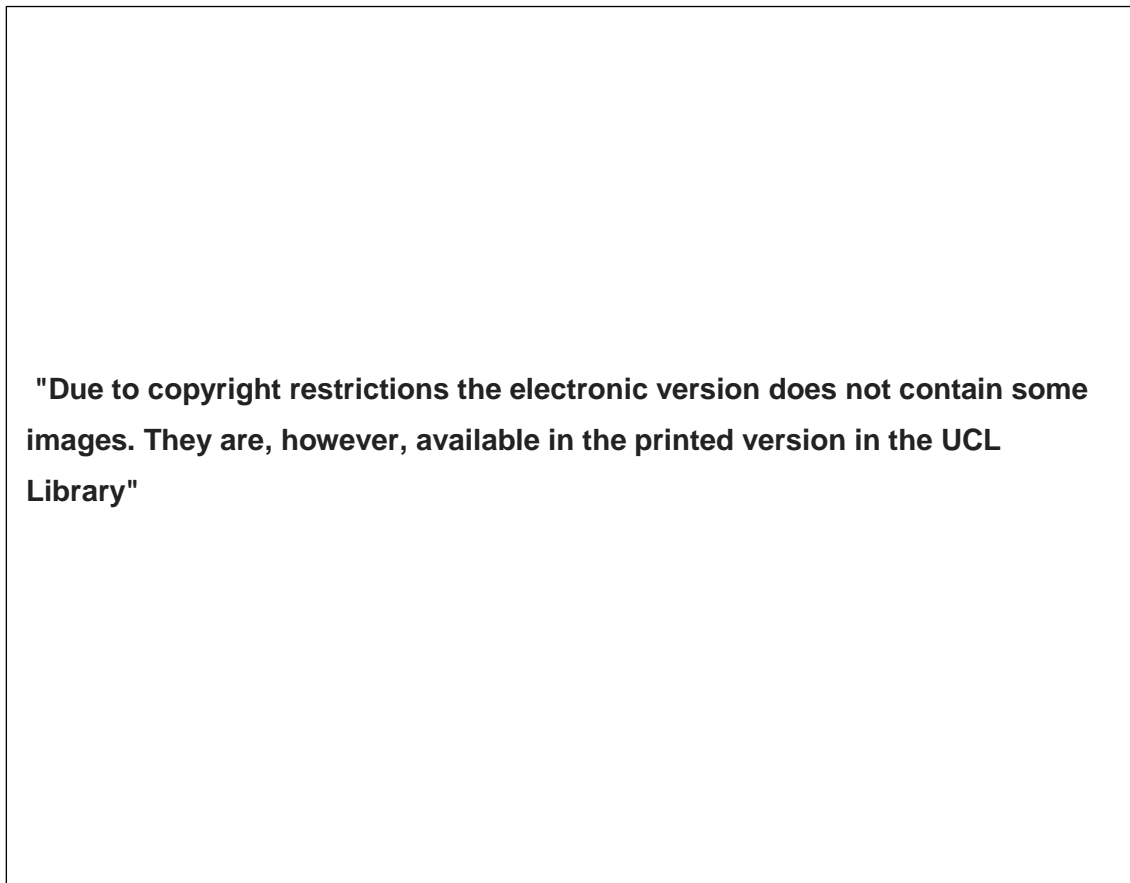


Figure 9. Sample stimuli (Study 2).

Given the previous study's observations regarding content characteristics influencing ratings, half of the new selection of images had human figures inside it. Of the human-present images, 10 photographs had more than three people in the content, and 9 photographs had humans small enough to not be able to distinguish their facial expressions. Around half of the images ( $N = 25$ ) had prominent elements of blue, and around half of the images ( $N = 23$ ) had horizontal elements.

RIBA photographs were excluded from testing, given the systematic differences that emerged between RIBA and the National Geographic photographs in Study 1. In addition, the RIBA images had a large "RIBApix" watermark in the right hand corner, which made the images lose their appeal as ideal experimental stimuli.

### **1d.3.2. Results**

**1d.3.2.1. Within-participants reliability.** For each participant, test-retest reliability scores for sublimity, beauty, and preference were calculated. Calculations using  $r$  values are based on Fisher's  $Z$  transformations, but presented in  $r$  values for interpretability.

Across the eight participants, sublimity had an average test-retest score of 0.74 ( $SD$ : 0.26). Beauty had an average test-retest score of 0.72 ( $SD$ : 0.20). Preference had an average test-retest score of 0.70 ( $SD$ : 0.15). These values are considered acceptable levels of test-retest

reliability (Algina & Crocker, 1986). Table 4 presents the test-retest scores for all eight individuals. All  $r$  values were significant at  $p < .001$  levels.

Table 4. Test-retest scores for sublimity, beauty, and preference responses (Study 2)

Participant	Sublimity $r$	Beauty $r$	Preference $r$
1	0.84	0.77	0.70
2	0.50	0.49	0.74
3	0.59	0.70	0.64
4	0.86	0.70	0.60
5	0.66	0.67	0.78
6	0.82	0.74	0.55
7	0.72	0.85	0.76
8	0.77	0.73	0.75

*Note.* All coefficients are significant at  $p < .001$ . N of observation for each correlation was 48, representing the 48 stimuli.

**1d.3.2.2. Between-participants agreement.** Given the acceptable levels of within-participants reliabilities, ratings were aggregated by items for each participant. To estimate between-participants agreement, Q-mode factor analyses with the same settings as used in Study 1 were computed, this time for each response variable.

As before, sublimity appeared to have a single-factor solution, determined by the prominent “elbow” after the first factor. The first factor explained 42.83% of the variance, followed by 13.76%, 12.95%, 10.74%, 7.55%, 5.23%, 3.86%, and 3.09%. Beauty, like sublimity, appeared most suited for a single-factor solution. The first factor explained 40.04% of the variance, followed by 16.06%, 11.97%, 9.74%, 7.51%, 6.51%, 4.82%, and 3.34%. These analyses demonstrate that there is evident to suggest that sublimity and beauty ratings are consistent across participants.

Preference, on the other hand, showed no such homogeneous rating patterns, with the factors explaining the following levels of variance: 32.86%, 20.96%, 14.21%, 12.66%, 8.01%, 4.85%, 3.74%, and 2.72%. Understandably, the scree plot displayed no distinct “elbow.” The scree plots of all three response variables are presented in Figure 10.

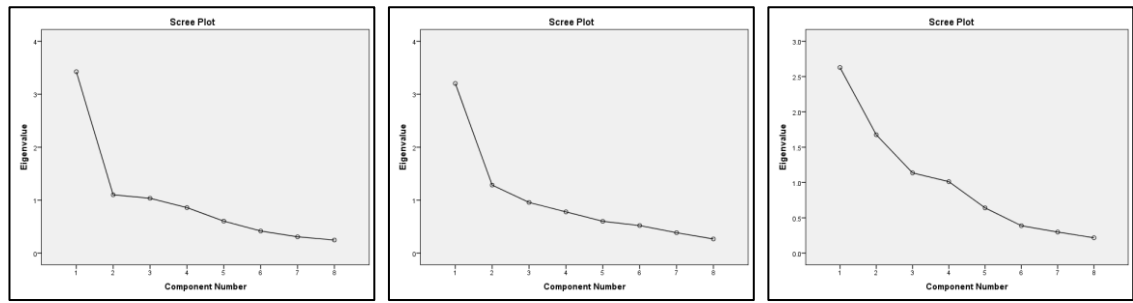


Figure 10. Screen plots for Q-mode factor analyses for sublimity (left), beauty (centre), and preference (right) (Study 2)

**1d.3.2.3. Ratings correlation.** To determine the relationship between sublimity, beauty, and preference, the three variables were correlated against each other for each participant. The correlations for each participant can be seen in Table 5. The mean correlation between sublimity and beauty is high,  $r = 0.71$  ( $SD = 0.41$ ), and where preference is correlated with sublimity at a high degree,  $r = 0.71$  ( $SD = 0.48$ ), the correlation between preference and beauty is also substantial,  $r = 0.79$  ( $SD = 0.39$ ).<sup>22</sup>

Table 5. Correlation table: sublimity, beauty, and preference responses (Study 2)

Participant	Sublimity-Beauty $r$	Sublimity-Preference $r$	Beauty-Preference $r$
1	0.46**	0.24	0.77***
2	0.24	0.23	0.37*
3	0.59***	0.69***	0.76***
4	0.70***	0.80***	0.88***
5	0.70***	0.49***	0.73***
6	0.93***	0.94***	0.92***
7	0.79***	0.79***	0.70***
8	0.85***	0.86***	0.91***
Mean	0.71	0.71	0.79

Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ . N of observation for each correlation was 48, representing the 48 stimuli.

Looking at the individual correlations, note that some participants, especially the first two participants, have weaker or non-significant correlations. That said, no correlation coefficients are negative, indicating that the general tendency of the aforementioned correlations are maintained. As such, overall, there is a tendency for sublimity, beauty, and preference judgements to move together.

<sup>22</sup> When participants' raw ratings were aggregated across participants for each rating, and the aggregated ratings were correlated against each other, the correlation pattern was replicated ( $r_s = 0.82, 0.75, \& 0.78$ , in the same order as before, and all  $p_s < .001$ ).

**1d.3.2.4. Determinants of ratings.** Following up on the previous study, the relationship between certain characteristics of photographs, such as blueness and human size, and rating outcomes were explored. In the present study, a more refined method of calculation was used by converting some of these variables, where possible, to continuous variables.

In calculating the blueness of an image, the image was converted into an rgb (red-green-blue) space via MATLAB. The blueness of each image was then determined by averaging the blueness pixels across each image, based on the image's blue space. A sample screen of decomposing an image into the three colour spaces can be seen in Figure 11. In the new arrangement, each image had a continuous blueness value, instead of the dichotomous categorical labels of 'there is blue' and 'there is no blue.'

The advantage of this conversion is that continuous variables allow the considerations of subtle differences between individual items that categorical variables fail to capture. The measure calculates the degree of blueness across all items, with the degree of blueness providing statistically crucial information. Secondly, and especially relevant for the calculation of blueness, the method allows the accounting of physical characteristics that are too subtle to be immediately or consciously registered with the naked eye. Referring back to Figure 11, if it wasn't for MATLAB, it would have been close to impossible to determine how much, for instance, greenness, there is in the example photograph.

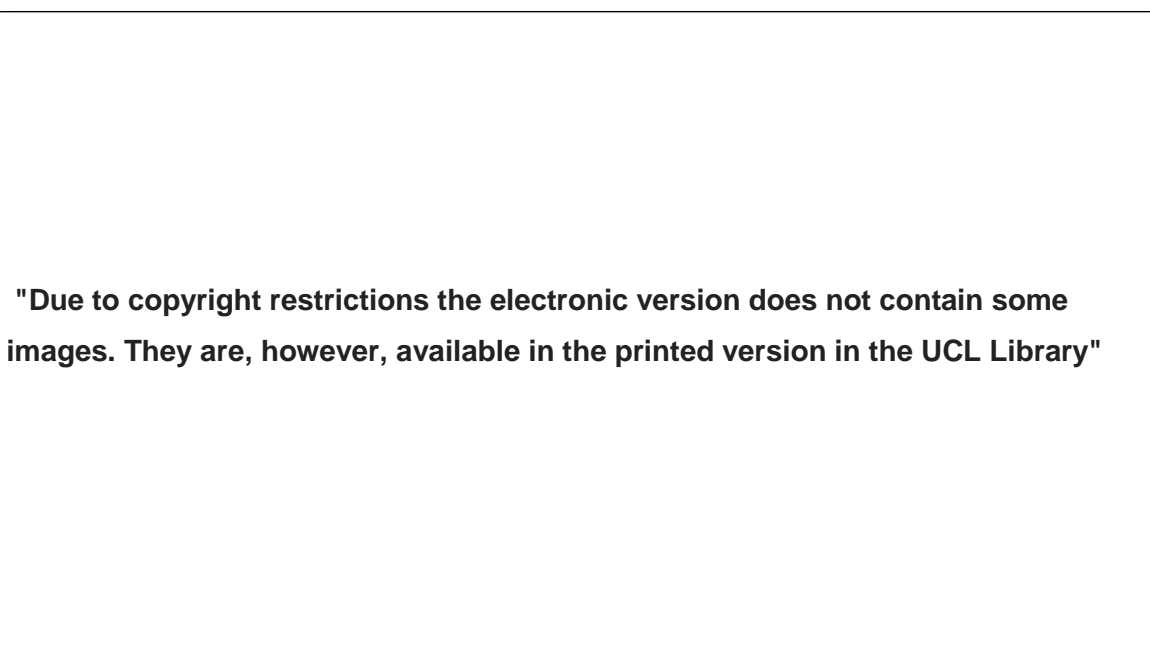


Figure 11. The decomposition of an image into the red-green-blue space through MATLAB.

Human size was determined by two variables, one as a continuous variable (human size), and the other as a categorical variable (human number). It is possible, for instance, that the more humans there are, the more smaller people may seem. For the human size variable, the ratio of the area of the largest human face in the photograph against the area of the entire image was

measured. The number of humans were determined by categorising the photographs into three categories, namely ‘1 person’, ‘around 5 people’, and ‘many people’ – this variable was not converted to a continuous variable because some photographs had simply numbers of people too much to count. Last but not least, after determining that elements of horizon commonly denoted landscapes, and thinking that nature is a more theoretically interesting variable than ‘horizontal element’ in understanding the sublime, photographs were dichotomously categorised into those with nature and those without nature (e.g. city-scape).

The three rating variables were aggregated across participants, and suitable inferential statistics were calculated (see Table 6). Blueness was not associated – using the rank-based Spearman’s rho, in concerns that some of the data are excessively positively skewed – with any of the ratings. On the other hand, face size was associated negatively with all three variables, indicating that the smaller humans are, the more liked, sublime, and beautiful, a photograph becomes. Face number did not have an influence on any of the rating variables. Last but not least, the presence of nature (31 of the 48 images had nature) seemed to increase degrees of sublimity (*Ms*: 5.37 vs. 6.35) and beauty (*Ms*: 5.74 vs. 6.49), but not preference (*Ms*: 5.61 vs. 6.00).

Table 6. Inferential statistics table for the determinants of ratings (Study 2)

	Sublimity	Beauty	Preference
Blueness	$r_s(48) = 0.12$	$r_s(48) = -0.05$	$r_s(48) = -0.06$
Face size	$r_s(23) = -0.56^{**}$	$r_s(23) = -0.51^*$	$r_s(23) = -0.51^*$
Face number (3 levels)	$F(2,20) = 1.69$	$F(2,20) = 0.25$	$F(2,20) = 0.33$
Nature (2 levels)	$t(46) = 2.99^{**}$	$t(46) = 2.45^*$	$t(46) = 1.37$

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

### 1d.3.3. Discussion

Study 2 tested some of the findings found in Study 1, but tested newer inquiries, such as the consideration of other response variables and within-participants reliability. While between-participants agreement was replicated on a newly recruited set of 8 participants, the new study also demonstrated this on beauty, as well as sublimity. Preference, on the other hand, seemed to display a certain degree of inconsistency between participants. For preference, it may be that unlike sublimity and beauty that are explicitly aesthetic judgement, preference may be associated with other psychological modes, such as motivation and approach-avoidance cognition. And these motivational elements, because they are closely linked with one’s unique survival sensitivities, may cause more individual uniqueness. Alternatively, it could mean that some people may like sublimity more than others.

It was clear that there was a highly acceptable level of within-participants reliability. In a way, how consistent one is with one’s own response fulfils the most crucial and basic assumption of studying the sublime or similar higher-level psychological processes. After all,

there can be individual differences in aesthetic processes (e.g. McManus, 1980), but it is crucial to assume that people know what they are doing.

In predicting the ratings through image characteristics, although blueness and human size emerged as important factors in Study 1 in predicting sublimity, it was revealed that there were more subtleties. Blueness, measured via a more sophisticated method of using continuous variables, did not emerge as a significant correlate to any response variables.

The size of humans in photographs, however, correlated strongly with sublimity, beauty, and preference. The ‘size of human’ effects may be to do with the fact that the smaller the humans, the larger the surroundings tend to get. This would mean that participants implicitly make size judgements during image rating tasks, and they may find much sublimity, beauty, and liking, through depictions of small humans. This brings the attention back to the aesthetic appeal of the two paintings presented in the opening chapter, where humans are presented in a small scale (Figure 1 and Figure 2). That said, the findings go against the claims by Edmund Burke (1759/2008), that large-perceived objects are sublime, while small-perceived objects are beautiful. There is a need for further investigation on this matter.

The presence of nature was mostly linked with sublimity and beauty, but not with preference. This indicates the possibility that sublimity, beauty, and preference, may be related, but ultimately separate experiences. Had the three judgements been conceived as a single experience, the influence of nature would have affected the three variables together. This was not the case. While nature evokes passions of sublimity and beauty, it may be that some people like nature more than others.

#### **1d.4. Chapter Summary**

The present chapter of two pilot studies provides the first steps regarding the issues of reliabilities of both within-participants and between-participants responses, the relationship between sublimity, beauty, and preference, and stimulus characteristics in predicting those judgements. As a consequence of the ratings, the two studies also provide a data-driven set of stimuli to be used for future studies.

The findings notwithstanding, the fact that the studies tested only 12 people in total limits the generalisability of findings. Studies with a larger group of participants are required. There are other ways future studies can additionally benefit the empirical narrative. Firstly, while sublimity, beauty, and preferences, are indeed potentially distinct processes, they still are within the limits of some positive evaluation. A relatively valence-free judgement, such as interestingness might add a cognitive dimension.

Secondly, while National Geographic images provide an interesting group of psychological responses, these images on baseline are of high quality, especially, of aesthetic quality. This means that while there is a spread of aesthetic judgements across the images, the

spread can be bettered. It can be a solution to add photographs that are not explicitly artistic, but still are measured for some known emotional measures.

Lastly, given the focus of the sublime and beautiful, two additional questions can be asked. On the one hand, how do people conceptualise the sublime and beautiful? This may require participants to make subjective judgements regarding the emotional and conceptual natures of sublimity and beauty. On the other hand, even without explicit conceptualisations, to what degree do people actually make distinctions between the sublime and beautiful in simple rating tasks, and are these distinctions reliable in any way? Regarding the last point, it may be useful to devise a way to quantify how one rates sublimity in relation to beauty, e.g. sublime but not beautiful or both sublime and beautiful.

The following study addresses these concerns, based on a larger participant number.

**Chapter 2. Studies 3 and 4: Establishing the Psychometrics of Sublimity and  
Beauty; Reliabilities, Relation to other Aesthetic Judgements, and Stimulus  
Characteristics Correlates**



## 2.1. Introduction

The previous pilot studies, which were very exploratory, looked at a number of psychometric properties of sublimity and beauty judgements. These included test-retest reliabilities, between-participants agreements of sublimity and beauty judgements, the general relationship between sublimity, beauty, and preference, and stimulus characteristics that correlate with these aesthetic judgements. The present chapter follows up on these explorations as to replicate and therefore verify those results, with a particular focus on the two main measurements of the thesis.

Regarding the reliabilities of sublimity and beauty judgements, of particular concern is the degree to which individuals can reliably distinguish the sublime from the beautiful, as well as being reliable in judgements of the sublime and beautiful independently. This distinction carries important theoretical concerns. Edmund Burke (1759/2008), like many of his peers in eighteenth century Britain, assumed that sublimity and beauty were separate if not opposite aesthetic experiences. Should reality bear resemblance to the claim, it should be unlikely that people confused between what elicits sublimity but not beauty, and what elicits beauty but not sublimity. A word association task examines how people distinguish the sublime and beautiful, conceptually.<sup>23</sup>

Differing from the two previous pilot studies, another measurement is introduced, namely interestingness. Interestingness, unlike sublimity, beauty, and liking, is emotionally neutral, and may tap upon more cognitive dimensions of judgements. Cognitive – as opposed to emotional – elements have been studied before in art appreciation (Gombrich, 1960), and finds place in empirical aesthetics, under the names of ‘curiosity’ (Berlyne, 1971) or ‘interest’ (Leder, Belke, Oeberst, & Augustin, 2004). If cognition does indeed operate separately to emotions, as commonly implied (e.g. Leder et al., 2004), there is good reason that interestingness would be independent to the sublime or similar aesthetic “passions” (Burke, 1759/2008).

The studies are run in similar settings as before, with the main rating task run via a computerised task.

## 2.2. Study 3

In the first of the two studies in the chapter, the reliabilities of sublimity and beauty were explored. Also explored was the relationship between sublimity, beauty, preference, and interestingness, and how the four rating variables relate to specific stimuli characteristics.

### 2.2.1. Methodology

**2.2.1.1. Participants.** The present study was run as a 2<sup>nd</sup> year mini-project of the ‘Design and Analysis of Psychological Experiments’ module, part of University College London’s (UCL) BSc Psychology degree.

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<sup>23</sup> The word association data are analysed separately in Chapter 9.

The participants of the present study mainly consisted of other 2<sup>nd</sup> year BSc psychology students, as students from the module partook in each others's mini-projects. Otherwise, friends or acquaintances of the experimenters were recruited. In all, 49 participants (38 female,  $M_{age} = 20.69$ ,  $SD_{age} = 2.32$ ) took part in the study. All participants provided written consent prior to the start of the study.

**2.2.1.2. Materials.** The study, as the previous pilot studies, was run via MATLAB 2015b (MathWorks, Inc., Natick, MA, USA), and was tested mostly in a UCL experiment cubicle. However, testing was also allowed to be run on personal laptops and elsewhere, assuming the testing was done in quiet and private settings.

A total of 96 images were rated throughout the study. Of these, 48 photographs consisted of the identical National Geographic stimuli used in Study 2 from the previous chapter.

The additional, newly chosen stimuli consisted of 48 images from the International Affective Picture System (IAPS; Lang et al., 1997), a standardised set of emotion-evoking photographs. The IAPS stimuli were chosen to represent a wide range of emotions, assessed in terms of the valence and arousal ratings provided in the IAPS manual (Lang et al., 1997). The final selection of IAPS photographs consisted of images with a range of levels of valence and arousal (see Table 7).

Table 7. Valence and arousal statistics of selected IAPS stimuli (Study 3).

	Low valence	High valence
High arousal	$M_{valence} = 2.74$ , $M_{arousal} = 6.76$ , $n = 10$	$M_{valence} = 7.60$ , $M_{arousal} = 6.79$ , $n = 10$
Low arousal	$M_{valence} = 3.44$ , $M_{arousal} = 3.82$ , $n = 10$	$M_{valence} = 7.82$ , $M_{arousal} = 3.77$ , $n = 10$
Moderate valence and arousal	$M_{valence} = 5.22$ , $M_{arousal} = 4.63$ , $n = 8$	

The study also included a word association task, where participants rated a set of 112 words and phrases on their perceived association with sublimity and with beauty. The list consisted of 50 words/phrases that appear commonly in original philosophical texts in describing (or describing against) sublimity or beauty. The words were mainly extracted from Ashfield and de Bolla (1996), and Hipple (1957). Also included were the 3 PAD dimensions (pleasure, arousal, & dominance; Mehrabian & Russell, 1974), aesthetic emotion terms developed in the Empirical Visual Aesthetics Lab at the University of Vienna (Pelowski et al., 2019), and awe-related words/phrases appearing in Bonner & Friedman (2011). The entire list of words and phrases can be seen in Figure 12.

To what degree is each word associated with the <u>sublime</u> and <u>beautiful</u> ?								
(Rating: 1-9)								
	S	B						
absorbed			dread			numinous		
active			dreamy			offended		
admiration			elegant			openness and acceptance		
adoring			elevating			orderly		
afraid			energetic			passionate		
agreeable			enlightened			peaceful		
amazed			euphoric			pleasant (vs. unpleasant)		
angry			exalting			pleasure		
anguished			existential awareness			power		
arousal (vs. non-arousal)			fascinated			presence		
ascending (vs. descending)			fearful			profoundness		
astonished			genius			psychologically distant		
astonishing			grand			religion		
at ease			great			sad		
awe-inspiring			grief			satisfied		
beautiful			happy			sense of connectedness		
bemused			heightened perception			sense of epiphany		
bored			heroism			sense of suspense		
calm			illuminated			sensual		
charmed			immense			shaken		
complex			imposing			shocked		
conflict			impressed			silent		
confused			ineffable			simple		
contemplative			innovative			smooth		
controlling			intense (emotion-wise)			softened		
curious			interested			solemn		
dark			irritated			solemn sedateness		
delighted			joyful			soothed		
delightful			languorous			spiritual		
delightful horror			little			stimulated		
desirous			lively			strength		
disconcerted			loving			surprised		
disgusted			low (vs. high)			tender		
distanced			magnanimous			terror		
dominance (vs. submissiveness)			majestic			touched		
			marvellous					
			melancholic					
			monumental					
			mystical					
			nature					
			noble					
			novel					

Figure 12. The word association task in full.

**2.2.1.2. Design and procedure.** The rating section of the study was divided into three sections. First, participants rated images in three blocks. The first two blocks each consisted of 48 trials. Half of the participants rated National Geographic photographs in the first block, and

International Affective Picture System (IAPS; Lang et al., 1997) photographs in the second block, while the other half of the participants had the order swapped. In the third block, i.e. the test-retest block, a subset of 10 photographs from the first block was selected and rated. The three blocks were separated by a short break.

Each trial was run in a manner similar to past pilot studies. Participants rated the evoked degrees of sublimity, beauty, preference, and interestingness for each image, while the image was still on the screen. As before, there were short cues below the image, e.g. “I like this”, to guide participants. To achieve parsimony in the rating process, the four aesthetic judgements appeared consecutively but in randomised order for each image. For instance, for a participant who rated an image in the order of sublimity, preference, beauty, and interestingness, the next image could have been rated in the order of beauty, sublimity, interestingness, and preference.

The image rating task was followed by a word association task, then by a recorded interview. In the interview, participants gave a short account of what they think is the relationship between sublimity and beauty.<sup>24</sup>

### **2.2.2. Results**

The results section is divided into the following five topics: (1) within-participants (or test-retest) reliability of sublimity and beauty ratings, (2) between-participants consistency of sublimity and beauty ratings, (3) relationship between the four measured aesthetic judgements, (4) differences between National Geographic and IAPS images, and (5) aesthetic correlates of stimulus characteristics.

**2.2.2.1. Within-participants reliability.** Test-retest reliabilities for sublimity and beauty were assessed, based on the 10 repeated items.<sup>25</sup> For each participant, a bivariate Pearson correlation between blocks 1 and 3 was calculated on those retested items. To examine the relationship between sublimity and beauty, two measures were additionally computed using the raw sublimity and beauty ratings. The first of these measures represented the degree to which a participant thinks an item is both sublime and beautiful, and the second, the degree to which a participant thinks an item is higher in one rating than the other, e.g. an item evokes more sublimity than beauty.

The two derived variables were computed using principal component analysis (see Figure 13). That is, in a principal component analysis, the first principal component represents

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<sup>24</sup> The interview data are not discussed in the thesis, as it overlaps much with works of Chapters 7 and 9.

<sup>25</sup> Initially, it was planned to repeat the entire first block again in the test-retest block (third block of the image rating task). However, due to negative feedback from participants pertaining to the strenuous study length, the study’s design was altered to only retest 10 randomly-chosen items from the first block. For the first five participants who had rerated the entire first block, their third block’s data in intact form was used in the test-retest analysis.

the degree to which a newly constructed dimension can maximise the variance between variables. A principal component score is allocated to each observation, which measures the degree to which an observation lies on the first principal component. The second principal component, which is orthogonal to the principal component, is a dimension that explains the second most variance in the data, and also comes along with its own second principal component scores for each observation. The same logic holds for the third, fourth, fifth, etc. principal components. The maximum number of components available equates to the number of items subjected into a principal component analysis.

In the case of sublimity and beauty, because there are only two variables to consider, there are two principal components. Following the aforementioned logic, the first principal component (henceforth PC1) thus refers to the degree a dimension explains both sublimity and beauty most effectively. Thus, the PC1 represents the degree to which an item is both sublime and beautiful. The second principal component (henceforth PC2), on the other hand, refers to the degree to which an item is more of one judgement (e.g. sublimity) than the other (e.g. beauty). This interpretation of the PC2 is possible because of the perpendicular relationship between the two principal components. Figure 13 represents a visualisation of the relationship. Note that dimension *a* is the first principal component, and *b*, the second principal component.

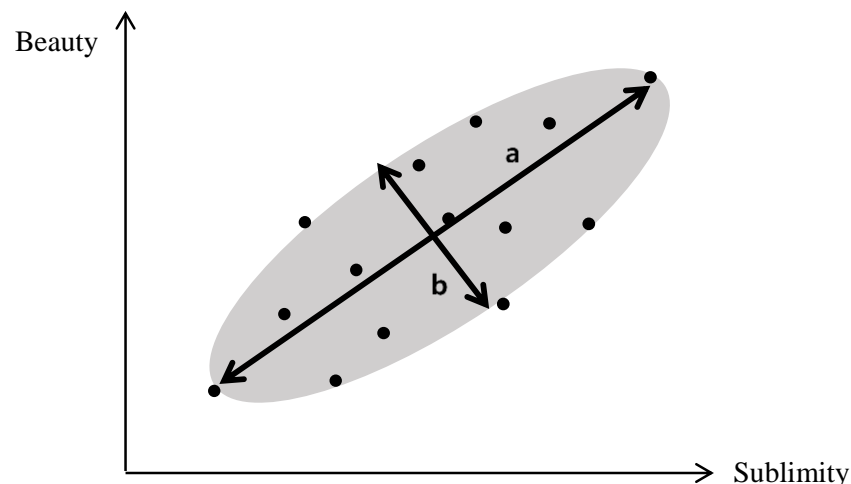


Figure 13. Visualisation of the two principal components in sublimity and beauty judgements.

For each participant, first and second principal component scores were computed using their individual raw sublimity and beauty ratings. These scores were then subject to test-retest correlations. All calculations using correlation coefficients are done using Fisher Z-transformed values, and are presented back in *r* correlation coefficients for interpretability.

Participants with exceptionally low level of reliability, i.e. 1.5 interquartile range below the first quartile in at least one of the four ratings ( $n = 5$ ), were examined. Perhaps owing to the fact that there was no course credit or financial compensations available for the task, these

participants did not seem to take the task seriously, giving single number responses across ratings. These participants were excluded from further analyses.

Across participants, sublimity, beauty, PC1, and PC2<sup>26</sup> had mean test-retest reliability scores of 0.84 ( $SD = 0.54$ ), 0.88 ( $SD = 0.45$ ), 0.89 ( $SD = 0.50$ ), and 0.60 ( $SD = 0.48$ ). As such, there was overall an agreeable level of consistency within individuals. In assessing if the four reliability scores are significantly different to each another, a one-way ANOVA between the four ratings revealed statistical significance,  $F(3, 170) = 19.43, p < .001$ . Post hoc analyses (Tukey HSD) informed that the PC2 scores had the lowest overall reliability in all comparisons,  $ps < .001$ , with the other three scores not being statistically different to each other,  $ps > .05$ . Figure 14 refers to a visualisation of reliability scores for all individuals.

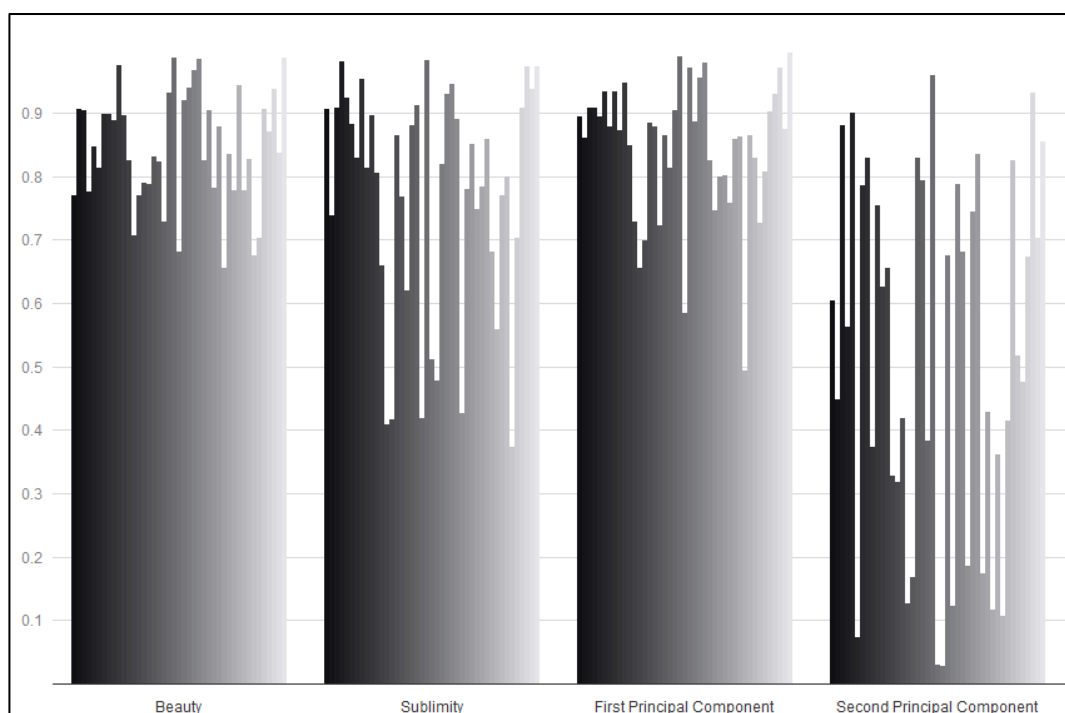


Figure 14. Distribution of individual test-retest reliability scores across four rating variables (Study 3).

**2.2.2.2. Between-participants agreement.** To what degree people rate images similar to one another was assessed using the Q-mode factor analysis. A detailed account of the analysis is provided in the previous chapter. The Q-mode factor analysis outcomes, via principal components and Varimax rotation, exposed single-factor solutions for beauty and PC1, with each scree plot displaying a clear-cut “elbow” after a single factor. For beauty, the first component explained 54.84% (followed by 3.77%, 3.38%, 2.95%, etc.), and for PC1, the first component explained 53.90% (followed by 4.48%, 3.80%, 3.16%, etc.). Thus, participants are consistent to each other when it comes to judgements of beauty and ‘both sublimity and beauty.’

<sup>26</sup> For the PC2 scores, the absolute values were used, given that the direction, i.e. plus vs. minus, of principal component scores are seemingly allocated at random.

The Q-mode factor analyses outcomes for sublimity and PC2 were less clear. The scree plot from sublimity’s factor analysis did not have a clear elbow, and the variances explained for the top 4 factors were 42.04%, 7.47%, 4.49%, and 3.72%, respectively. While the scree plot for PC2 somehow had a sharp-angled “elbow”, the variance explained by the first factor was only 21.19%, followed by 5.65%, 5.20%, and 4.77%. The scree plots are available in Figure 15.

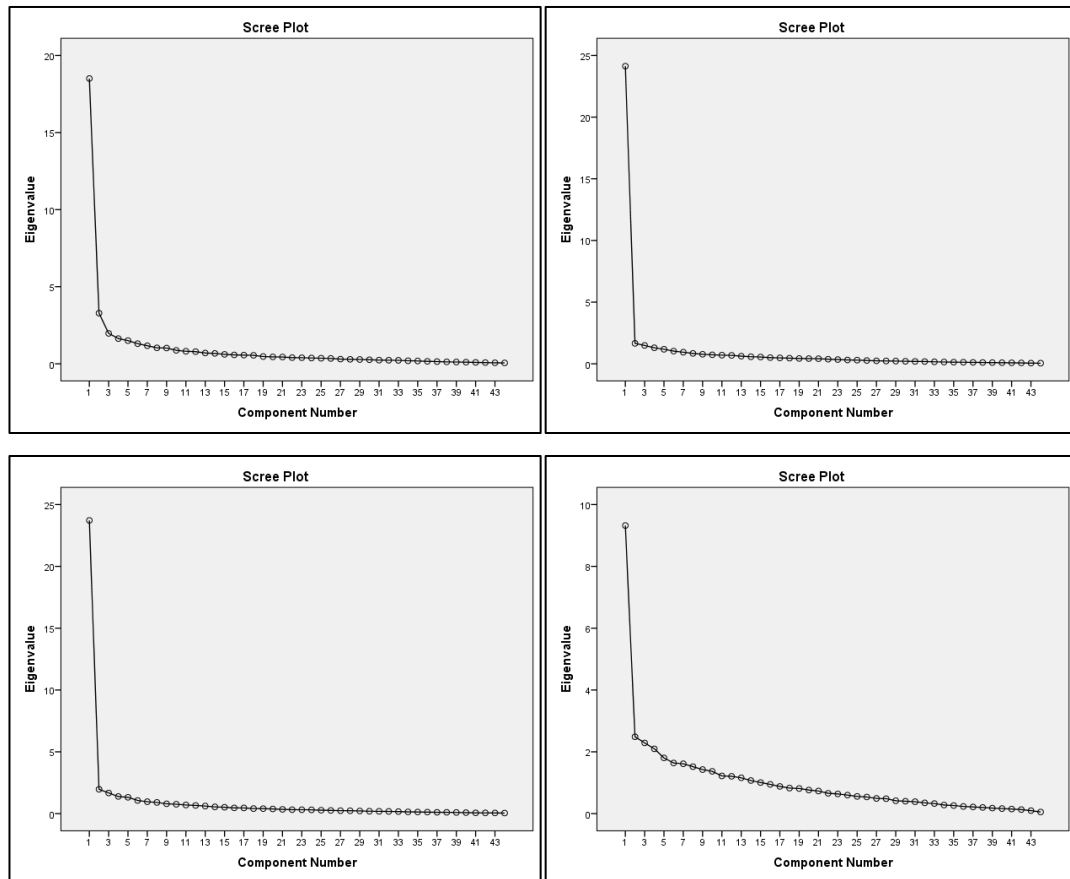


Figure 15. Scree plots for sublimity (top left), beauty (top right), PC1 (bottom left), and PC2 (bottom right) (Study 3).

To uncover the between-participants agreement for sublimity and PC2, 11 individuals (25% of total participants) with the highest levels of test-retest reliabilities were selected for the two measurements. When Q-mode factor analyses were run using the subset, sublimity had a single-factor solution, with the first factor explaining 51.36% of the variance, and the only other factor with at least 1 eigenvalue score explained 11.13% of the variance. When the raw sublimity ratings of these reliable individuals were averaged across participants, and correlated against the averaged sublimity ratings by the non-reliable 33 participants, there was a high level of consistency,  $r = 0.93$ ,  $p < .001$ , between the two groups. Therefore, sublimity ratings are similar among individuals with good test-retest reliability levels, and their scores are in whole similar to the rest of the participants.

Q-mode factor analysis using PC2 ratings from 11 reliable participants also gave a single-factor solution, although the solution was less clear than that of sublimity. The first factor

explained 30.00% of the variance, followed by 12.57%, 10.72%, and 9.78%. As before, the averaged PC2 scores among the reliable 11 individuals were correlated against the average PC2 scores among the non-reliable 33 participants. The correlation was moderate,  $r = 0.48$ ,  $p < .001$ .

One reason for the moderate effect size for the immediately preceding correlation was due to the fact that MATLAB (through which the principal components scores were calculated), gives the directionality, i.e. plus vs. minus signs, of the principal scores at random for each individual. In this context, the averaging up of the principal component scores between participants would thus cancel out scores between participants. Note that the directionality of numbers, as long as the magnitudes are intact, does not affect the extraction of components nor the inter-relations of components in factor analyses.

One solution is to compute a score that signifies what the PC2 score signifies, yet which makes the meaning of the directionality of the scores more predictable. In this newly computed score, raw beauty ratings were subtracted from the sublimity ratings, i.e. ‘sublimity minus beauty.’ As opposed to PC2, which represents the degree to which one judgement is higher than the other, the ‘sublimity minus beauty’ (henceforth S-B) specifically represents the degree to which sublimity judgement is higher than beauty judgement. Using this score, a Q-mode factor analysis using the 11 most reliable individuals of the S-B score revealed an almost identical result as before, with the first three factors explaining 31.22%, 13.27%, and 10.76% of the data’s variance, respectively. When the averaged S-B scores for the 11 reliable individuals were correlated against the S-B scores for the 33 non-reliable individuals, the correlation was highly significant,  $r = 0.82$ ,  $p < .001$ . Thus for S-B, like sublimity, there is a general agreement among those who have good test-retest reliabilities, and their averaged ratings reflect the ratings of the rest of the people.

In subsequent analyses, the PC1 and PC2 scores are replaced with ‘sublimity plus beauty’ (henceforth S+B) and S-B, respectively.<sup>27</sup>

**2.2.2.3. Relationship between judgements.** What is the general relationship between sublimity and beauty, and how do they relate to preference and interestingness? All ratings were aggregated by stimuli, and correlated against each other (Table 8). Sublimity and beauty were highly correlated,  $r = 0.89$ ,  $p < .001$ . A scatterplot reveals the relationship (Figure 16).

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<sup>27</sup> When the reliability analyses were run again using S+B and S-B scores, the outcomes were nearly identical to those of PC1 and PC2, respectively.



Table 8. Correlation table: Four ratings (Study 3)

	Sublimity	Beauty	Preference	Interestingness
Sublimity				
Beauty	0.89			
Preference	0.86	0.98		
Interestingness	0.83	0.73	0.73	

*Note.* All coefficients are significant at  $p < .001$ . N of observation for each correlation was 96, representing the 96 stimuli.

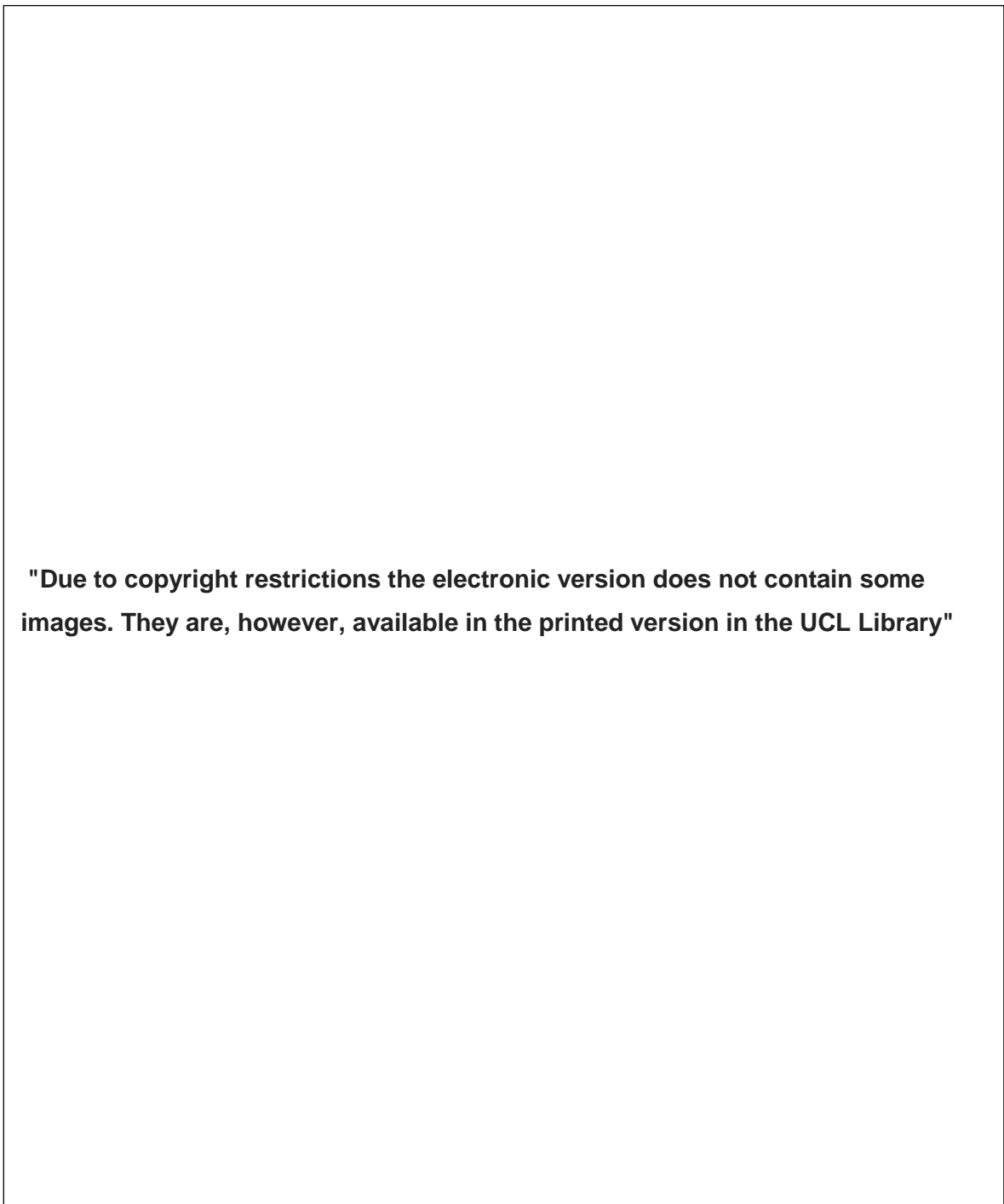


Figure 16. Average sublimity and average beauty ratings scatterplot with images (Study 3)

To further explore the relationship between the four ratings, a factor analysis was run using the four rating types as items, and the 96 photographs (with their aggregated ratings for each rating type) as the observation, using principal components and Varimax rotation. The outcome revealed a one-factor solution, with that factor explaining 87.75% of the variance. No other factor had an eigenvalue score above 1. As such, the four response variables seem one an large a single psychological factor.

To paint a clearer picture of the relationship between the four ratings and stimuli, a correspondence analysis was run. The correspondence analysis, while an exploratory technique utilised to examine a general correspondence between columns and rows in a dataset, is also used as a way to visualise the structures of separate categorical variables. According to the correspondence analysis, no relation between items and judgement types were established,  $\chi^2(1) = 35.53, p > .05$ . For purposes of visualisation, a two-dimensional solution was taken. It is possible to interpret, through Figure 17, that beauty and preference are grouped along Dimensions 1, and relatively independent to these judgements is sublimity, which represents Dimension 2.

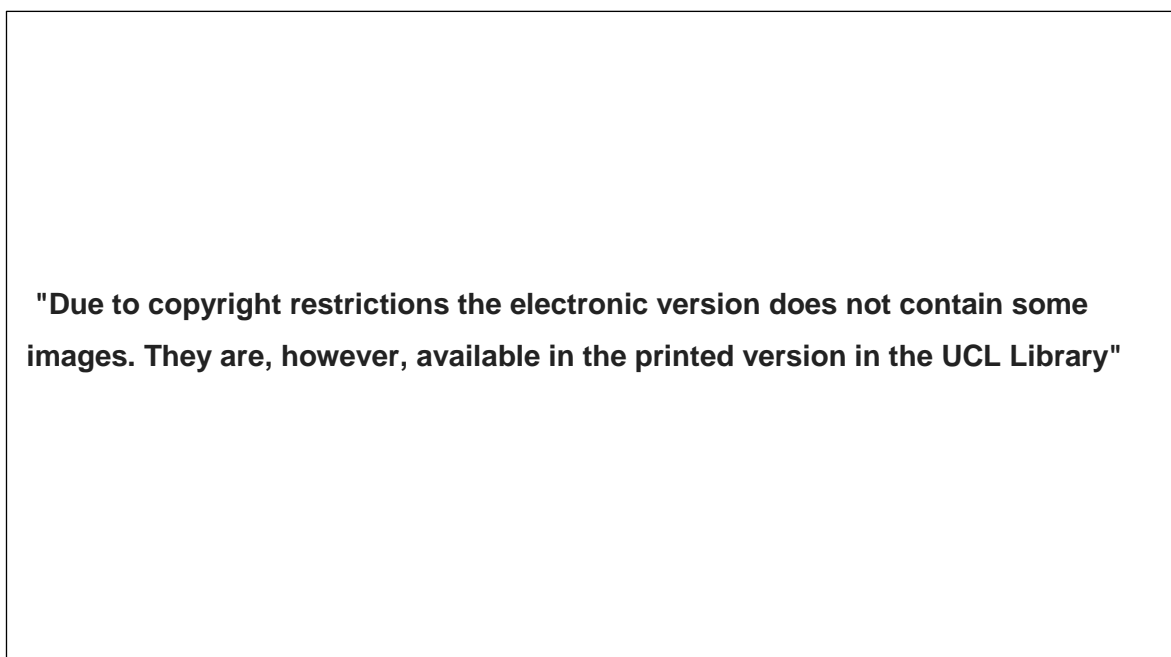


Figure 17. A two-dimension solution of the correspondence analysis: judgement type and stimuli in a common space (Study 3)

**2.2.2.4. National Geographic vs. IAPS.** To explore potential systematic differences that exist between the two sources of stimulus, National Geographic and IAPS photographs, a series of *t*-tests were run. All *t*-tests revealed significance (Table 9), and the distribution of images are seen in Figure 18. Despite the significant differences, both types of images form a nice distribution along the rating spectrum. Particularly, the wide distribution of IAPS images allow IAPS images as suitable candidates for aesthetic research.

Table 9. NG vs. IAPS photographs according to rating type (Study 3).

Rating type	Descriptive statistics	$t$ ( $df = 94$ )
Sublimity	<u>NG</u> 5.42 ( $SD = 1.38$ )	6.17
	<u>IAPS</u> 3.71 ( $SD = 1.34$ )	
Beauty	<u>NG</u> 6.17 ( $SD = 1.27$ )	6.82
	<u>IAPS</u> 3.95 ( $SD = 1.84$ )	
Preference	<u>NG</u> 6.01 ( $SD = 1.11$ )	6.25
	<u>IAPS</u> 4.04 ( $SD = 1.88$ )	
Interestingness	<u>NG</u> 6.30 ( $SD = 0.69$ )	8.63
	<u>IAPS</u> 4.63 ( $SD = 1.16$ )	

Note. All coefficients are significant at  $p < .001$ . “NG” refers to National Geographic photographs. “IAPS” refers to International Affective Picture System photographs. Descriptive statistics represent mean values.

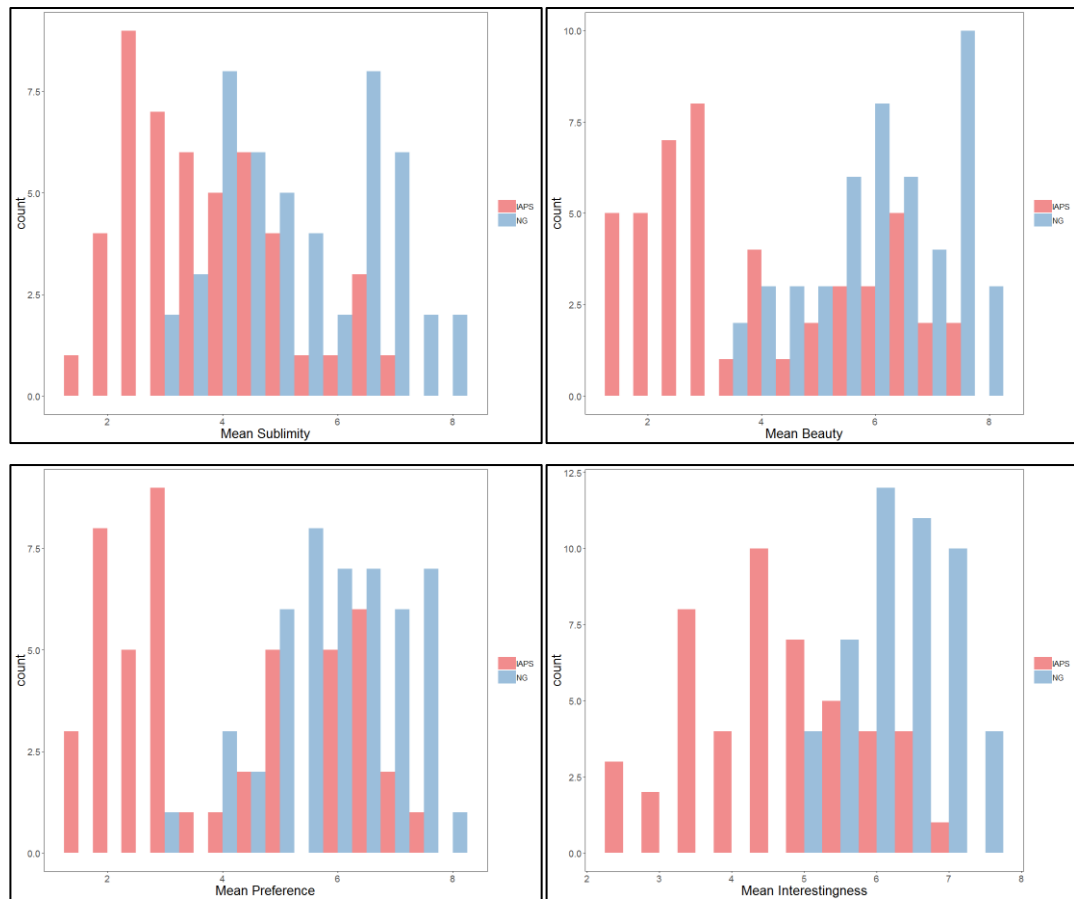


Figure 18. NG vs. IAPS photographs according to rating type: Histograms (Study 3)

**2.2.2.5. Predicting judgements through stimulus characteristics.** Following the pilot studies, blueness, face size, and the presence of nature were further explored. Blueness moderately correlated with sublimity,  $r_s = 0.27$ ,  $p < .01$ , beauty,  $r_s = 0.24$ ,  $p < .05$ , and preferences,  $r_s = 0.25$ ,  $p < .05$ . Face size was strongly correlated with sublimity,  $r_s = -0.67$ ,  $p <$

.001, beauty,  $r_s = -0.52$ ,  $p < .001$ , preference,  $r_s = -0.59$ ,  $p < .001$ , and interestingness,  $r_s = -0.70$ ,  $p < .001$ . The correlation table can be seen in Table 10.

Table 10. Correlation table: Item characteristics and ratings types (Study 3).

	Sublimity	Beauty	Preference	Interestingness
Blueness	0.27**	0.24*	0.25*	0.16
Face size	-0.67***	-0.52***	-0.59***	-0.70***

Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ . N of observation for each correlation was 96, representing the 96 stimuli.

Last but not least, the effects nature on ratings were tested using a 4 (4 judgement types)  $\times$  2 (presence of nature) ANOVA. The ANOVA revealed a main effect of response type,  $F(3,376) = 6.64$ ,  $p < .001$ , and nature,  $F(1,376) = 158.58$ ,  $p < .001$ , but no interaction between judgement type and nature,  $F(1,376) = 2.03$ ,  $p > .05$ . That is, the presence of nature ( $M = 5.92$ ) seems associated with higher levels of ratings for all four judgements similarly, compared to when nature is not present ( $M = 4.11$ ). See Table 11 for a description of the data.

Table 11. Nature effects, descriptive statistics table (Study 3).

	Without nature	With nature
Sublimity	3.54 ( $SD = 1.10$ )	5.55 ( $SD = 1.38$ )
Beauty	3.98 ( $SD = 1.73$ )	6.10 ( $SD = 1.55$ )
Preference	4.05 ( $SD = 1.26$ )	5.96 ( $SD = 0.96$ )
Interestingness	4.85 ( $SD = 1.69$ )	6.06 ( $SD = 1.43$ )

Note. Descriptive statistics represent mean values.

### 2.2.3. Discussion

The present study provides an important first step into the research of sublimity and beauty. The study adopted four measures to flesh out sublimity and beauty rating patterns. In addition to sublimity and beauty raw ratings, two derivative variables were considered, namely ‘the degree of sublimity more than beauty’ (i.e. PC2 & S-B scores) and ‘the degree of sublimity and beauty together’ (i.e. PC1 & S+B scores). Using these measures, there were acceptable levels of test-retest reliabilities, especially for sublimity, beauty, and S+B. This means that on a psychometric level at least, people have an implicit understanding of the experiences of sublimity, beauty, and their relations. For this reason, people are able to give highly consistent responses in two points of time. This is a fundamental assumption for any empirical research using sublimity and beauty, and at the same time fulfils eighteenth century philosophies that characterise aesthetic experiences through the pillars of sublimity and beauty (e.g. Burke, 1759/2008).

In light of earlier works that reported individual differences in simple geometric shapes using simple responses (e.g. McManus et al., 2010), that people were similar to each other in

their complex responses of beauty and S+B ratings on complex stimuli, is both reassuring and surprising. While between-participants consistency was less clear cut for sublimity and S-B, those who showed good test-retest reliabilities displayed good between-participants consistency among themselves. The fact that the scores of these reliable individuals highly correlated with those of the rest of the participants shows that there seems to be at least some sort of aesthetic standard that is present as it is, not fleshed out sufficiently for some individuals. Then, the large picture is that there are substantial claims for between-participants agreements, as well as within-participants reliabilities, in these measures.

Otherwise, sublimity and beauty were highly related to preference and interestingness, which leads to the worry that people still have problems in teasing apart the four judgements apart. Blueness, face size (conveying size information), and the presence of nature in stimuli content seemed to be closely related to the four measures.

These findings provide valuable insights into the workings of the sublime and beautiful. Still, there are probing questions. For instance, given the variance of test-retest reliabilities among participants, what characteristics of an individual relates to one's within-participants reliabilities in sublimity and beauty judgements? Furthermore, are the randomly selected 10 items in the repeated block sufficient as a measure of test-retest reliability? A more robust measure of reliability would require retesting of the entire set of previously seen stimuli. Lastly, to what degrees can the present findings be replicated using a separate set of participants?

## 2.3. Study 4

The following study, while almost identical in design as the previous study, aimed for two purposes. The first purpose was the replication of the previous results based on an improved experimental setting. The second purpose was to examine the role of individual differences.

### 2.3.1. Methodology

**2.3.1.1. Participants.** A total of 39 participants (27 female,  $M_{age} = 26.41$ ,  $SD_{age} = 13.34$ ) took part in the study through UCL's subject pool, and were compensated either financially or with course credit.

**2.3.1.2. Materials.** The general setup was identical to that of Study 3, except that all studies were run in a UCL experiment cubicle. For the image rating task, 45 images were rated in total.<sup>28</sup> Of these images, 28 were taken from Study 3. Images that are on the edges of Study 3's sublimity-beauty rating scatterplot were selected – this was done in order to select stimuli that are most extreme in their combined sublimity and beauty profiles. This also meant that

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<sup>28</sup> Due to technical errors, around half of the participants were exposed to only 36 images of the 45. The rest of the analyses follows results based on the 36 images only. The data from the 9 unanalysed images are fed into subsequent analyses for stimulus selection.

unlike middle-range images where the ratings could have been caused by ratings cancelling each other out between participants, images at extreme ends were likely to have been least influenced by individual differences. 17 new photographs were newly chosen from IAPS and the National Geographic, in order to diversify stimulus type. The word association task was identical as before.

The following individual differences measures were introduced: Big 5 (BFI-2; Soto & John, 2016), empathy (Interpersonal Reactivity Index; Davis, 1980), masculinity, and femininity (Personal Attributes Questionnaire; Spence & Helmreich, 1978). In total, 26 individual differences measures are considered. A copy of each questionnaire (along with basic demographics measures) is available in the Appendix.

***The Big 5 personality traits.*** The Big 5 personality traits were measured using Soto and John's (2016) Next Big Five Inventory (BFI-2). The 60-item scale produces aggregate scores of Extraversion, Agreeableness, Conscientiousness, Negative Emotionality, and Open-Mindedness. Additionally, each factor is subdivided into the three facets, with each of the facets measured through 4 items (as the facets are largely self-explanatory, no separate explanations are provided):

- Extraversion: Sociability + Assertiveness + Energy Level
- Agreeableness: Compassion + Respectfulness + Trust
- Conscientiousness: Organization + Productiveness + Responsibility
- Negative Emotionality: Anxiety + Depression + Emotional Volatility
- Open-Mindedness: Intellectual Curiosity + Aesthetic Sensitivity + Creative Imagination

The BFI-2 produces 20 measures in total, namely the 5 aggregate Big 5 factors and 15 facets.

***Empathy.*** A shortened 12-question version of Davis's (1980) Interpersonal Reactivity Index (IRI) is adopted to measure empathy. The following four dimensions of empathy are measured:

- Perspective Taking: the tendency to spontaneously take in others's psychological perspectives.
- Fantasy: the tendency to take viewpoints of characters in books, plays, and cinema.
- Empathic Concern: the tendency for "other-orientated emotions", e.g. sympathy, in tense situations.
- Personal Distress: the tendency for "self-orientated emotions", e.g. personal unease, in tense situations.

The IRI produces 4 measures in total.

**Masculinity, femininity, and androgyny.** The Personal Attributes Questionnaire by Spence and Helmreich (1978) is a measure of masculinity, femininity, and androgyny. Of these, only the first two measures are used. The two measures denote the following characteristics:

- Masculinity (or Instrumentality): the tendency to be independent, active, competitive, and to stand up well under pressure.
- Femininity (or Expressivity): the tendency to be emotional, gentle, empathic, and kind.

**2.3.1.3. Design and procedure.** The general design between the present study and Study 3 differed little, apart from two aspects. To achieve a better reliability of subsequent test-retest reliability calculations, every participant evaluated the set of 45 stimuli twice, in two blocks. The appearance order was completely randomised for each block. Furthermore, instead of an interview following the word association task, the measures of individual differences followed.

### **2.3.2. Results**

The results section is divided into the following four topics: (1) within-participants (or test-retest) reliabilities of sublimity and beauty ratings and their individual differences, (2) between-participants consistencies of sublimity and beauty ratings and their individual differences, (3) relationship between the four measured aesthetic judgements, and (4) aesthetic correlates of stimulus characteristics.

**2.3.2.1. Within-participants reliability and individual differences.** Test-retest reliabilities were computed for sublimity, beauty, S+B, and S-B ratings. Five participants were determined as outliers, following similar standards and reasons as those of Study 3, and were excluded from subsequent analyses.

With 34 valid individuals, there was a high level of average reliability for sublimity,  $r = 0.85$  ( $SD = 0.28$ ), beauty,  $r = 0.91$  ( $SD = 0.31$ ), S+B,  $r = 0.92$  ( $SD = 0.23$ ), and S-B,  $r = 0.70$  ( $SD = 0.32$ ). All average test-retest reliability scores were larger than those of Study 3. Where a one-way ANOVA revealed significant differences between the reliability of ratings,  $F(3, 132) = 37.81$ ,  $p < .001$ , post hoc analyses (via Tukey HSD) revealed that the reliability score of S-B was significantly lower than all other measures,  $ps < .001$ . While this replicates Study 3, the present study also demonstrated a statistical difference between the reliabilities of S+B and sublimity,  $p = .003$ . As such, the reliability is highest of S+B and beauty, then sublimity, followed by S-B.

To examine which individual differences variables correlate with the degree to which a participant is reliable in each of these four measures, a set of Spearman correlation analyses

were run (Table 12).<sup>29</sup> The tendency to be reliable in S-B ratings was positively linked with Agreeableness (Compassion facet,  $r_s = 0.35$ ,  $p = .04$ ) and Open-mindedness (Aesthetic Sensitivity,  $r_s = 0.41$ ,  $p = .02$ , & Creative Imagination,  $r_s = 0.50$ ,  $p = .002$ , facets) from the Big 5, masculinity (Instrumentality),  $r_s = 0.33$ ,  $p = .05$ , and Empathic Concern,  $r_s = 0.46$ ,  $p = .006$ , from the Interpersonal Reactivity Index. No other correlations were significant. As such, although the average reliability of S-B was lowest from the four examined variables, one's consistency in distinguishing between sublimity and beauty was moderated by one's open-mindedness and abilities of empathy and agreeableness.

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<sup>29</sup> Spearman correlations were chosen given the worry of negative skew and ceiling effects for individuals high with average reliability ratings.



Table 12. Correlation table: Reliability scores and individual differences variables (Study 4).

	Sociability	Assertiveness	Energy Level	Compassion	Respectfulness	Trust	Organization	Productiveness	Responsibility
Sublimity	-0.04	0.01	-0.11	0.23	-0.08	-0.16	-0.17	-0.04	-0.20
Beauty	-0.20	-0.07	-0.07	0.10	0.28	0.14	-0.01	0.24	-0.06
S+B	-0.16	0.00	-0.08	0.00	0.04	0.00	-0.02	0.04	-0.11
S-B	-0.28	0.25	-0.11	<b>0.35*</b>	0.33	0.11	-0.24	0.01	-0.13

	Anxiety	Depression	Emotional Volatility	Intellectual Curiosity	Aesthetic Sensitivity	Creative Imagination	<i>Extraversion</i>	<i>Agreeableness</i>	<i>Conscientiousness</i>
Sublimity	0.09	0.23	0.25	0.02	0.07	0.24	-0.05	-0.01	-0.19
Beauty	-0.25	-0.26	-0.22	0.16	0.09	0.18	-0.20	0.26	0.04
S+B	-0.24	-0.16	-0.13	0.07	0.01	0.14	-0.15	0.06	-0.07
S-B	-0.17	-0.14	-0.01	0.25	<b>0.41*</b>	<b>0.50**</b>	-0.07	<b>0.37*</b>	-0.18

	<i>Negative Emotionality</i>	<i>Open- Mindedness</i>	Instrumentality	Expressivity	Fantasy	Perspective Taking	Empathic Concerns	Personal Distress
Sublimity	0.21	0.16	0.00	0.10	0.09	0.25	0.03	0.01
Beauty	-0.26	0.18	0.27	0.13	0.03	0.05	0.24	-0.21
S+B	-0.20	0.10	0.25	0.03	0.12	0.01	-0.02	-0.13
S-B	-0.12	<b>0.51**</b>	<b>0.33*</b>	0.18	0.12	0.12	<b>0.46**</b>	-0.24

Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ . Significant correlates are marked in bold. Variables in italics are aggregated scores. N of observation for each correlation was 34, representing the 34 participants.

**2.3.2.2. Between-participants agreement and individual differences.** Data over the two blocks were aggregated for each participant, and were subjected to Q-mode factor analyses to examine between-participants agreement. Replicating Study 3, beauty and S+B ratings achieved single-factor solutions, with the first factor explaining 74.93% (followed by 4.73% and 3.14%) and 70.93% (followed by 6.01% and 3.61%). These results indicate that beauty and S+B ratings are highly consistent between participants. Scree plots are not visualised, given their almost identical shapes, i.e. with a distinctly protruding “elbow” for each plot, to those of Study 3.

Differing from Study 3, however, S-B produced a single-factor solution, with the scree plot producing an “elbow”, and the first factor explaining 55.54% of the variance (followed by 6.77%, 5.44%, 4.40%, etc.), meaning that S-B ratings were consistent across participants. Also different from Study 3, sublimity seemed to satisfy a two-factor solution, with the first factor explaining 57.02% and the second factor explaining 12.80% (followed by 4.02%, 3.82%, etc.). The scree plot indicated two factors above its “elbow.”

For sublimity, a new Q-mode factor analysis with a subset of 9 individuals (around 25% of the total participants) with the highest test-retest reliabilities still produced a two-factor solution. There was good consistency between the aggregate sublimity ratings of these reliable individuals and those of the 24 non-reliable individuals,  $r = 0.97$ ,  $p < .001$ . The scree plots for the three analyses mentioned in the paragraph are presented in Figure 19.

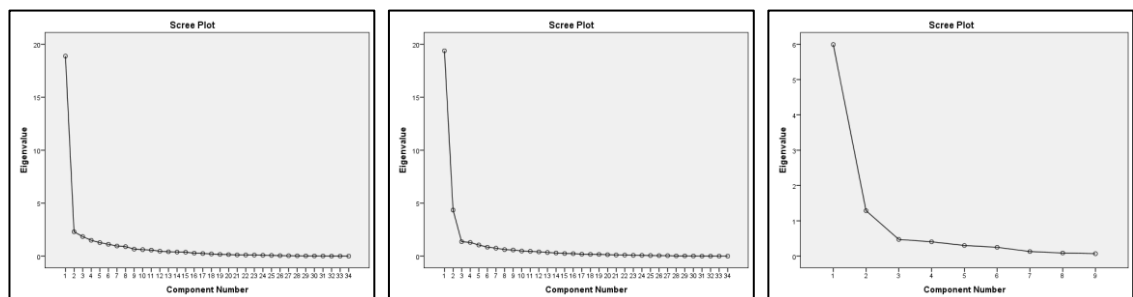


Figure 19. Scree plots for S-B (left), sublimity (centre), and sublimity using 9 reliable participants (Study 4)

The two-factor solution of sublimity ratings suggests the presence of two subgroups of participants. To determine the nature of the divide, 8 people with the highest loadings in each Varimax-rotated factor (8 constitutes approximately half of participants in each factor) were selected, and their sublimity ratings were averaged by photographs. A scatterplot (Figure 20) using the averaged sublimity ratings suggested that there was a subset of photographs that one group of participants thought as sublime, while the other did not (bottom right corner in the scatterplot). These photographs depicted forms of violence. In most other cases, both groups of participants agreed on what was low in sublimity (bottom left corner in the scatterplot) and high in sublimity (upper right corner in the scatterplot).

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Figure 20. Scatterplot of sublimity ratings from two groups of participants (Study 4).

A personality profile comparison was made between the two groups of participants, using the two sets of 8 participants. Of the entire list of individual differences variables, not a single variable explained the difference. However, a sex difference emerged,  $\chi^2(1) = 9.60, p = .002$ . Participants that thought the aesthetically violent photographs were not sublime, consisted entirely of females. On the other hand, of the group of raters that found sublimity in those same images, 75% were male. Thus, there appears to be a possible tendency for male participants to find aesthetic value in objects or events of violence, such as tornadoes, natural disasters, and explosions.

**2.3.2.3. Relationship between judgements.** When the relationships between the four judgements were explored via a set of correlations, a similar picture as Study 3 was presented (Table 13). In fact, the statistical significance and directions are close replications of those in Study 3. To verify the consistency between the two studies further, the four rating types were paired between Study 3 and the present study by stimuli ( $n = 28$ ) and correlated against each other. All four ratings achieved high consistency at  $p$ -values under 0.001, i.e. sublimity,  $r = 0.95$ , beauty,  $r = 0.99$ , preference,  $r = 0.99$ , interestingness,  $r = 0.95$ .

Table 13. Correlation table: Four ratings (Study 4)

	Sublimity	Beauty	Preference	Interestingness
Sublimity				
Beauty	0.68			
Preference	0.66	0.99		
Interestingness	0.90	0.64	0.67	

*Note.* All coefficients are significant at  $p < .001$ . N of observation for each correlation was 36, representing the 36 stimuli.

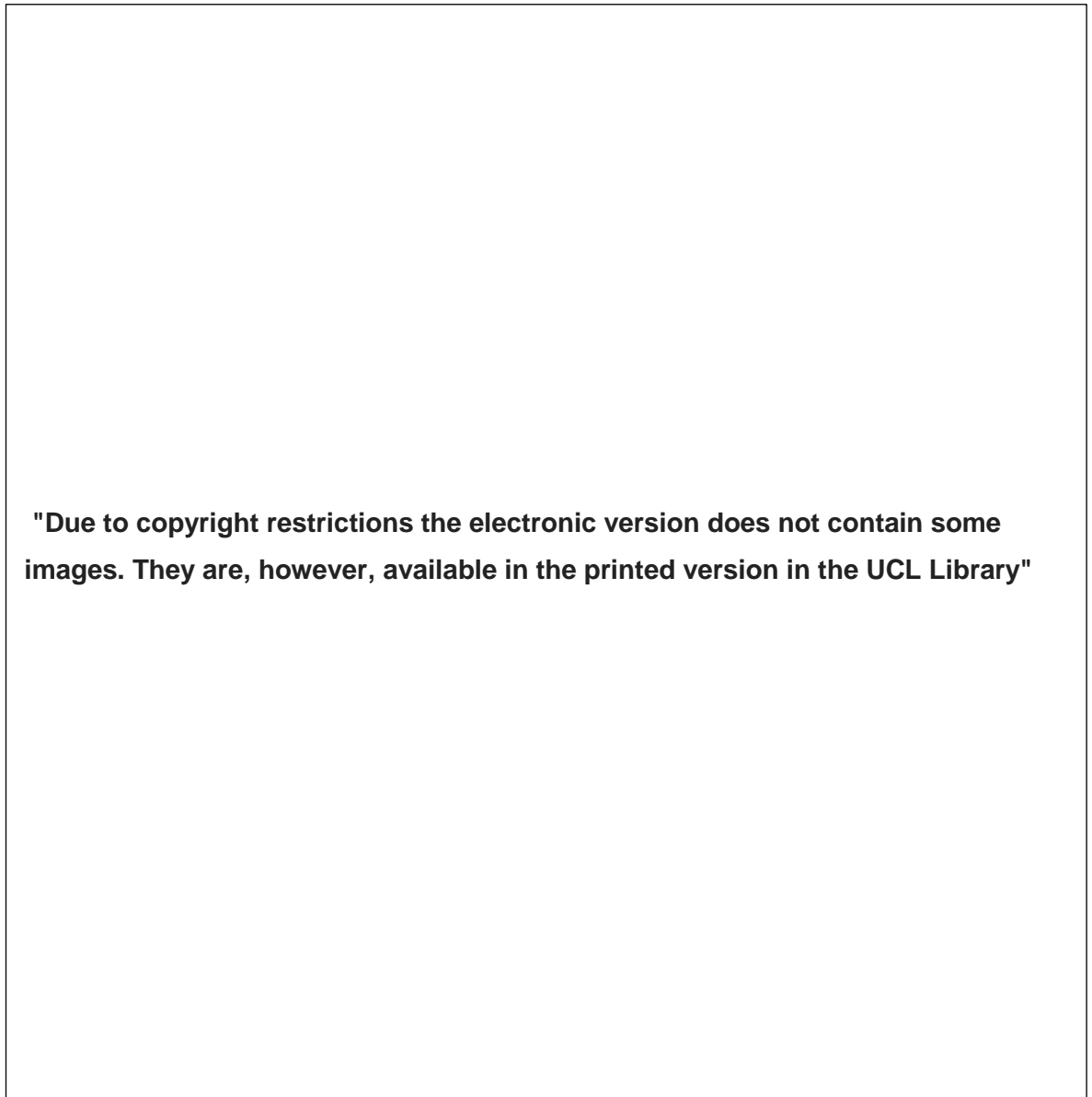


Figure 21. Average sublimity and average beauty ratings scatterplot with images (Study 4)

Replicating the results of Study 3, factor analyses using the four response variables yielded a single factor solution, with the first factor explaining 81.61% of the variance. Thus in the present study, participants associated the four response variables close to each other. Likewise, a correspondence analysis did not reveal a relationship between the items and the four responses,

$\chi^2(1) = 33.30, p > .05$ , possibly caused by the high correlation between the four response variables.

**2.3.2.4. Predicting judgements through stimulus characteristics.** The relationship between the four variables and blueness, face size, and the presence of nature were explored. Unlike the results of Study 3, blueness was not correlated to any of the ratings, while face size was related only to interestingness,  $r_s = -0.70, p < .05$ . A 4 (4 judgement types)  $\times$  2 (presence of nature) ANOVA on the effects of nature resulted in a main effect of nature,  $F(1,136) = 192.83, p < .001$ , with no other effects significant. The presence of nature ( $M = 5.47$ ) seemed to be linked with higher levels of ratings for all four judgements similarly, compared to when nature was not present ( $M = 3.15$ ).

### 2.3.3. Discussion

The present study was aimed as a replication and extension of the preceding study, with the inclusion of individual differences measures. By asking participants to re-rate an entire set of images (instead of re-rating a randomly chosen subset of 10 as was done in Study 3), the present study's design further allowed improved estimates of reliabilities.

While much of the preceding study's outcomes were replicated, the present study presented a marked improvement of both intra- and inter-participants consistencies of S-B scores, or the degree to which one distinguishes the sublime from the beautiful. This is a reassuring outcome, given the thesis's general aim to compare the two aesthetic categories. What's more, the results certainly give a nod to eighteenth century thinkers such as Edmund Burke (1759/2008) in validating the duality of sublimity and beauty. The presents results imply that people are comfortable in distinguishing the two.

A small number of individual differences variables seemed to moderate one's reliability in distinguishing between the sublime and beautiful. The more consistent, and perhaps better, one was in distinguishing sublimity in beauty, the more one tended to be aesthetically sensitive, creative, compassionate, empathic, and masculine. It may be that individuals high in these traits easily identify expressions within these photographs through empathy and through aesthetic imaginations, ensemble a systematic way to categorise these experiences into aesthetic responses. Certainly, past works have reported links between empathic ability and creativity (e.g. Carlozzi, Eells, & Hurlburt, 1995).

Unlike Study 3, participants were subdivided into two groups for sublimity ratings. Where one subgroup of participants found aesthetic value in violence (e.g. natural disasters, explosions, etc.) and thereby gave those images high sublimity ratings, the other subgroup rated these photographs as eliciting no levels of sublimity. Sex was the only variable that explained the difference, with male participants more likely to find aesthetic value in these violent images. These results echo previous works that reported that men, more than women, prefer paintings

with troubling content (Chamorro-Prezumic, Burke, Hsu, & Swami, 2010). Still, given the good between-participants agreement for S-B, these individual differences are not likely to overturn the overall relationship of relative sublimity and beauty.

The roles of blueness and face size on ratings were mostly not replicated, while the role of nature was present. This indicates that there are subtleties in the link between ratings and stimulus content. What accounted for the differences in outcome between the two studies is hard to verify. The role of testing context could have also played a role. Since the previous study had three experimenters bringing in their own friends and acquaintances, this could have played into the general relaxation of concentration from the participant's side. Yet given the replications of the core inquires, namely that people are generally consistent within themselves in sublimity and beauty judgements, and that these ratings are largely consistent among participants, criticisms of Study 3 do not merit overstatement.

## **2.4. Chapter Summary**

The general aim of the present chapter was to produce a basic assessment of the psychometric properties of the two main concepts of the thesis, namely sublimity and beauty, and their relationships. The latter concerns, for instance, the degree to which one is distinguishable from the other. As such, test-retest reliabilities, between-participants agreements, and the relationship to other related aesthetic judgements (i.e. preference and interestingness) were examined. On the whole, one can be content that the reliabilities are met, the results which justify the continued use of sublimity and beauty as psychological measures for future empirical studies. Detailed examinations of how sublimity, beauty, preference, and interestingness relate to one another, especially in light of individual differences, merit future examinations in separate studies.

Theoretically, despite Burke's (1759/2008) claim of sublimity and beauty being opposites, and thus being negatively correlated, both studies in the present chapter did not support this claim. Instead, there were positive and significant correlations between sublimity and beauty ratings. Therefore, despite the presence of objects that reliably elicit sublimity but not beauty and vice versa, sublimity and beauty seem related in general.

The production of experimental stimuli in Studies 1, 2, 3, and 4 should not be glossed over. While no in-depth by-item analyses were conducted, various consistencies and correlations have been rooted on identical image sets within studies, and scatterplots suggest a consistent picture of items locations between studies. For instance, looking at the variously produced sublimity-beauty scatterplots (Figure 17 & Figure 21), an image of low sublimity and low beauty, e.g. jail, would unlikely be seen as high in both sublimity and beauty. Likewise, while a picture of a young girl, located as high beauty and low sublimity, would rarely be seen as being very sublime but with not much beauty.

Based on these observations, a conceptual map of experimental stimuli is introduced, namely the *Aesthetic Hexagon*. The *Aesthetic Hexagon*, as is depicted in Figure 22, represents six conceptual corners from a two-dimensional sublimity-beauty rating space. It should be emphasised that the six categories are not discrete categories in the sense of categorical perception (as in phonetics), but are instead a set of heuristics in describing the sublimity-beauty space. Table 14 lists some of the typical photograph contents seen in each category.

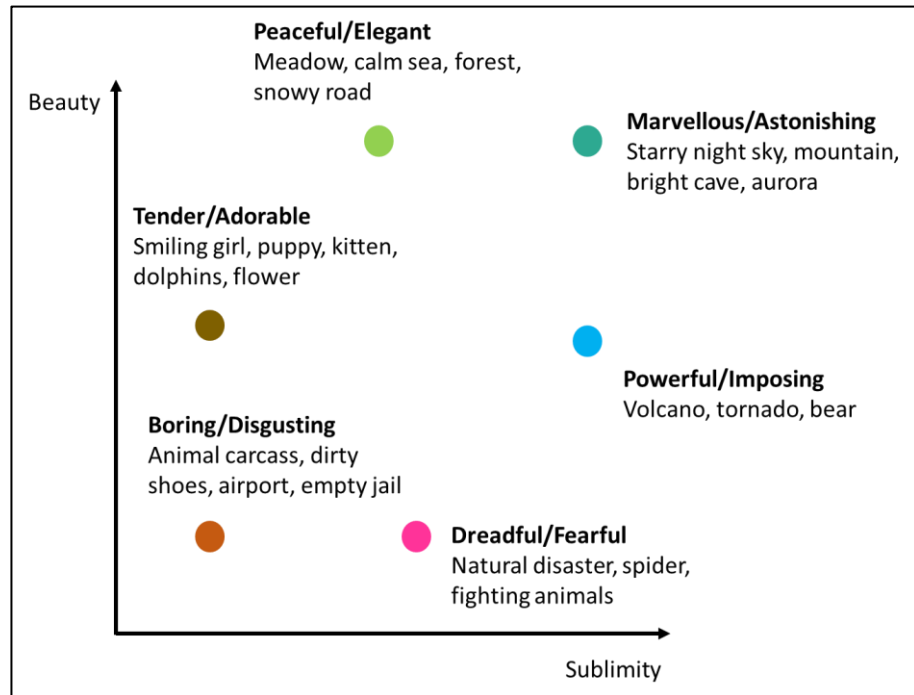


Figure 22. Conceptual figure of the *Aesthetic Hexagon*

Table 14. Typical contents of the *Aesthetic Hexagon*

Category	Content
Boring/Disgusting	Jail, cigarette, frowning lady, & old man
Tender/Adorable	Kitten, hare, young girl, & flower
Peaceful/Elegant	Meadow, calm sea, & forest
Marvellous/Astonishing	Mountain, rainbow, & dramatic sea
Powerful/Imposing	Flame-wrapped man, tornado, storm, & volcano
Dreadful/Fearful	Shark, destroyed airplane, rescue mission, & war/weaponry

The Tender/Adorable and Peaceful/Elegant categories represent two variants of stimuli considered to be more beautiful than sublime. The Powerful/Imposing, and Dreadful/Fearful categories, on the other hand, represent two variants of stimuli rated as more sublime than beautiful. The Boring/Disgusting and Marvellous/Astonishing categories represent photographs that are considered not sublime and not beautiful, and very sublime and very beautiful, respectively.

The *Aesthetic Hexagon*, while not categorically absolute, is a conceptual shorthand that allows the consideration of a wide range of photographic content. As such, the tool will appear regularly for stimulus selection in future studies.

To sum up, the present study validated the psychometrics of sublimity and beauty judgements, and have provided a set of suitable experimental stimuli. Given the satisfaction of psychometric groundworks, the following chapters focus on the determinants of sublimity and beauty experiences. First examined is the psychophysics of sublimity and beauty, namely how the manipulation of stimuli's physical attributes influences the elicitations of sublimity and/or beauty.



**Chapter 3. Study 5: The Roles of Stimulus Size and Height on Sublimity and  
Beauty Judgements**

### 3.1. Introduction

The view that sublimity and beauty constitute distinct aesthetic experiences has been postulated in past philosophical writings (Chapter 1b). In Chapter 2, such claims were empirically supported. In fact, Chapter 2 represents a general verification of using sublimity and beauty as valid and stable psychological measures. With such evidence in hand, the present chapter marks the start of a series of studies exploring the visual mechanisms that may affect sublimity and beauty differentially. In particular, the roles of physical characteristics of stimuli are investigated.

While there are a number of visual elements that stand out in descriptions of the sublime, perhaps no descriptors are as prominent as size and height. From language use around the world to various philosophical texts, size and height not only regularly feature as characteristics or associates of the sublime, but they also seem to do so with little dispute between thinkers. Such consistency, a rare feat in philosophy especially, suggests a robustness and potential universality of the relationship between size and height, and the psychological consequence of sublimity when viewing object with these qualities.

If viewers of Belgian surrealist painter René Magritte's (1898 – 1967) *The Castle of the Pyrenees* (Figure 23) indeed are evoked of some feelings of sublimity, such sensation may have been caused by the size and height of the sturdy stone castle, elevated above a wave-torn sea. The very impossibility of the situation by logic of gravity, and the contrasting – perhaps “beautiful” – light-blue calm of the background sky, arouse astonishment and disbelief, as if to further encourage the evocation of sublimity. The present chapter examines the generalisability of the roles of object size and height on sublimity.

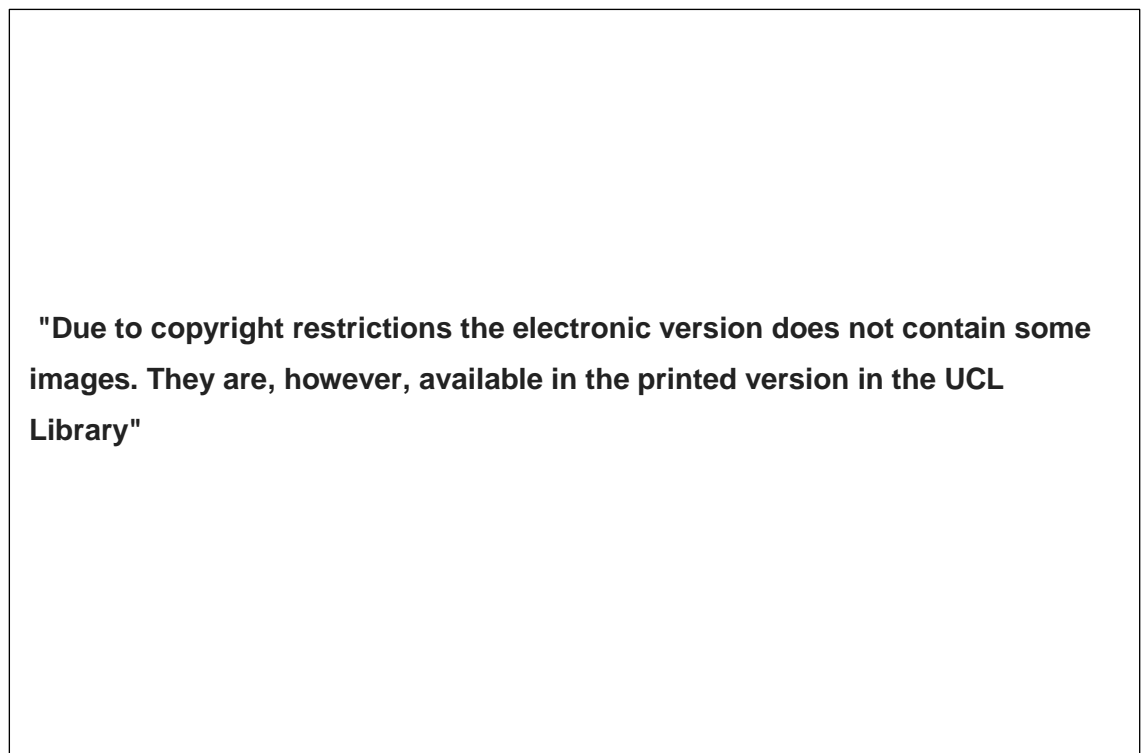


Figure 23. René Magritte, *The Castle of the Pyrenees* (1959)

### 3.1.1. Sublimity's Lexical and Philosophical Associations with Size and Height

Sublimity often finds associations with physical features of largeness and height in the English language. In the *Oxford English Dictionary*, the sublime is characterised as “set or raised aloft; high up”, “rising to a great height; lofty, towering”, “uplifting”, “grand and elevated”, “vastness”, and “grandeur.” Thesauruses support these results; the *Merriam-Webster Thesaurus*, for instance, lists “big”, “elevated”, “great”, and “high” as synonyms of the sublime, while “little”, “base”, and “low” as seen as antonyms. The etymological history of the sublime, as a derivative of raising motions and an associate with largeness, is covered already in the Introduction. Yet such lexical links are not unique to English, as can be seen in the likes of Arabic (رفع; ضخم), Chinese (崇高; 崇高), German (großartig; erhöhen), Persian (رفيع; والا), and Russian (возвышенный, грандиозный), among many other languages.<sup>30</sup>

The link between an object's size/height and sublimity can be further observed in encounters with natural or man-made objects. When the Irish poet Thomas Moore visited the Niagara Falls, his exclamation, “[w]e arrived at the New Ladder and descended to the bottom. Here all its awful sublimities rushed full upon me” (ARTnews, 2015), portrays exaltations as a result of the author viewing a giant natural object whilst looking upward. Architecture provides intriguing insights. Thomas (2007, 2014), for instance, reports height and size as typical formal features of monumental architecture in ancient Greece and Rome. Following on from Thomas, towering buildings are prominent and can immediately appeal to the emotions of sublimity, wonder, and shock.

In eighteenth century Britain, thinkers and critics such as Burke, Stewart, Gerard, and Lord Kames, commonly discuss the sublimities of large and elevated things. In addition to grand nature, Gothic architecture especially was key to many of their arguments. Scottish thinker Hugh Blair (1718 – 1800), for example, argued, “[a] Gothic cathedral raises ideas of grandeur in our minds by its size, its height, its awful obscurity, its strength, and its durability”<sup>31</sup> (Monk, 1935, p. 123; see Figure 24). Alexander Gerard (1728 – 1795), who conceptualises sublimity as an aesthetics of quantity, believed that large objects in general fill up the mind and stretches the mind's boundaries – an experience which is initially unnerving. Yet once the difficulty is overcome in “deep silent wonder and admiration”, the process can enlarge the mind,

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<sup>30</sup> Across different cultures and language families, divinity – an example of sublime expressions – is conceptualised as being located above, while most secular and unholy things are described as being located below, e.g. *scala naturae*, or *chain of being* (Haidt, 2000, 2003; Haidt & Algoe, 2004).

<sup>31</sup> It is worth noting that when discussing the birth of monumental architecture in ancient Rome, the revolution of concrete is considered an important enabling factor. With concrete, architects Severus and Celer experimented with mass and volume, and their efforts were culminated in Nero's Golden House (Thomas, 2014). Since concrete is also perceived as a material type that is both strong and durable (Hemström, Mahapatra, & Gustavsson, 2011) – adjectives used by Blair in describing the sublime – one can also notice parallels between how architectural monumentality was conceived in Roman and Gothic architectures beyond size and height.

to which the mind can “[entertain] a lofty conception of its own capacity”, filled with “noble pride” (Ashfield & de Bolla, 1996, p. 168)<sup>32</sup>.

One of the most pronounced observations come from Edmund Burke’s (1759/2008) *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful*, where aesthetic passions are forced into certain quantitative characteristics of external objects. Importantly, Burke sees sublimity and beauty as opposites. Accordingly, the vastness of “the oak, the ash, or the elm” (Burke, 1759/2008, p. 115), more than the meagre physical presence of the myrtle, orange, almond, jasmine, and the vine, would elicit sublimity. On the other hand, Burke sees small things as beautiful, “[t]he sublime, ... dwells on great objects, and terrible; the [beautiful] on small ones, and pleasing” (p. 113; see Figure 25). These observations put forth the possibility that lexical associations may be reflections of non-accidental correlations between the size and height of external objects and the triggered inner state of sublimity.

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Figure 24. “[A] Gothic cathedral raises ideas of grandeur...” Rouen Cathedral, Rouen, France.

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Figure 25. According to Burke, the jasmine is an unlikely candidate of the sublime.

### **3.1.2. Size and Sublimity, a Psychological Perspective**

Stimulus size has often been linked with a number of emotional-aesthetic outcomes. Stimulus size has been positively associated with emotional arousal (Codispoti & de Cesarei, 2007; Detenber & Reeves, 1996; Lang et al., 1997; Lombard, Reich, Grabe, Companella, & Ditton, 1995; Reeves, Lang, Kim, & Tartar, 1999), motivational relevance (De Cesarei & Codispoti, 2006), attention (Reeves, Detenber, & Steuer, 1993), recollection (Detenber & Reeves, 1996), positive evaluations of attractive people (Lombard, 1995), and positive evaluations of words (Meier, Robinson, & Caven, 2008).

Object size has been particularly covered in light of evolutionary contexts; the size of an object, communicating distance information (Fanselow, 1994; Lang et al., 1997; Teghtsoonian & Frost, 1982), and interacting with valence information to feed into approach-avoidance behaviour (Miller, 1959). Thus, the largeness of benign objects, feeling close, would trigger approach behaviour. On the contrary, the largeness of threatening objects would trigger avoidance. Animals also display body puffing to communicate mate-attraction and threat-repulsion (Alcock, 1984; Campbell, 1976).

Size has been consistently linked with general liking, i.e. "bigger is better." For instance, people enjoy larger screens than smaller screens (Lombard, 1995), and feel that the actions in larger screens are more intense, physical, and exciting (Lombard, Ditton, Grabe, & Reich, 1997; Lombard et al., 1995). Larger eyes are typically more attractive than smaller eyes (Berry & MacArthur, 1985), and both adults and 3-year-old participants prefer abstract objects that were larger in forced choice tasks (Silvera, Josephs, & Giesler, 2002). The preference for size can be observed in human decision making. Frynta and colleagues (2010, 2013), for example, reported that zoos prefer to have animals that are large – ahead of other explanatory variables such as animal brain size and the International Union for Conservation of Nature red

list status – simply because large animals attract liking from both adults and children (Ward, Mosberger, Kistler, & Fischer, 1998). These findings echo what Silvera et al. (2002) noted as the “fundamental, reliable association between physical size and human preference” (p. 191).

Relatedly, screen size has been studied in the research of presence, or the “perceptual illusion of nonmediation” (Lombard & Ditton, 1997; Slater & Usoh, 1993). Accordingly, larger stimuli elicit a higher sense of “I felt like I was a part of the action” (Reeves et al., 1993), “sensation of reality” (Yuyama, 1982), “sense of participation” (Lombard et al., 1995), “participation”, and “involvement” (Ditton, 1997), even after controlling for visual angle (Troscianko, Meese, & Hinde, 2012; Hatada, Sakata, & Kusaka, 1980; Yuyama, 1982). While the research explained why consumers may buy larger TV sets at home and other home theatre-related technologies (Pressler, 1996; Thorpe, 1989), they provide groundwork of recent literature on the sense of presence in virtual reality via perceived screen size (Visch, Tan, & Molenaar, 2010).

Given Burke’s (1759/2008) view that sublimity of vast objects is an exalting and transporting experience “productive of the strongest emotion which the mind is capable of feeling” (p. 39) and ultimately linked with self-preservation, these empirical findings, that stimulus size is associated with arousal, evolutionary instincts, aesthetic appreciation, and a sense of presence, are in line with Burke’s views.

More recent studies, on the other hand, have attempted for more direct insights into the link between object size and sublimity. In Keltner and Haidt’s (2003) theory of awe, the authors see the importance of perceived vastness of objects in procuring sublime experiences. Two further theoretical works by Konečni (2011), and Joye and Verpooten (2013) emphasise the effect of physical largeness on the elicitation of sublimity. In the second of these papers, the authors make a case for the importance of physical magnitude on religious monumental architecture. They argue that the impressiveness of large religious buildings is caused by the sensory experience of largeness itself, separate from economic connotations of implied costliness in expansive buildings.

A number of empirical works – many of them from Keltner’s close colleagues – have supported the notion that the experience of awe is linked with perceived vastness of the object in question or “the presence of something greater than myself” (Piff, et al., 2015; Gordon, et al., 2016; Ishizu & Zeki, 2014; Seidel & Prinz, 2017; Shiota, et al., 2007). The wide range of stimuli used, from photographs, recollections, and artworks, testifies the reliability of the association. To knowledge, however, only a study by Seidel and Prinz (2017) has come near to testing the association between sublimity and object size by manipulating stimulus size directly. Their work is consistent with the view that physically enlarged artworks are judged as more wonderful. Conversely, the more wonderful an artwork is seen, the greater its estimated physical dimension. These works point to the direction that object size and sublimity may share a common psychological mechanism.

### 3.1.3. Height and Sublimity, a Psychological Perspective

Height is commonly associated with positive valence. People recognise positive words quicker when those words are located at the top of a screen (Meier & Robinson, 2004), and even falsely recall positive stimuli to be located at a higher physical location than they actually were (Crawford, Margolies, Drake, & Murphy, 2006). Conversely, individuals with higher neuroticism and depression – aligned with frequent experience of negative affect – tend to have their attention focused more on the lower areas of screens (Meier & Robinson, 2006).

Power is a concept central to both Burke's (1759/2008) and Keltner and Haidt's (2003) conceptualisations of sublimity, since sublimity entails an experience of being controlled and dominated. Height has been often linked with various forms of power (Schubert, 2005). For example, there is a tendency that powerful people are perceived as taller (Wilson, 1968). Relatedly, the height perception of politicians who won in an election increased after their win (Higham & Carment, 1992). In another instance, Giessner and Schubert (2007) have demonstrated that the increase in vertical distance between a manager and a subordinate in an experimental setting increases the perceived power of the manager. Behaviourally, upright posture has been linked with both power (Carney, Hall, & LeBeau, 2005) and pride (Stepper & Strake, 1993), and physical height has been associated with wealth (Jackson & Ervin, 1992) and political power (Boller, 1984).

Unlike size, height has been yielded limited attention from the theoretical works of Keltner and Haidt (2003), and Konečni (2011). In other words, height is rarely mentioned as a separate mechanism related to sublimity. Even so, authors regularly bring up the importance of height. Konečni (2011), for example, considers the Great Pyramid of Giza and the Giant Buddha in Leshan (Sichuan; see Figure 26), even emphasising their prominent height. On the other hand, Joye and Verpooten (2013) go as far as to claim height as a “historically constant feature” of monumental buildings, and considers height as a shorthand of both social and physical power.

While no empirical work has directly tested the role of stimulus height on the elicitation of sublimity, three have come close, by testing sublimity-like experiences. In the work by Seidel and Prinz (2017), when Kandinsky's *Sky Blue* was located in three height conditions, i.e. above eye-level, eye-level, and below eye-level, the higher the artwork was located, the more it was considered to be wonderful. Of particular relevance is also a work by Meier, Hauser, Robinson, Friesen, and Schjeldahl (2007), who reported the association between high (vs. low) vertical positioning and perceived divinity of stimuli. As theorists have on numerous occasions linked divine experiences with sublime experiences (Burke, 1759/2008, Keltner & Haidt, 2003; Konečni, 2011), participants attributed belief-in-God to photos of strangers located in a high vertical position. The effect stood even after controlling for other related variables, namely power and likability. For both attention and recall, participants readily associated God-related stimuli in higher physical positions on screens. Lastly, while not involving a design of putting

stimuli on a physically high location *per se*, Joye and Dewitte (2016) observed via photography and VR settings, that high-level buildings elicit greater feelings of awe than low-level buildings.

**"Due to copyright restrictions the electronic version does not contain some images. They are, however, available in the printed version in the UCL Library"**

Figure 26. The Great Pyramid of Giza, a symbolic object of the sublime, is prominent in its height as well as its size.

#### **3.1.4. Limitations of Past Empirical Works and Current Study**

Sublimity's lexical associations with size and height is reflected in the rich literatures of philosophy and psychology. These evidences point out that the experience of the sublime can in part be caused by the encounter of objects that are physically large and/or elevated. Yet in both theoretical and empirical works in psychology, size and height have often been conflated, as one has often assumed the other (Schubert, 2005; Konečni, 2011). Besides, most stated empirical works fall short methodologically in ways that are discussed in Chapter 1c.

The present research had two broad aims. Firstly, an attempt at understanding how the physical presentation of size (small vs. large) and height (centre vs. high) may affect the ratings of sublimity and beauty. Secondly, an attempt to measure to what degree stimulus size and height may affect sublimity and beauty differentially. Specifically, if Burke's (1759/2008) views are valid, large and elevated objects would be more sublime than small and non-elevated objects. The effect of size would be the opposite for beauty, thus forming a double dissociation. An experimental design was adopted, where numerous photographs were manipulated for size and height of presentation.



## 3.2. Methodology

### 3.2.1. Participants

Thirty-two participants (16 female,  $M_{age} = 26.53$ ,  $SD_{age} = 18.39$ ) from University College London were recruited in return for course credits. All participants provided written consent prior to the start of the study.

### 3.2.2. Material

Each participants looked at a subset of a pool of 60 photographs. The pool was divided into two groups, i.e. Set A and Set B, each consisting of 30 photographs. Photographs from Set A consisted of stimuli from Chapters 1d and 2, while those from Set B were newly selected.

For Set A, photographs from each corner of the *Aesthetic Hexagon* (see end of Chapter 2) were equally represented in number. These photographs consisted of a mix of the International Affective Picture System (IAPS; Lang et al., 1997) and National Geographic photographs. For Set B, 22 photographs were taken from Study 11<sup>33</sup>, but some were newly selected for the present study. Set B photographs were approximated to represent each corner of the *Aesthetic Hexagon* in equal numbers, based on photograph content or available rating data. While both Set A and Set B had predominant themes of nature, Set B was made exclusively nature-based, without humans or human artefact. All images were in landscape orientation.

Sessions took place in a dark room at University College London and was run via MATLAB 2016b (MathWorks, Inc., Natick, MA, USA) of a laptop. The laptop was connected to a 200W Epson EBX03 projector, and photographs were projected onto a blank wall. Participants used a computer mouse to input the photograph ratings. To measure participants' head movements, an AX3 3-Axis Logging Accelerometer (Axivity, 2015) was attached to the heads of participants.<sup>34</sup>

### 3.2.3. Design

There were two types of experimental manipulations, namely manipulations of presentation size and height. Each manipulation was done in separate blocks. For the size manipulation (i.e. size block), photographs in the 'small' condition were presented  $75 \times 100$  cm in dimension, whereas photographs in the 'large' condition were presented  $150 \times 200$  cm in dimension. Both size conditions had photographs presented at eye-level (i.e. centre), the photograph's centre approximately 135cm raised from the floor.

For the height manipulation (i.e. height block), photographs in the 'centre' condition were presented 135cm raised from the floor, whereas photographs in the 'high' condition were

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<sup>33</sup> The present chapter's study made use of the paper's Study 11 rating data. The paper's study is described later in Study 11.

<sup>34</sup> Although interesting, the accelerometer data are not discussed in the thesis.

presented 195cm raised from the floor. Both height conditions had photographs presented in the 'small' size. Participants sat 390cm away from each stimulus.

The three presentation conditions, namely 'small-central', 'large-central', and 'small-high' are portrayed in Figure 27. Note that due to the absence of a 'large-high' condition, the manipulations are not crossed. The 'large-high' condition was left out, since the 'large' version of photographs already covered most of the presentation screen. Figure 28 represents the actual setup of the study.

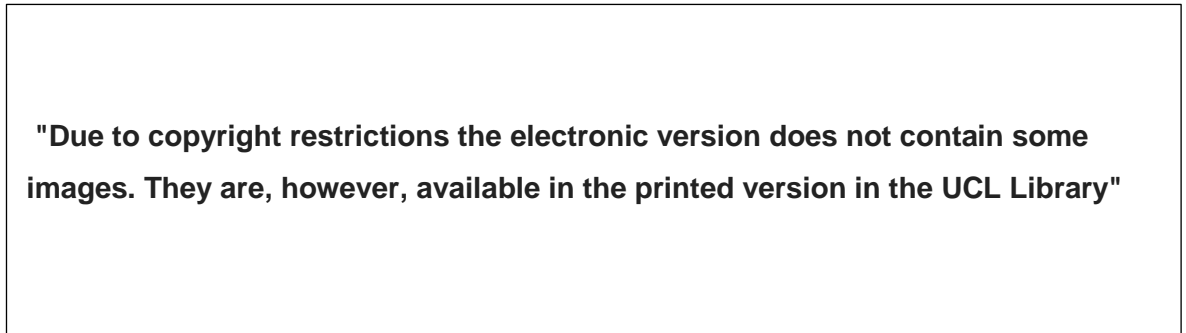


Figure 27. Example presentation screens; small-centre (centre), large-centre (left), and small-high (right) (Study 5).

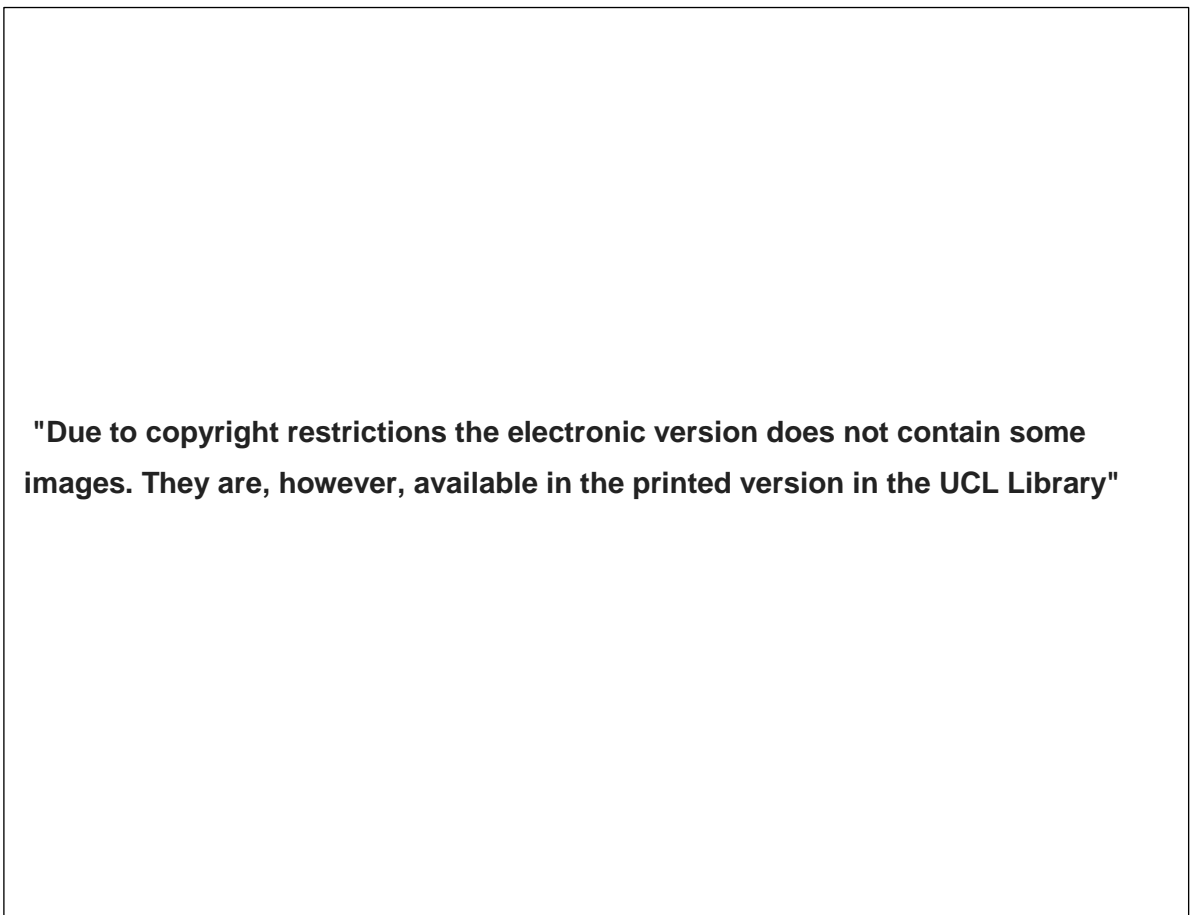


Figure 28. Study 5 setup.

All participants rated both the size and height blocks. The experimental manipulations were thus done within-participants, such that each participant was subject to both size and height

manipulations. Stimulus-wise, a stimulus was presented as part of either the size or height manipulation condition. Within a block, a photograph appeared twice, once for each condition. Half of the participants had Set A appear in the size block and Set B appear in the height block; the other half had the two image sets switched between the blocks.

Each of the size and height block consisted of 36 trials, with 18 unique stimuli being presented once for each manipulation condition. In the first half of each block, no photograph contents were repeated, making the first 18 trials of each block a between-participants design regarding stimuli. The stimuli selection for each block (from the image pools Set A and Set B) was randomised, but it was also assured that each block represented the six corners of the *Aesthetic Hexagon* in equal numbers. The stimuli were presented in randomised order and in randomised size condition.

#### **3.2.4. Procedure**

Before the start of each study, participants were given a set of definitions of the sublime and beautiful – the two dependent variables of the study. Note that the definitions are slightly different from the ones used in the previous pilot studies. This alteration was done in order to be more in line with the sublime and beautiful as presented in Burke's (1759/2008) *Philosophical Enquiry*. After all, Burke's theory forms an integral part of the thesis, and to ensure that experiments measure what the researcher intends to measure is a sign of enhanced construct validity. Given Burke's tendency to contrast sublimity against beauty, it was also hoped that the new definition would create a greater distinction between the seemingly related response measures.

As such, sublimity was defined as, "the degree to which one feels in an object a sense of power, loftiness, shock, and the grandiose. Synonyms include awe-inspiring and imposing." Beauty was defined as, "the degree to which one feels in an object a sense of pleasure, elegance, and joy. Synonyms include attractive, pretty, and loving."

Each participant first went through a practice block of rating six photographs (not included in the photograph pool) for their elicited sublimity and beauty. That was followed by the size block, then the height block. For each trial, a fixation screen in the form of the response screen appeared for 0.5 seconds, before the stimulus appeared. Participants observed the stimulus for 6 seconds, before clicking the mouse. Participants could then rate the stimulus's elicited degree of sublimity and beauty in their own pace. This was followed by a 'next trial' screen, where participants could click their mouse whenever they were ready for the next trial. Figure 29 presents a visualisation of a single trial procedure.

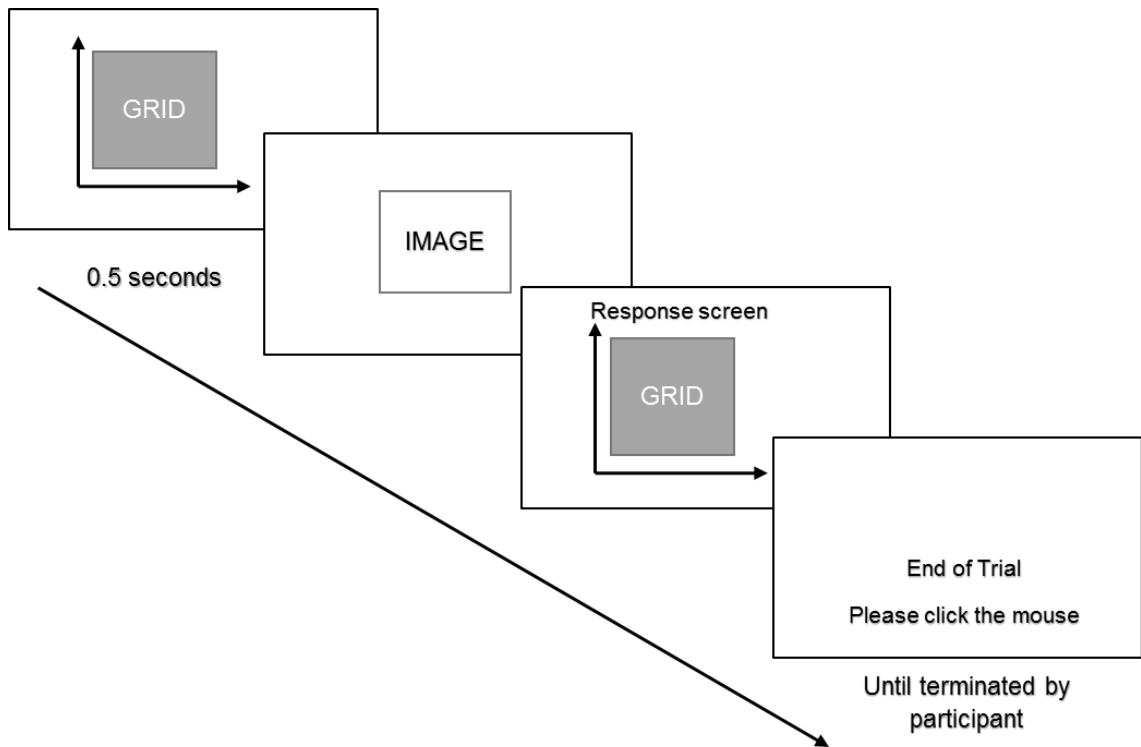


Figure 29. Schematic description of a trial progression (Study 5)

Regarding the response screen, participants rated their experienced sublimity and beauty using a different method as was used in previous chapters. That is, a variant of the *Evaluative Space Grid* (Larsen, Norris, McGraw, Hawkley, & Cacioppo, 2009) was used. Here, Likert-like scales of sublimity and beauty were simultaneously presented in the  $x$  (measuring sublimity) and  $y$  (measuring beauty) axes of a grey square (see Figure 30)<sup>35</sup>. By clicking once in an area within the square using a computer mouse, each participant thus gave ratings of the two scales simultaneously. This method is used effectively in mixed emotions research, because the simultaneous and orthogonal portrayals of two emotions signal to participants the coexistence of seemingly two similar experiences (Larsen et al., 2009). In the context of sublimity and beauty, this served the purpose of enabling a better distinction between the two measures, and visually signal to the participants the possibility of experiences that are sublime but not beautiful, and beautiful but not sublime. For each scale, participants's responses are recorded as a continuous variable between 0 and 400, which denote pixel numbers.

<sup>35</sup> Note that sublimity is presented on the horizontal axis to avoid any association with verticality or height.

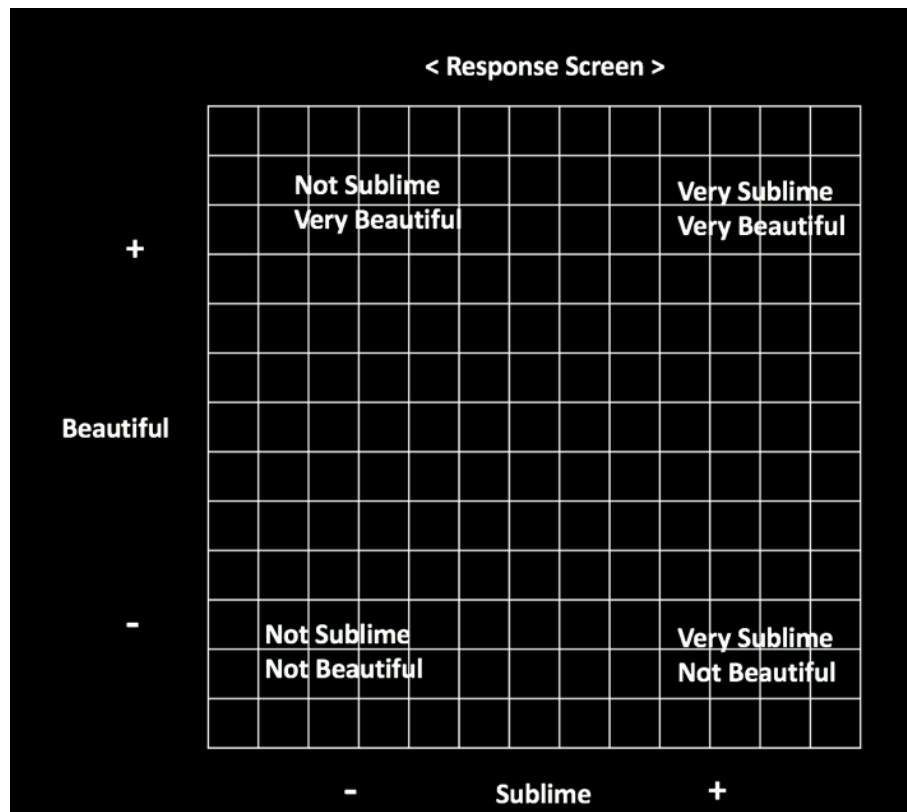


Figure 30. Response screen (Study 5).

Following the task, a questionnaire was administered, asking participants to generate 7 to 10 words that immediately come to mind when thinking of sublimity and beauty (see Appendix). Personality measures, identical to those used in the past chapter, were also collected. Each session took approximately 45 minutes.

### 3.3. Results

#### 3.3.1. Manipulation Checks

There were two main methodological changes from the previous chapter's studies. Firstly, a new set of sublimity and beauty definitions were administered. Secondly, instead of participants rating sublimity and beauty with two consecutive linear Likert-like scales, the present study made use of a grid, where participants rated sublimity and beauty simultaneously. Therefore, the manipulation checks were also a measure of the impact of these changes.

**3.3.1.1. Test-rest reliability.** Since a photograph appeared twice per session, it was possible to measure the degree participants were consistent with their own ratings of a photographic content over the two encounters. Although the appearance of an image was across different presentation conditions, consistency measures represent the degree of relative ratings of an image compared to other images. For each participant, a Pearson correlation was calculated between the evaluations. All  $r$  values were averaged across participants via Fisher's  $Z$

transformations.<sup>36</sup> For the purpose of interpretability, reported means and confidence intervals are computed by transforming the averaged *Z* values back to *r* values.

For the size manipulation block, the average test-retest reliabilities of sublimity and beauty were 0.83 (*SD* = 0.32), and 0.87 (*SD* = 0.40), respectively. The two derived measures, S+B (the degree to which an image is both sublime and beautiful) and S-B (the degree to which an image is more sublime than beautiful) were also considered. S+B had a reliability of 0.89 (*SD* = 0.38) and S-B had a reliability of 0.73 (*SD* = 0.39). Comparing the four reliabilities, a one-way ANOVA revealed a significant effect,  $F(3, 124) = 10.86, p < .001$ . Replicating the past chapters and via post hoc pairwise comparisons (Tukey HSD), S-B had the lowest test-retest reliability score compared to those of all other measures,  $ps < 0.05$ . Sublimity also had a lower reliability score than that of S+B,  $p < 0.05$ .

Despite the pattern that S-B ratings were comparatively lower in test-retest reliabilities compared to those of the other three measures, the overall picture is that there is a generally good level of test-retest reliability. This is a good replication of the past chapter's studies. Table 19 represents a comparison of test-retest reliabilities across studies. Comparing the reliabilities across studies for each rating, there were no statistical differences at  $p < .05$ . However, it is noticeable that there is a gradual increase of S-B reliabilities across studies, from 0.60 (Study 3) to 0.82 (present study, Height block).

Table 15. Test-retest reliabilities across Studies 3, 4, and 5.

	Study 3 ( <i>n</i> = 44)	Study 4 ( <i>n</i> = 34)	Study 5, Size Block ( <i>n</i> = 32)	Study 5, Height Block ( <i>n</i> = 32)
Sublimity	0.84	0.85	0.83	0.89
Beauty	0.88	0.91	0.87	0.88
S+B	0.89	0.92	0.89	0.90
S-B	<b>0.60</b>	0.70	0.73	<b>0.82</b>

*Note.* The numbers in bold represent a significant difference at  $p < .06$

**3.3.1.2. Between-study reliability.** 52 out of the 60 photographs were taken from pre-rated stimuli from previous studies.<sup>37</sup> Therefore, it is possible to estimate to what degree the ratings from the current study are consistent with those from past works. Sublimity and beauty ratings were aggregated by item from the current and past works respectively, and were correlated. Both ratings were consistent between studies; sublimity,  $r = 0.88, p < .001$ , and beauty,  $r = 0.91, p < .001$ . The consistency was also found for the S+B,  $r = 0.89, p < .001$ , and S-B,  $r = 0.94, p < .001$ , ratings. This shows that the participants from the current study gave responses that are consistent to those of past works, meaning that participants had similar ideas

<sup>36</sup>  $Z = \frac{1}{2} \ln \frac{1+r}{1-r}$

<sup>37</sup> The ratings derive from Studies 3, 4, and 10.

of the relative sublimity and beauty ratings of the stimuli. It should not be surprising that the pre-allocated *Aesthetic Hexagon* more or less re-emerge of the current dataset (see Figure 31). Also similar to past works, sublimity and beauty ratings were positively and moderately correlated,  $r = 0.53, p < .001$ .

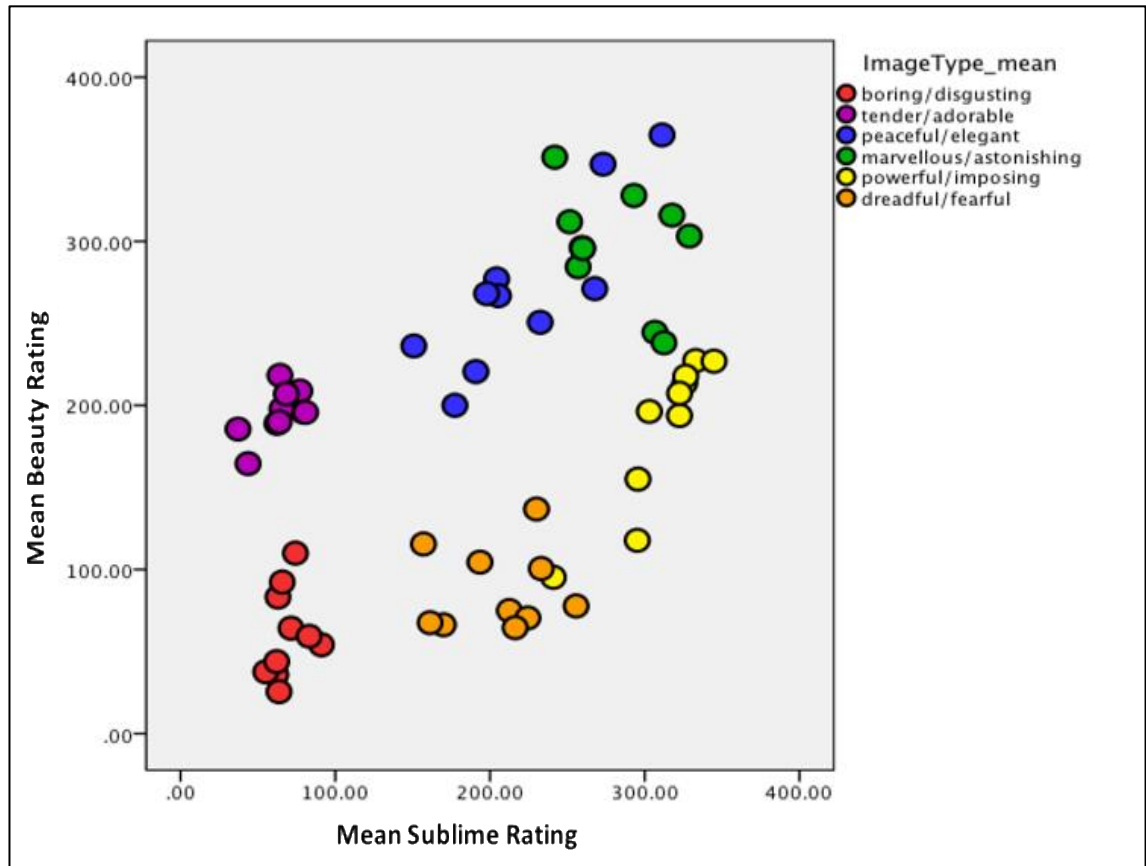


Figure 31. Aggregated sublimity and beauty ratings by stimulus (Study 5)

In Studies 3 and 4, all sublimity and beauty ratings were administered based on generic dictionary definitions of the two measurement variables, and using two separate linear Likert-like scales. The question remains, to what degree the changes in methodologies in the present chapter, namely the new sublimity and beauty definitions and the introduction of the grid rating method, influenced rating patterns. One of the reasons behind the introduction of new methodologies was to expand people’s responses to fully exploit the possibilities of the sublimity-beauty ratings. Therefore, to understand the extent of data spread, a series of variance analyses were computed based on data from Studies 3, 4, and 5, using by-item aggregated data.<sup>38</sup>

<sup>38</sup> Because the present study took 30 pre-tested stimuli from the previous chapter’s data and assembled them as stimulus pool Set A, only stimuli from Set A are analysed in the following analyses of this section.

Table 16. Variance per rating type (Study 5)

	Studies 3 and 4	Study 5
Sublimity	0.06	0.08
Beauty	0.08	0.08
S+B	0.27	0.23
S-B*	0.03	0.07

*Note.* \*  $p < .05$

Four Levene's tests were run, one for each rating type. Levene's test is a test comparing variance between two samples. Therefore, it is used in the present analysis to compare the degree to which item ratings are spread along a dimension. When the tests were run, Levene's test was significant for S-B,  $F(1, 58) = 5.21, p = .03$ , indicating that the variance in S-B between data from Studies 3 and 4, and from the present study were unequal. Specifically, with the introduction of new methodologies, there was a wider spread of data along the S-B, meaning that people were more likely to rate experiences of beauty but not sublimity and sublimity but not beauty. No other Levene's test analysis was significant at each rating type. Figure 32 demonstrates the general spread of aggregate ratings between those of Studies 3 and 4 (i.e. Chapter 2), and of the present study (i.e. Chapter 3).



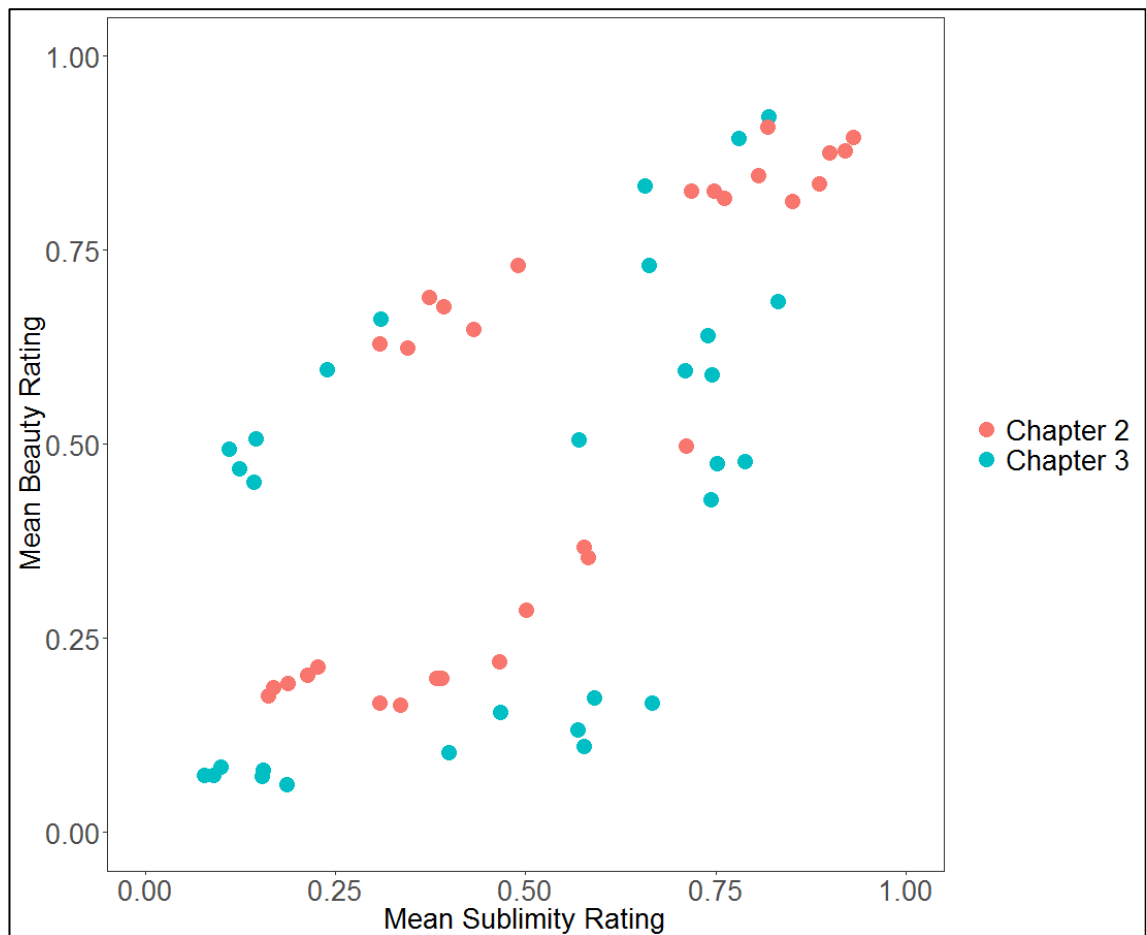


Figure 32. Average sublimity and beauty ratings for Chapters 2 (Studies 3 & 4) and the present study (Study 5).

**3.3.1.3. Between-participants agreement.** In estimating between-participants agreement, the Q-mode factor analysis, as was used in the previous chapter, was not used, because each participant looked at different images in the present design. Missing values are incompatible with factor analyses.

As an alternative measure, the “mean-minus-one” (MM1) correlation measure (Vessel, et al., 2018) was used to determine the degree to which participants of the current study were similar to one another. Average ratings across repeated stimulus content was computed for each participant. For a particular rating type, a set of correlations was then computed between an individual participant’s ratings and the average ratings of all other participants. Using Fisher’s Z transformations, these correlations were averaged together, and back-transformed to an  $r$  value. The  $r$  value represented the MM1 score for that particular rating.

As a measure of individual differences, the MM1 appears comparable to other known methods as pairwise correlation, inter-class correlation, and variance partitioning. Subjected under the MM1, high levels of between-participants agreement as observed in sublimity, 0.86 ( $SD = 0.35$ ), beauty, 0.85 ( $SD = 0.23$ ), S+B, 0.87 ( $SD = 0.28$ ), and S-B, 0.81 ( $SD = 0.25$ ). These values are comparable to Vessel et al.’s (2018) highest reported MM1 values. Comparing MM1

scores across the four rating types, the four rating types did not have equal between-participants agreement,  $F(3, 124) = 4.11, p = .01$ . Specifically, S-B had lower MM1 scores than those of sublimity,  $p = .04$ , and S+B,  $p = .01$ .

**3.3.1.4. Viewing time.** When the raw data for image viewing time were analysed, participants did not generally dwell long on each image. Participant viewed an image for a mean duration of 3.36 ( $SD = 4.21$ , median = 2.09) seconds. As can be seen in Figure 35, the distribution of viewing time was positively skewed, with a kurtosis value of 43.71. In 48.35% of the trials, participants looked at images for 2 seconds or less, arousing the suspicion that participants were not fully engaged in the given task.

When viewing time was averaged for each person across all trials, there was a wide range of individual differences. One participant, for instance, spent a mean duration of 1.45 seconds viewing images, where another participant spent a mean duration of 7.08 seconds doing the same set of tasks. In a by-participant analysis, when the average image viewing times were correlated with the four test-retest reliability scores, image viewing time did not correlate with test-retest reliability scores, i.e. sublimity,  $r_s = -0.20, p > .05$ , beauty,  $r_s = 0.18, p > .05$ , S+B,  $r_s = -0.30, p > .05$ , and S-B,  $r_s = -0.25, p > .05$ . The time spent viewing an image, therefore, did not appear to affect reliability.

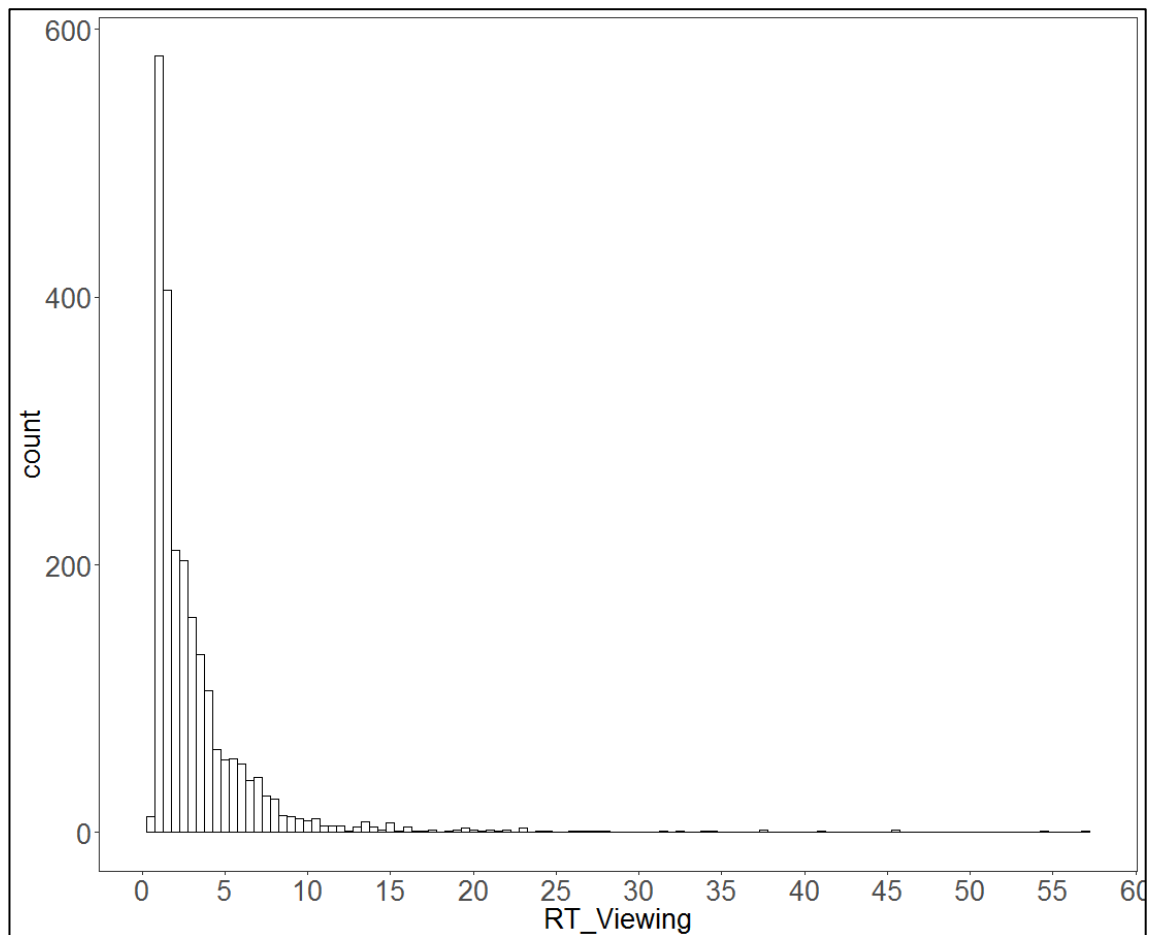


Figure 33. Raw data for image viewing time (Study 5)

### 3.3.2. Presentation Size and Height Effects on Sublimity and Beauty

**3.3.2.1. Analytic approach.** In determining the size and height presentation effects, the size and height effects were analysed separately. For each analysis, ratings were predicted by manipulation type (i.e. small vs. large or centre vs. high) and judgement type (i.e. sublimity vs. beauty), and their interaction. The interaction term enables assessing the degree to which the presentation manipulation affects sublimity and beauty differentially. Inferential statistics were calculated using linear mixed modelling, as described in Chapter 1c.

**3.3.2.2. Size effect.** For the size manipulation block, there was a main effect of size,  $F(1, 49.74) = 53.45, p < .001$ , with large (vs. small) photographs rated higher in both sublimity and beauty. There was no main effect of judgement type,  $F(1, 68.62) = 0.73, p > .05$ , implying that there were in general no differences between sublimity and beauty ratings over both size conditions.

There was a significant interaction between manipulation type and judgement type  $F(1, 81.53), p < .001$ . The interaction appeared to derive mainly from the fact that although ratings of sublimity and beauty were similar when presented small,  $t(69.90) = 0.27, p > .05$ , relatively more sublimity was evoked than beauty when images were presented large,  $t(65.10) = 1.80, p =$

.08. Increase of stimulus size increased both sublimity,  $t(50.60) = 7.65, p < .001$ , and beauty,  $t(47.10) = 5.18, p < .001$ . Descriptive and inferential statistics are provided in Table 17 and Table 18. The results are shown in Figure 34.

Given the general correlation between sublimity and beauty, a separate set of analyses were run, where sublimity ratings were predicted by the size manipulation, with beauty ratings set as a covariate. This would enable an understanding of size's effect on sublimity without the influence of beauty. Conversely, beauty ratings were predicted by the size manipulation, with sublimity ratings set as a covariate. The size effect remained intact for predicting both sublimity,  $F(1, 48.60) = 46.25, p < .001$ , and beauty,  $F(1, 46.60) = 13.45, p = .001$ .

Table 17. Size effect, descriptive statistics table (Study 5).

	Sublimity rating	Beauty rating
Large	225.09 ( $SD = 151.23$ )	197.79 ( $SD = 136.98$ )
Small	173.92 ( $SD = 126.74$ )	171.62 ( $SD = 126.20$ )

*Note.* Descriptive statistics represent mean values.

Table 18. Size effect, inferential statistics table (Study 5).

	<i>df</i>	<i>F</i>	<i>p</i>
Size	1, 49.74	53.45	<b>&lt; .001</b>
Judgement Type	1, 68.62	0.73	.40
Size × Judgement Type	1, 81.53	19.51	<b>&lt; .001</b>

*Note.* Bold show inferential statistics that are significant at  $p < .05$ .

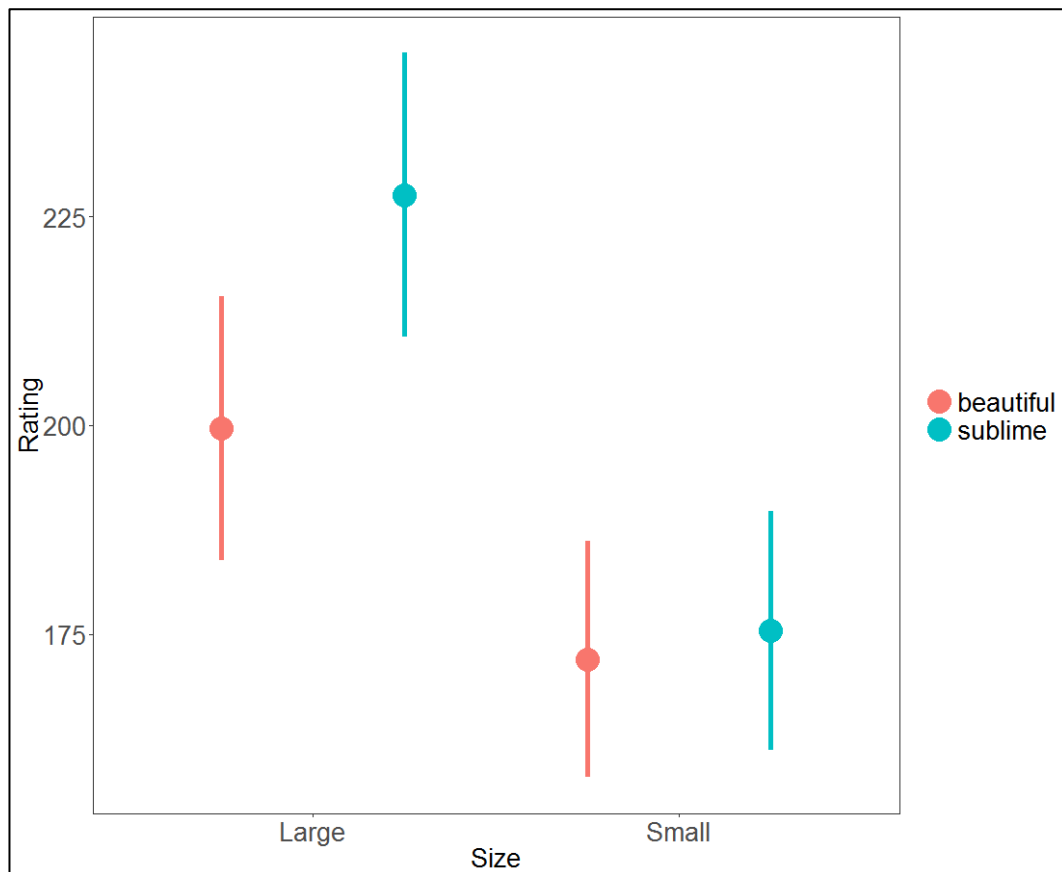


Figure 34. Size effect visualisation, with mean  $\pm$ 1SE (Study 5).

**3.3.2.3. Height effect.** For the height manipulation block, there was a main effect of height,  $F(1, 38.50) = 20.57, p < .001$ , with high (vs. centre) photographs rated higher in both sublimity and beauty. There was no main effect of judgement type,  $F(1, 68.52) = 0.14, p > .05$ , implying that there were no differences between sublimity and beauty ratings over both height conditions. Likewise, the lack of a significant interaction, between manipulation and judgement types,  $F(1, 38.08) = 0.42, p > .05$ , meant that the height effect did not affect sublimity and beauty differentially. Descriptive and inferential statistics are provided in Table 19 and Table 20. The results are shown in Figure 35.

As with the size effect, a separate set of analyses was run, where one rating type was predicted by the height affect whilst being accounted for the other. Even after controlling for the other rating variable, the height effect was there in predicting sublimity,  $F(1, 47.42) = 8.89, p = .005$ , and beauty,  $F(1, 32.09) = 5.72, p = .02$ .

Table 19. Height effect descriptive statistics table (Study 5).

	Sublimity rating	Beauty rating
High	194.62 ( $SD= 142.80$ )	188.51 ( $SD = 135.09$ )
Centre	173.92 ( $SD = 126.74$ )	171.62 ( $SD = 126.20$ )

Note. Descriptive statistics represent mean values.

Table 20. Height effect, inferential statistics table (Study 5).

	<i>df</i>	<i>F</i>	<i>p</i>
Height	1, 38.50	20.57	<b>&lt; .001</b>
Judgement Type	1, 68.52	0.14	.71
Height × Judgement Type	1, 38.08	0.42	.52

*Note.* Bold show inferential statistics that are significant at  $p < .05$ .

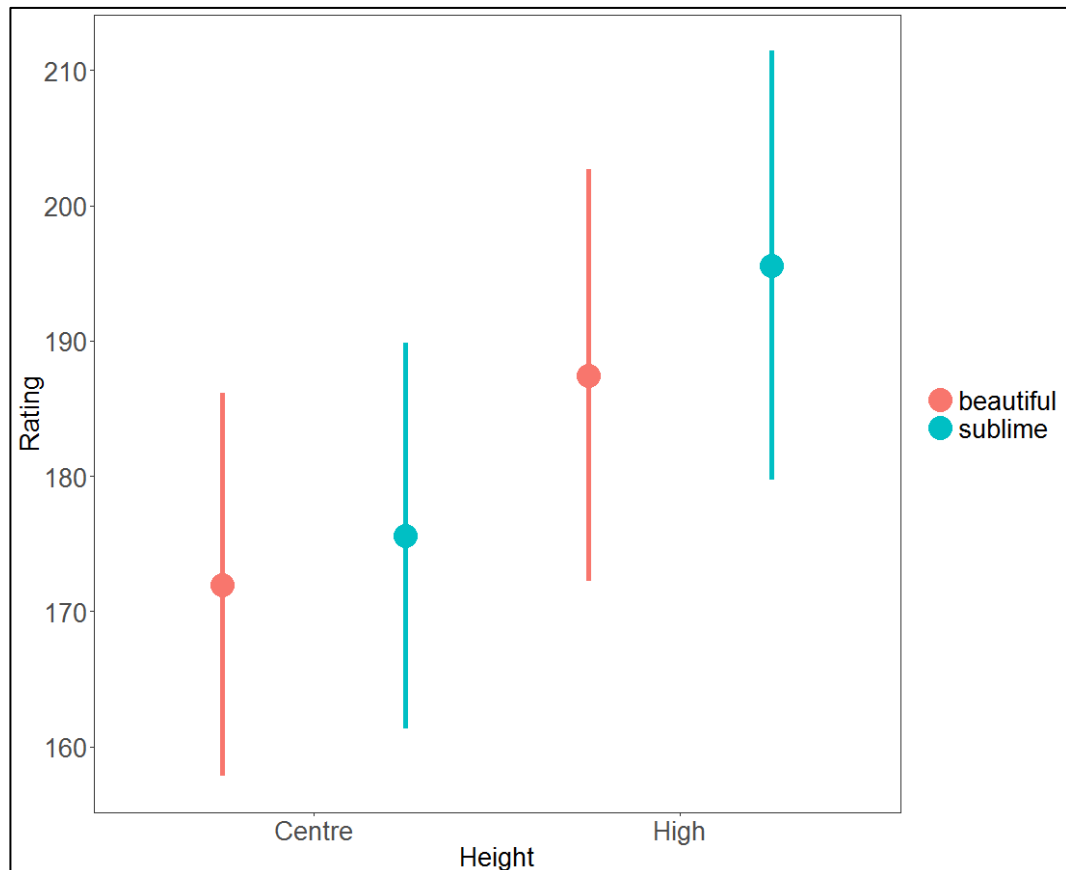


Figure 35. Height effect visualisation, with mean  $\pm$ 1SE (Study 5).

### 3.4. Discussion and Chapter Summary

The present study explored the effects of presentation size and height on sublimity and beauty elicitation through photographs. Where increase of presentation size or height of photographs lead to higher elicitations of sublimity and beauty, size affected sublimity more than beauty. Height, on the other hand, affected sublimity and beauty to similar degrees. It was further determined that the ratings of sublimity and beauty, while being moderately and positively related, had good test-retest and between-cohort reliabilities, and between-participants agreement.

These findings confirm both philosophical and psychological views of sublimity's close association with objects of great size and height (e.g. Konečni, 2011; Seidel & Prinz, 2017). Yet these effects are not unique to sublimity. Nor do the results support the postulation by Burke

(1859/2008) that sublimity and beauty operate on opposite mechanisms. Burke had predicted a double dissociation, where beauty is in small objects but not in large. What is found instead is that although sublimity and beauty are similar, sublimity and beauty may still operate on differing visual mechanisms, given their different sensitivities to size manipulations.

Why should size but not height stand out as a mechanism particularly linked to sublimity? Studies have reported that object size conveys information on emotional arousal more than valence (e.g. Lang et al., 1997). This is similar to sublimity's strong relationship with arousal but not with valence, as reported empirically by Hur and colleagues (2018). Burke (1759/2008), too, had described sublimity as an emotionally arousing experience, for instance, as "the strongest emotion which the mind is capable of feeling" (p. 39), whereas he allocated sublimity a rather vague valence profile, e.g. "this is not an unmixed delight, but blended with no small uneasiness" (p. 46). As such, the arousal-driven sublimity would have responded more in alignment with the arousal-driven size effect. Since beauty is closely linked with pure pleasure (Burke, 1759/2008; Hur et al., 2018), its link with the size effect would have been comparatively weak.

Translating this into reality, it would make sense that where the enlarging of sublime feelings is expected, e.g. outer space-themed films, this would benefit from large presentations, e.g. large screen in cinema. On the other hand, emphasis on the beauty elements of feelings, e.g. gardening advertisement, would benefit not as much from the exploitation of large presentation screens.

For the increase of presentation height, noticeable differentiations did not emerge between sublimity and beauty feelings. It is possible that the height effect for beauty might link with height's association with positive valence (Meier & Robinson, 2004). The effect for sublimity may link with height's link with power (Schubert, 2005), on the other hand. Based on the available data, it is not possible to determine, however, to what degree the height effect for sublimity and beauty each is rooted from the same psychological mechanism, and is caused by independent mechanisms unique to sublimity and beauty.

While the present chapter's main focus was indeed on the roles of presentation size and height on sublimity and beauty judgements, there were also a number of methodological advancements. Participants in the present study, compared to those in Chapter 2 (Studies 3 & 4), were given a more contrasting set of characterisations of sublimity and beauty. Furthermore, instead of rating sublimity and beauty in two consecutive Likert-like scales, participants used a grid to input two ratings in one go. While these changes did not change the general rating pattern – verified by high rating correlations between studies – the present methods, by making the sublimity and beauty contrast more explicit, showed an improvement in the test-retest reliability of S-B. Participants seemed also more eager to explore experiences of sublimity but not beauty, and beauty but not sublimity, but spreading out their S-B responses more. As such, the alterations represent an improved methodology in exploring the sublimity and beauty

relationship, especially in the Burkean sense of comparing sublimity against beauty. Lastly, while it was a concern that participants viewed images for a duration that was shorter than desired, this did not seem to affect the rating qualities, given the lack of correlations between image viewing time and test-retest reliabilities.



**Chapter 4. Study 6: The Roles of Stimulus Size and Colour on Sublimity and  
Beauty Judgements**

## 4.1. Introduction

The previous chapter tested whether manipulating the presentation size and height of photographs can influence elicitations of sublimity and beauty. The increase of presentation size and height of stimuli appeared to affect both sublimity and beauty positively. Still, size appeared to have stronger effects on sublimity than on beauty.

Methodologically, the introductions of new sublimity and beauty definitions and the adoption of the grid response method, proved to enhance distinctions between sublimity and beauty ratings. Carrying on with a similar set of methodologies from the previous chapter, the present chapter explores the role of another stimulus manipulation, namely the manipulation of colour (vs. monochrome), on sublimity and beauty judgements. The size manipulation is kept, in order to replicate the past findings.

### 4.1.1. Colour vs. Monochrome, as Predictors of Sublimity and Beauty

Visual representations in monochrome may seem uncommon in the natural world. Yet as the proverb “all cats are grey in the dark” goes, monochrome vision occurs at night. Importantly, and more relevant to the aesthetic narrative of the present thesis, artists from as early as the Middle Ages have practiced black and white paintings (*grisaille*), for “aesthetic, emotional, and sometimes even for moral reasons” (National Gallery, 2017). Conversely, people often ascribe colourfulness as an adjective in describing aesthetic experiences (Augustin, et al., 2012). As such, colour seems a noteworthy artistic concept that finds itself central in various aesthetic processes.

If visualising in black and white indeed assumes a distinct aesthetic style and if viewers are likely sensitive to colourfulness, what effects could the black and white presentation of objects (vs. coloured presentations) have on the aesthetic experiences of sublimity and beauty? Burke (1759/2008) and Akenside (Ashfield & De Bolla, 1996) have both considered that colour may be uniquely associated with beauty, but not sublimity. Burke’s view that, “if the colours be strong and vivid, they are always diversified, and the object is never of one strong colour” (p. 116) delegates colourfulness over monochrome as a unique predictor of beauty. Burke’s physiological explanation finds that as light strikes the eyes, and if “these rays frequently vary their nature, now to blue, now to red, and so on, . . . the organ has a sort of relaxation or rest” (p. 136), these result in feelings of calmness and beauty. On the other hand, sublimity, which rests on passions of pain and physiological tension, is evoked through blackness, i.e. “[which] cannot be considered as a colour” (p. 145). As such, the lack of colour is likely the cause of sublimity.

That colourfulness is a predictor of beauty has been empirically investigated. When people make evaluations of visual textures, subjective beauty associates with subjective ratings of warmth and colourfulness. Conversely, manipulated colourfulness of abstract visual stimuli correlates positively with beauty ratings (Jacobs et al., 2016). Looking at similar beauty-related

dependent variables, coloured objects, compared to their greyscaled versions, are seen as more likeable (Labreque & Milne, 2012) and more aesthetic (Massaro et al., 2012).

On the other hand, Forsythe, Nadal, Sheehy, Cela-Conde, and Sawey (2011) have reported no particular difference of subjective beauty between coloured and greyscaled versions of photographs and artworks. Similarly, Lyssenko, Redies, and Hayn-Leichsenring (2016) report that subjective beauty has no relation to colour saturation (i.e. colourfulness) in abstract paintings. Colour also did not affect the cropping of photographs (Mathers, 2013; McManus, Zhou, l'Anson, et al., 2011).

In relation to the Burkean assumption that sublimity relates to fear and beauty to pleasure, some works have reported that colour saturation is associated with subjective positive valence (Allan, 2009; Detenber & Winch, 2001; Kuzinas, Noiret, Bianchi, & Laurent, 2016). In evaluations of photographs of facial expressions, joyful expressions had higher colourfulness (measured in saturation) than fearful expressions (Dael et al., 2016). That said, Bradley, Codispoti, Cuthbert, and Lang (2001) reported no difference in evoked valence, arousal, and dominance between colour and black and white versions of normalised emotional photographs. Emotions seem elicited solely on the photographic content.

Despite these works, none of the studies measured sublimity and beauty simultaneously. As elaborated in the Introduction, this makes it difficult to generalise to what degree these studies have measured general aesthetic goodness or specifically beauty as opposed to sublimity.

#### **4.1.2. Current Study**

There are some clues from both philosophy and psychology that coloured objects are more beautiful compared to their black and white versions. One can thus expect that the presence of colour (vs. monochrome) would increase beauty, but not sublimity. To further generalise the size effect from the previous chapter, the size manipulation was carried over to the new study, using some newly selected stimuli and participants, in an experimental setting largely similar to Study 5.

### **4.2. Methodology**

#### **4.2.1. Participants**

As in Study 3, Study 6's data collection was done on the basis of the 'Design and Analysis of Psychological Experiments' module of UCL's BSc Psychology degree. Four 2<sup>nd</sup> year undergraduate students assisted in collecting data, and the thirty-nine participants (24 female,  $M_{age} = 20.08$ ,  $SD_{age} = 1.01$ ), were largely the data collectors's own acquaintances. There were no financial compensations nor course credits involved. All participant provided written consent prior to the start of the study.

#### 4.2.2. Stimuli, Material, and Design

Each participant looked at a subset of a pool of 60 photographs – 42 of them from Study 5, and 18 of them newly selected from Study 11. As before, the photographs were chosen to approximately represent the *Aesthetic Hexagon* in equal numbers, with ten unique photographs for each of the six categories.

The design of the study was a 2 (size: large vs. small)  $\times$  2 (colour: colour vs. monochrome) within-participants design, as each participant observed all four of the stimulus manipulations. Therefore, the present design enabled the estimation of an interaction between the two main manipulations. The size condition manipulation was identical to that of the previous study. The colour condition manipulation of converting coloured photographs to a greyscaled monochrome was done via MATLAB 2016b's (MathWorks, Inc., Natick, MA, USA) *rgb2gray()* function. Figure 36 presents a couple of sample stimuli, and their colour manipulations.

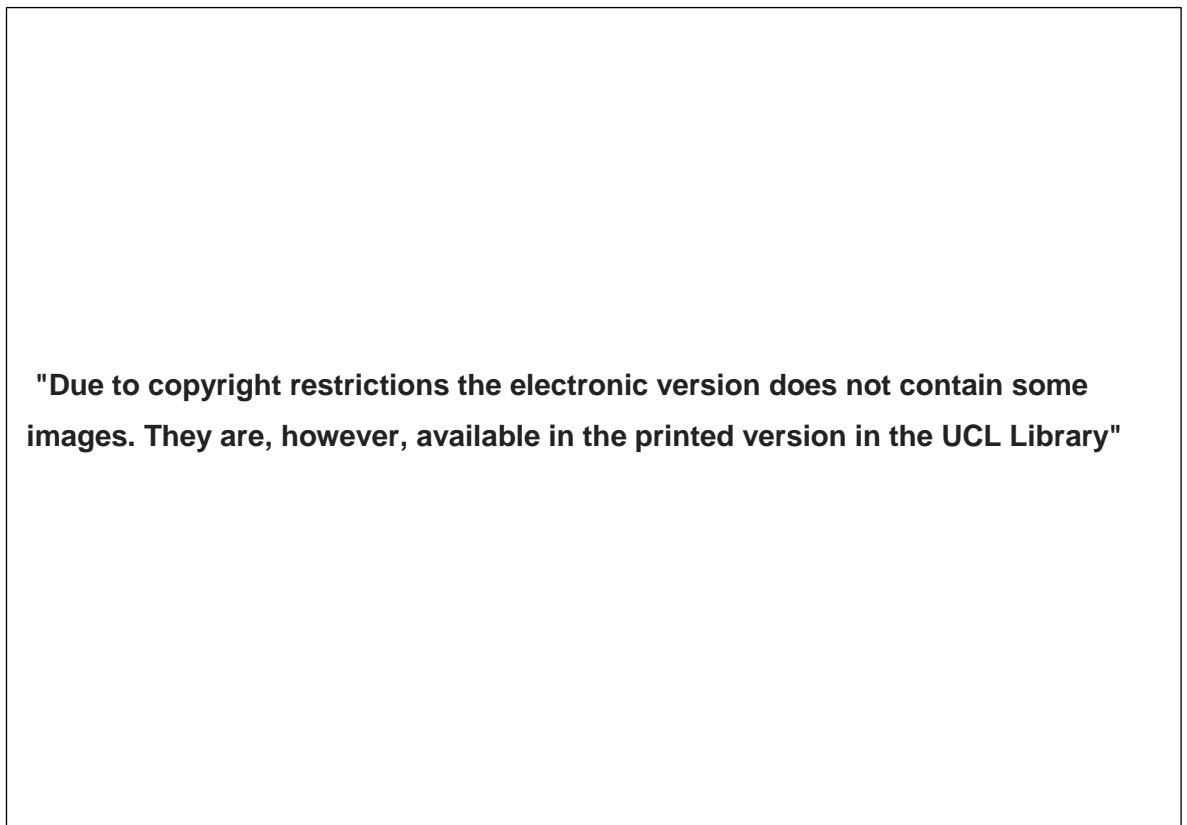


Figure 36. Sample stimuli (Study 6)

#### 4.2.3. Procedure

The procedure was largely similar to that of Study 5, but with a few differences. In the current study, participants were forced to view each stimulus for 6 seconds instead of viewing the photograph as long as they wished. In Study 5, where participants could view the image as long as they wished, the image viewing time varied between participants, and the median viewing time was only 2.09 seconds. Fixing the image viewing time enabled better control of stimuli

exposure time across participants and stimuli. Therefore, potential psychological consequences deriving from varying stimuli exposure time were accounted for.

Regarding the main rating section of the study, 30 unique photographs from the entire stimulus pool were randomly selected for each participant. Note that unlike Study 5, the photographs were not allocated to two different sets, allowing for a purer randomisation in stimuli selection per participant. Those 30 photographs were composed of 5 photographs from each corner of the *Aesthetic Hexagon*. Of the 5 photographs from each hexagon corner, either 2 or 3 (randomly decided) photographs were allocated to be presented in colour, leaving the other 3 or 2 in monochrome. All 30 photographs appeared once in large and once in small, with the order of both photograph content and size manipulation, randomised. For example, a photograph chosen for a participant as colour would appear once as coloured and large and once as coloured and small throughout a session, but never in monochrome. This design prevented the participants from repeatedly seeing all four manipulation conditions of a photograph content.

Similar to Study 5's design, until halfway point of the study, no stimuli contents were repeated. Therefore, up until the mid-point of the entire image rating task, the design adhered to a between-participants design in terms of the stimuli. There was a small break halfway through the 60-trialed main section of the study.

### 4.3. Results

#### 4.3.1. Manipulation Checks

The manipulation checks assessed the replications of test-retest reliability and between-participants agreement. The section also calculated the extent to which the present study data are consistent with datasets from other studies, i.e. Studies 5 and 10. A summary of the manipulations checks is available in Table 21.

**4.3.1.1. Test-retest reliability.** As in Study 5, Pearson correlations were calculated between the repeated evaluations of images (an image appeared twice in different size conditions). The average test-retest reliabilities of sublimity and beauty were 0.79 ( $SD = 0.37$ ), and 0.84 ( $SD = 0.35$ ), respectively. The average reliability scores were also acceptable for S+B, 0.85 ( $SD = 0.34$ ) and S-B, 0.73 ( $SD = 0.36$ ). With the 39 participants as observations, a one-way ANOVA revealed that the four reliability scores were not equal,  $F(3, 152) = 7.63, p < .001$ . Tukey HSD post hoc testing revealed that the test-retest reliability score of S-B was particularly low, being significantly lower than beauty,  $p = .001$ , and S+B,  $p < .001$ . This pattern of S-B having low test-retest reliability replicates the Study 5 outcomes.

**4.3.1.2. Between-study reliability.** All photographs rated in the current study had already been rated in other studies. Of the 60 images, 42 appeared in Study 5, and 18 appeared in Hur et al. (2018), i.e. Study 11.<sup>39</sup> Ratings were aggregated by stimuli once on the past rating data comprising of Studies 5 and 10, and once on the data of the present study. The two sets of rating were correlated according to matching ratings, to assess how the ratings were consistent between studies. Both sublimity and beauty ratings of the current work were highly consistent with those of past works, with  $r = 0.88, p < .001$  and  $r = 0.97, p < .001$  respectively. A similar set of between-study consistencies was found for S+B,  $r = 0.95, p < .001$ , and S-B,  $r = 0.95, p < .001$ .

It should be noted that in the current study, sublimity and beauty ratings were positively and moderately correlated,  $r = 0.29, p < .05$ . The degree of sublimity-beauty correlation, while substantially lower than that of Study 5 ( $r = 0.58, p < .001$ ), nevertheless replicates the general positive relationship between sublimity and beauty. Figure 37 denotes the general sublimity and beauty relationship of the present study.

Methodologically, the present study adopted a design where participants rated photographs after viewing each photograph for a fixed duration of 6 seconds. This was a contrast to Studies 5 and 10, where participants could view each photograph as long as they wished. In this context, the positive between-study reliability suggests that image viewing time does not affect one's relatively sublimity and beauty ratings.

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<sup>39</sup> The data collection of Study 11 was done prior to the data collection of Studies 5 and 6.

"Due to copyright restrictions the electronic version does not contain some images. They are, however, available in the printed version in the UCL Library"

Figure 37. Sublimity-beauty rating space (Study 6)

**4.3.1.3. Between-participants agreement.** The “mean-minus-one” (MM1) correlation (Vessel et al., 2018) was calculated as a measure of between-participants agreement. Details of the method are available in Study 5. Subjected under the MM1, acceptable levels of between-participants agreement as observed in both sublimity, 0.70 ( $SD = 0.28$ ), and beauty, 0.79 ( $SD = 0.35$ ). Similar degrees of agreement were found for S+B, 0.75 ( $SD = 0.31$ ), and S-B, 0.73 ( $SD = 0.36$ ). These MM1 scores are considered high in the Vessel paper. Unlike Study 5, the MM1 scores were not different across the four rating types, as informed by a one-way ANOVA,  $F(3, 152) = 2.35, p > .05$ .

Table 21. Manipulation checks (Study 6)

	Test-retest reliability	Between-study reliability	Between-participants agreement
Sublimity	0.79	0.88	0.70
Beauty	0.84	0.97	0.79
S+B	0.85	0.95	0.75
S-B	0.73	0.95	0.73

### 4.3.2. Presentation Size and Colour Effects on Sublimity and Beauty

The analytic approach was similar to that of Study 5, with the use of linear mixed modelling via R's `lmer()` function of the `lme4` package (Bates et al., 2015). However, the current work had a factorial design of the manipulations, meaning that the ratings were predicted by not only the main effects of size (i.e. small vs. large) and colour (i.e. i.e. colour vs. monochrome) manipulations, but also their interaction. To determine the degree to which these effects are moderated by the judgement type (i.e. sublimity vs. beauty), this variable was also entered as a predicting variable. In the end, ratings were predicted by the main effects of size manipulation, colour manipulation, judgement type, and all possible interactions between these variables.

There were main effects of manipulations of size,  $F(1, 85.70) = 19.24, p < .001$ , and colour,  $F(1, 41.80) = 14.33, p < .001$ . That is, both sublimity and beauty ratings increased as a photograph was generally presented as large (vs. small) or presented in colour (vs. monochrome). However, there was no significant interaction between size and colour,  $F(1, 3428.90) = 1.43, p > .05$ .

There was a significant interaction between colour and judgement type,  $F(1, 3493.80) = 7.53, p = .006$ , meaning that the effects of colour manipulation had selective effects on sublimity and beauty ratings. This interaction can be explained by the fact that although photographs presented in monochrome lead to similar sublimity and beauty experiences,  $t(63.90) = 0.40, p > .05$ , photographs presented in colour are more beautiful than they are sublime,  $t(68.50) = 2.30, p = .03$ . Similarly, where coloured photographs elicit substantial more beauty than monochrome photographs,  $t(68.50) = 4.63, p < .001$ , this colour effect is relatively muted for elicitations of sublimity,  $t(68.50) = 2.06, p = .04$ . Given the lack of a triple interaction between size manipulation, colour manipulation, and judgement type, the interaction between colour and judgement type appeared to work similarly for both presentation size groups. Descriptive statistics are provided in Table 22. The entire inferential statistics table is presented in Table 23.

Table 22. Size and colour effects, descriptive statistics table (Study 6).

		Sublimity rating	Beauty rating
Large	Colour	213.44 ( $SD = 123.09$ )	225.43 ( $SD = 121.68$ )
	Monochrome	209.68 ( $SD = 120.98$ )	202.44 ( $SD = 120.42$ )
Small	Colour	203.12 ( $SD = 124.38$ )	216.77 ( $SD = 122.35$ )
	Monochrome	189.32 ( $SD = 119.23$ )	191.79 ( $SD = 113.75$ )

*Note.* Descriptive statistics represent mean values.



Table 23. Size and colour effects, inferential statistics table (Study 6).

	<i>df</i>	<i>F</i>	<i>p</i>
Size	1, 85.70	19.24	< <b>.001</b>
Colour	1, 41.80	14.33	< <b>.001</b>
Judgement Type	1, 38.10	1.11	.299
Size × Colour	1, 3428.90	1.43	.231
Size × Judgement Type	1, 3458.00	1.22	.270
Colour × Judgement Type	1, 3493.80	7.53	<b>.006</b>
Size × Colour × Judgement Type	1, 3458.00	0.58	.446

Note. Bold show inferential statistics that are significant at  $p < .05$ .

No other main or interaction effects reached statistical significance at  $p < .05$ . This meant that findings of Study 5, namely the interaction between presentation size and judgement type was not replicated in the present data,  $F(1, 3458.00) = 1.22, p > .05$ . The interaction effect between size and judgement type did not reach significance even when a new linear mixed model was run, this time only using presentation size, judgement type, and their interaction as the predicting variable,  $F(1, 3371.8) = 2.00, p > .05$ . Figure 38 represents a visualisation of the entire set of findings in a single output. The visualisations are further broken down into the effects of colour and judgement type (Figure 39), and size and judgement type (Figure 40), for interpretability.

Similar to what was done in Study 5, the size and colour effects, including their interaction, were modelled predicting sublimity or beauty one at a time, while holding the other response variable as a covariate. This was done to account for the positive correlation between sublimity and beauty. The outputs, while seemingly redundant to the previous set of analyses, represent a more purer effect of manipulations on each aesthetic response. For sublimity, only size,  $F(1, 40.68) = 20.52, p < .001$ , predicted the response. Colour, on the other hand, did not predict sublimity,  $F(1, 114.53) = 2.07, p > .05$ . Beauty was predicted both by size,  $F(1, 37.09) = 6.78, p = .01$ , and colour,  $F(1, 46.08) = 20.60, p < .001$ . These outcomes emphasises that colour seems to uniquely predict beauty ratings, but not sublimity ratings. A full inferential table of this new set of analyses is provided in Table 24.

Table 24 Inferential statistics table, for separate predictors (Study 6).

	Predicting sublimity			Predicting beauty		
	<i>df</i>	<i>F</i>	<i>p</i>	<i>df</i>	<i>F</i>	<i>p</i>
Size	1, 40.68	20.52	< <b>.001</b>	1, 37.09	6.78	<b>.01</b>
Colour	1, 114.53	2.07	.15	1, 46.08	20.60	< <b>.001</b>
Size × Colour	1, 62.29	3.37	.07	1, 41.02	0.03	.87
(Covariate)	1, 2159.66	23.34	< <b>.001</b>	1, 2270.77	15.19	< <b>.001</b>

Note. Bold show inferential statistics that are significant at  $p < .05$ .

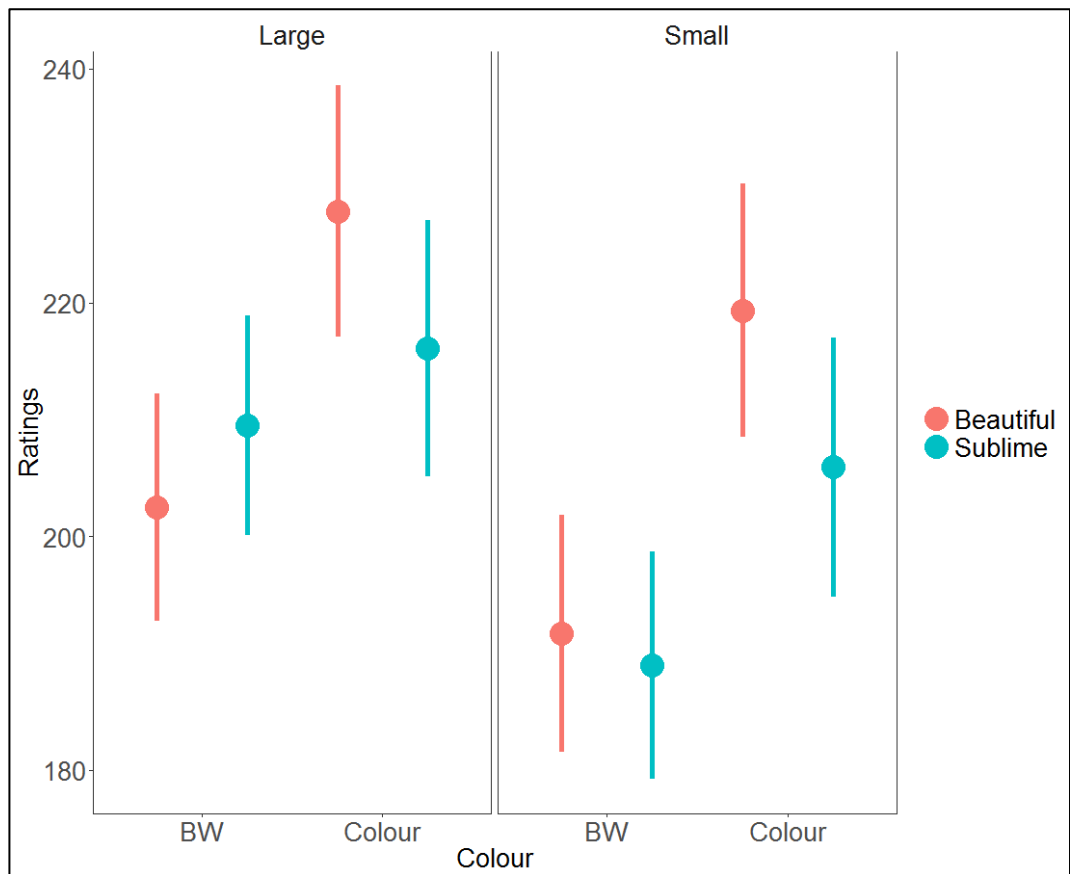


Figure 38. Colour and size effects visualisation, with mean  $\pm 1$ SE (Study 6).

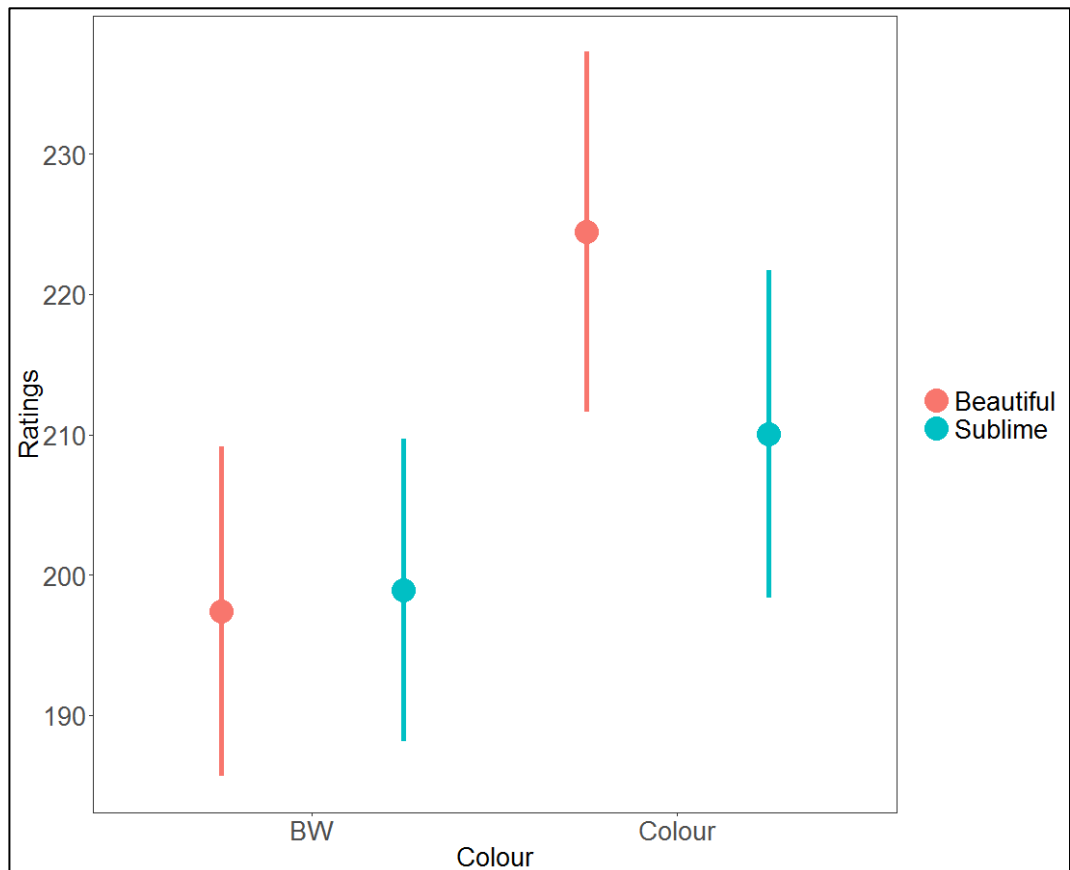


Figure 39. Colour effect visualisation, with mean  $\pm 1$ SE (Study 6).

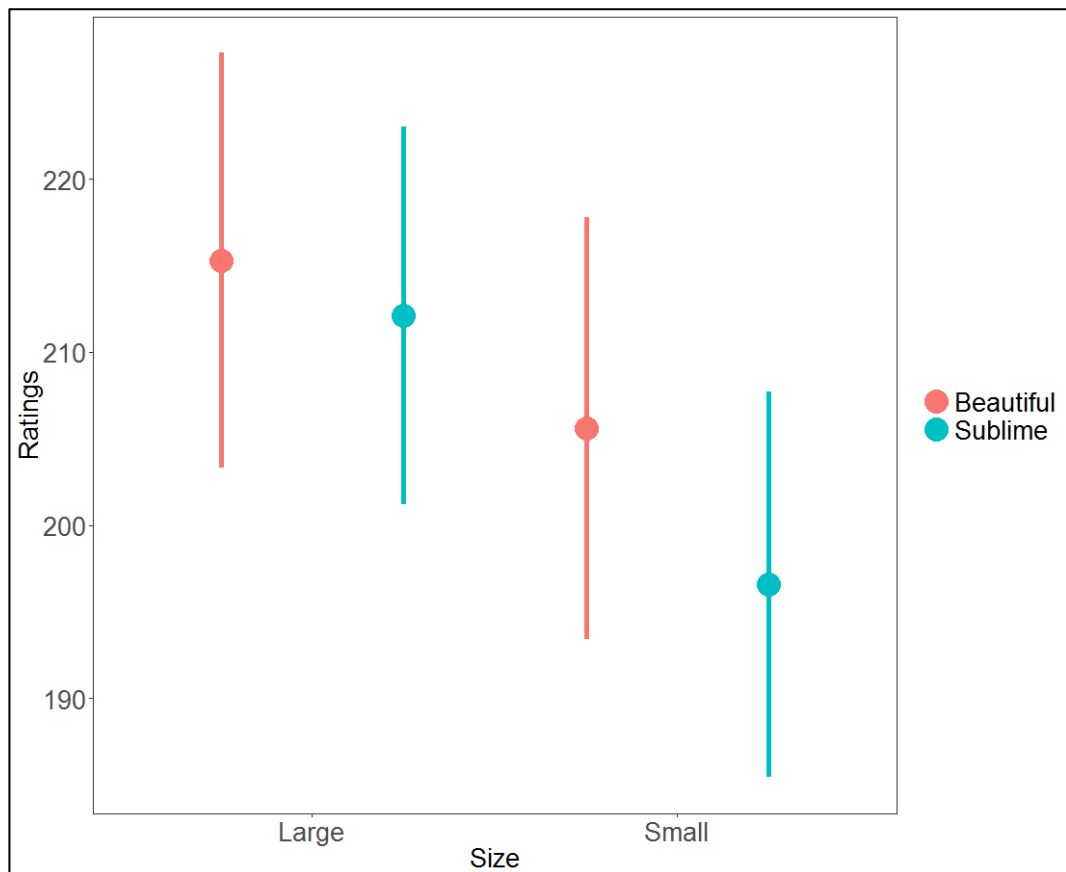


Figure 40 Size effect visualisation, with mean  $\pm$ 1SE (Study 6).

#### 4.4. Discussion and Chapter Summary

The present study explored the roles of presentation colour (i.e. colour vs. monochrome) and size (i.e. large vs. small) on their effects on experienced sublimity and beauty. While colour and size both increased ratings of sublimity and beauty, colour affected beauty more than sublimity. Although the preceding study reported that size affects sublimity more than beauty, this was not replicated in the new data.

Previous works from other researchers have reported colour to be a predictor of generally positive aesthetic evaluations as intensity and liking (e.g. Labreque & Milne, 2012), a conclusion that shares much with the present results. While such colour effect does not support previous works that claim colour to not play a role in the evaluations of subjective beauty (e.g. Lyssenko et al., 2016), it may be that these particular works often used paintings as stimulus. If true that artworks are processed differently to photographic stimuli (Vessel et al., 2018), a direct comparisons of results may prove difficult. Even if one assumes that different stimuli are processed similarly, most empirical works in the field rarely test for the experience of sublimity and beauty simultaneously. As discussed in the thesis Introduction (Chapter 1c), the assessment of beauty alone may cause difficulties in the interpretation of the measure. Hence, to what degree the beauty and general aesthetic evaluations from previous works align with the presently adopted Burkean sublimity and beauty, is difficult to estimate.

That colour was effective in increasing perceptions of beauty but had a lesser effect on perceptions of sublimity partially supports Burke's viewpoints that colour uniquely pertains to beauty. In fact, when the effects of colour on sublimity was predicted after controlling for beauty, the initial colour-sublimity relationship was eliminated. Burke posited that beauty relates to pleasure and sublimity to fear – and colourfulness is what evokes pleasure. In support of Burke, colourfulness was also reported to be associated with emotional positivity (e.g. Detenber & Winch, 2001). In this association between colourfulness and beauty, it may be possible to understand why visual contents – especially advertisements, because they require strong impact in a short amount of time – emphasising qualities of love and pro-sociality (e.g. a family having a picnic together whilst advertising food products) seem to work much better in colour than in black and white. After all, love and pro-sociality are two further elements that Burke uniquely links to beauty.

Yet the findings fail to support Burke's expectations that black and white may elicit sublimity. This may be linked with the mystery that black and white, an artistic device so deliberately and often used in artworks as cinema (e.g. Béla Tarr) and photography (Anselm Adams), for its obvious artistic merit, was rated generally low in sublimity and beauty from the current data. While black and white photographs may artistically picture states of solemnity and weight, these experiences may not have been fully captured in the measures used in the present work. That is, black and white photos may have their own beauties and/or sublimities, but these qualities may not have been within the range of the Burkean beauty and sublimity measured in the present work.

As in Study 5, the increase of photograph size increased both sublimity and beauty – a result that emphatically fits into the “bigger is better” mould (Lombard, 1995). However, the present study's outcome that size affects sublimity more than beauty was insufficient, ultimately not leading to a statistical significance.

A few reasons may explain the discrepancy of the size effect between Study 5 and the present study. Design-wise, Study 5 had the size manipulation obvious; one block was purely dedicated to the manipulation of presentation size, and the following block was purely dedicated to the manipulation of presentation height. In other words, it was clear to the participants what the study was about. This differs from the present study's design, where either one of the four manipulations appeared seemingly haphazardly in consecutive trials, not delineated block-wise. This added subtlety of manipulation could have made the size and judgement type interaction less salient, consequentially dimming down its presence. Conversely, the decrease of saliency of the size manipulation could have also emerged from the fact that participants were relatively more engrossed by the colour manipulation compared with the size manipulation.

**Chapter 5. Studies 7 and 8: The Roles of Visual Angle, Viewing Distance,  
Brightness, and Contrast, on Sublimity and Beauty Judgements**

## 5.1. Introduction

Studies 5 and 6 have explored whether certain formal features of photographs affect photographs's elicited sublimity and beauty. Presentation size and height, and the presence of colour (vs. monochrome) increased both reported sublimity and beauty. Of these, colour increased beauty more than sublimity. With size, there was some support that presentation size affected sublimity more than beauty. These findings tap into the notion that while sublimity and beauty are positive aesthetic experiences, they may operate on independent visual mechanisms. All previous studies showed good within-participants and between-study reliabilities, along with between-participants agreement. These conclusions converge to some degree with philosophical theories elaborated in the Introduction of the thesis, especially those by Burke (1759/2008).

Building on the previous chapters, the present chapter concerns three sets of questions. Firstly, what are the mechanisms of the size effect? Given size's association with sublimity, the mechanism of the association is further explored by systematically controlling the relationship between retinal size (i.e. visual angle), actual size, and viewing distance. Secondly, what are the roles of brightness and contrast on their effects on sublimity and beauty? These manipulations follow up on the issue of colour and sublimity from Study 6, and represent two further manipulations of colour constancy (Hatfield, 2009). Thirdly, re-analysing using aggregated data from Studies 5, 6, and 7, and thereby increasing statistical power, what factors (e.g. emotional content of images) contribute to the size effect? These questions are answered in two studies, Studies 7 and 8, with the latter study comprising an aggregated data analysis.

### 5.1.1. Size Perception as a Function of Visual Angle, Absolute Size, and Viewing Distance

The increase of stimulus size has important effects on emotional, cognitive, and aesthetic outcomes (e.g. Lombard, 1995), as has been discussed in Studies 5 and 6. The assumption is that increased actual physical size of a stimulus leads to an increase in perceived physical size of the stimulus.

Yet what does an increase of perceived stimulus size exactly entail? In accordance to the literature of psychophysics, size perception relies on three factors. These factors are 1) actual size of an object, 2) retinal image size, or the angle an object subtends at the eye, i.e. visual angle, and 3) viewing distance. The relationship between the actual size of an object and its retinal image size can be computed in the following equation (Figure 41), where  $V$  is the visual angle;  $S$ , the actual size of the object; and  $D$ , the distance between viewer and object:

$$V = 2 \tan^{-1} \frac{S}{2D}$$

Figure 41. The relationship between visual angle, absolute size, and viewing distance of a stimulus.

With any of the two variables, the other is automatically determined. A visualization of the relationship between the three variables is shown in Figure 42.

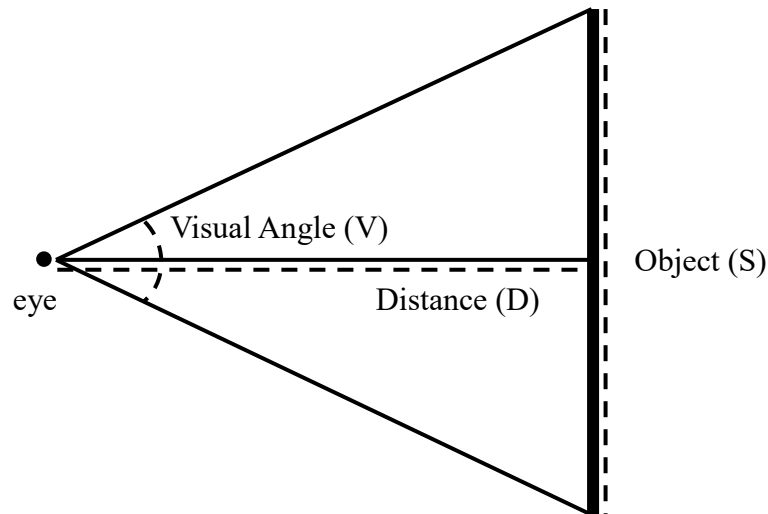


Figure 42. Visualisation of the relationship between the visual angle, absolute size, and viewing distance of a stimulus.

There are, however, disagreements as to which of these elements is most important when it comes to size perception using actual objects. “Retinal image” theories state that object size is exclusively perceived based on the resulting image on the retina, i.e. visual angle (Fincham, 1945). On the other hand, “size constancy” theories assume object size is perceived regardless of how far an object is (Burbeck, 1987; Haber & Levin, 2001; Koffka, 1935), thus emphasizing the importance of the actual size of objects. Realistically, it is likely that the truth lies between the two extremes; in binocular vision, as opposed to monocular observations or with reduction of distance cues, size perception occurs close to size constancy (e.g. Holway & Boring, 1941; Jayson, 1949; Thouless, 1931). Nevertheless, considering recent fMRI evidence that an object’s actual size, its retinal image size, and distance of view may map out systematically in the brain (Murray, Boyaci, & Kersten, 2006), accounting for these three factors in understanding the mechanisms of size perception becomes inevitable.

### 5.1.2. Visual Angle, Absolute Size, and Viewing Distance on Sublimity

The importance of the three size factors in understanding size perception notwithstanding, existing studies on the role of perceived size on aesthetic outcomes tend to overlook systematic control of these three factors, studies commonly attributing effects to stimulus size, even though the effect could have also been caused by visual angle. This misattribution is caused because experimenters often change absolute presentation sizes of stimuli without changing viewing distances. When viewing distance is kept constant, visual angle and absolute size are

confounded with each other. Thus Seidel and Prinz's (2017) findings that evaluations of wonder of an artwork increases with the artwork's size risk being confounded.<sup>40</sup>

Similar imprecisions also occur in philosophy. For Burke (1759/2008), sublimity by vast visual dimensions is sublime because largeness triggers confusion on the retina. While Burke's perspective borders on the "retinal image" theories in consequence, Burke, like Seidel and Prinz (2017), does not venture into the possibility of large objects being viewed from various distances. Accordingly, the mechanism of the size-induced account of sublimity is blurred. Payne Knight's subsequent ridicule of Burke, that "one's pen a foot away makes a greater impression on the retina than Salisbury steeple at a mile, and the sheet of paper on which one writes would be more sublime than the Peak of Teneriffe" (Hipple, 1957, p. 92), is rightly justified.

Research on the sense of presence (Lombard & Ditton, 1997; Slater & Usoh, 1993) experimented with visual angle, although the general picture, as will become evident, is still confusing. It should be mentioned that the sense of presence has previously been linked with 'beautiful' and 'fascinating', as well as to general intensifying of emotional experiences (Visch et al., 2010). One can further assume that presence, given its link to intensified emotions, may be a close relative to Burke's sublimity.

In this context, Tan's (2004) report of a positive link between the sense of presence and actual stimulus size, with visual angle kept constant, is promising. Similar designs have been put forth by Troscianko et al. (2012), Hatada et al. (1980), and Yuyama (1982). Of these, Troscianko et al.'s work is notable for having shown participants 45-minute film clips of *The Good, The Bad, and The Ugly* to participants, and finding that when visual angle is kept constant, participants think the film on the large screen gave a higher sense of presence. These results are confirmed by Wu, Lin, and Tang (2011), but Wu and colleagues manipulated visual angle whilst keeping the actual size of stimuli constant. Having done so, they found that the increase of visual angle increased the sense of presence, engagement, emotional arousal, and emotional valence, thus demonstrating further subtleties.

While Wu and colleagues (2011) did not attempt to look at the possible interaction between visual angle and actual size, that was done by Baranowski and Hecht (2014). They found no notable effect of actual size on subjective presence ratings after controlling for visual angle, although presence rating was positively correlated with perceived size rating of the

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<sup>40</sup> In psychological studies, the confounding of actual size and visual angle is especially common, as many designs change stimulus size under constant distances. One possible explanation of the confusion between actual size, visual angle, and distance, is that people generally infer information about distance from manipulating stimulus size (i.e. Size-Distance Paradox, Woodworth & Schlosberg, 1954). Still, this does not justify commonly assumed statements that larger stimuli are located closer than smaller stimuli (see Codispoti & de Cesarei, 2007; Gerhardsson, Högman, & Fischer, 2018). These assumptions have rarely been tested in these studies.



stimulus. Surprisingly, neither visual angle nor the interaction between visual angle and absolute size significantly predicted subjective presence.

The discrepancies between the reports are not easy to reconcile, but may result from issues of design. For example, Wu et al. (2011) made use of a predominantly male (83%) sample engaging in gaming in a within-participants design, where Baranowski and Hecht (2014) made participants watch movie clips in a between-participants design. Yet these explanations fall short in explaining how the size effect from the past two studies of the current thesis failed to be replicated, nor do they explain why even Troscianko et al. (2012) could not replicate their size effect across their two main studies. These cases demonstrate that there may be subtle confounds underlying size effects when predicting higher level outcomes as the sense of presence or sublimity.

### **5.1.3. Brightness, Contrast, Sublimity, and Beauty – A Burkean Interpretation**

There are grounds for believing brightness and contrast may be associated with sublime experiences. Burke (1759/2008) writes “darkness is more productive of sublime ideas than light” (p. 79-80). Sections such as the following are typical of Burke’s descriptions:

An immense mountain covered with a shining green turf, is nothing, in this respect, to one dark and gloomy; the cloudy sky is more grand than the blue; and night more sublime and solemn than day... in buildings, when the highest degree of the sublime is intended, the materials and ornaments ought neither to be white, nor green, nor yellow, nor blue, nor of a pale red, nor violet, nor spotted, but of sad and fuscous colors, as black, or brown, or deep purple, and the like.... sublimity must be drawn ... with a strict caution however against anything light and riant; as nothing so effectually deadens the whole taste of the sublime. (Burke, 1759/2008, p. 81-82)

Burke believed darkness evokes obscurity, terror, and pain, events that would directly cause sublimity. He notes, for example, that unpleasant things have dark contexts, giving examples of nocturnal ghost stories. Conversely, darkness in itself causes unpleasantness, “blackness and darkness are in some degree painful by their natural operation, independent of any associations whatsoever.” (p. 142) that “any one will find, if he opens his eyes and makes an effort to see in a dark place, that a very perceivable pain ensues.” (p. 144). Anything that is transparent, delicate, and bright, on the other hand, is a source of the beautiful, which roots from the elicitation of “mere positive pleasure” (Burke, 1759/2008, p. 158).

Yet close reading of *Philosophical Enquiry* reveals Burke’s consideration of contrast as a source of the sublime, in some cases even more than darkness *per se*. He claims light and darkness, together, can produce striking sensations of passion, leading to sublimity. In explaining how one can conjure sublimity in architecture, for example, he suggests that one “ought to pass from the greatest light, to as much darkness” (p. 81). In Burke’s citation of Milton’s depiction of Deity in *Paradise Lost*, “Dark with excessive light thy skirts appear” (p. 80), the conjured imagery indicates heightened contrast. On the other hand, given Burke’s

conception of beauty operating on properties of smoothness, gradual variation, lack of angularity and abruptness, and softness, one can postulate that strong contrast may oppose beauty.

#### **5.1.4. Brightness, Contrast, Sublimity, and Beauty – A Psychological Interpretation**

While some empirical works have clarified brightness's association with preferences (or liking; Che, Sun, Gallardo, & Nadal, 2018) and beauty (e.g. Lyssenko, Redies, & Hayn-Leichsenring, 2016), neither preference nor beauty inform much about sublimity. As is mentioned multiple times in the thesis already, the measure of beauty alone does not capture sublimity, let alone Burke's beauty as opposed to his sublimity.

Still, in assuming a Burkean perspective that sublimity is linked with fear and tension while beauty is linked with soothing qualities and pleasure, implications can be derived from empirical works concerning the relationship between colour and emotions. In this context, lightness is often associated with high valence (i.e. pleasure) and occasionally, low arousal, and hence associated with Burke's beauty. Conversely, darkness is often associated with low valence and with high arousal, and hence also associable with Burke's sublimity. The extensive evidence ranges from the use of lexical associations (Adams & Osgood, 1973; Allan, 2009; Hemphill, 1996; Wright & Rainwater, 1962), to explicit emotional rating of controlled colour panels (Valdez & Mehrabian, 1994) or naturalistic photographs (Lakens, Fockenberg, Lemmens, Ham, & Midden, 2013).<sup>41</sup>

That said, most of these works have used dichotomous scales where positive and negative emotions are considered as opposites in the valence spectrum. In doing so, they have effectively forgone the possibility of mixed emotions where positive and negative emotions can coexist. If there is truth in Burke's views that sublimity is a state of delight driven by fear, the complex nature of this aesthetic emotion may be difficult to predict on the brightness-valence link alone.

Research on contrast's role on emotion is limited. Lakens et al. (2013) report that contrast in naturalistic photographs was not associated with valence, without linking its association with arousal. There have also been reports that high contrast images are aesthetically pleasing (van Dongen & Zijlmans, 2017). Reber, Winkielman, and Schwarz (1998), reported, on the other hand, that a prettiness judgement was positively linked with figure-ground contrast using simple abstract stimuli.

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<sup>41</sup> Similarly, priming to certain emotions appear to alter brightness perception (Meier, Robinson, Crawford, & Ahlvers, 2007), thus rendering the link between positive valence and brightness bidirectional, and to a certain extent automatic (see also Meier, Robinson, & Clore, 2004; Specker et al., 2018). While seen as largely universal (Specker et al., 2018), the link is also evident cross-modally, be it between color and music (Palmer, Schloss, Xu, & Prado-León, 2013) or color and body movement (Dael, Perseguers, Marchand, Antonietti, & Mohr, 2015), for example.

### 5.1.5. Current Study

While the philosophical and psychological literature often point to a potential relationship between size and sublimity, in the current state of affair, it is difficult to determine from where the size effect originates. It does not help that existing literature is already riddled with contradictory findings. To systematically tease apart the size effect, three visual mechanisms are considered in the present study, namely retinal size, absolute size, and distance of viewing. Building up on the previous literature, brightness and contrast are considered as two further manipulations (Study 7). The present chapter also includes an analysis (Study 8) using aggregated data from Studies 5, 6, 7, and 9<sup>42</sup>, in order to further generalise some key findings, notably the size effect.

## 5.2. Study 7

In the first of the two studies in the chapter, the roles of visual angle, viewing distance, actual stimulus size, brightness, and contrast were tested by recruiting a new set of participants. The study was run in similar settings to Studies 5 and 6.

### 5.2.1 Methodology

**5.2.1.1 Participants.** Thirty-nine participants (28 female,  $M_{age} = 22.64$ ,  $SD_{age} = 10.24$ ) from University College London were recruited in return for course credit. All participants provided written consent prior to the start of the study.

**5.2.1.2 Stimuli and design.** As with Studies 5 and 6, each participant looked at a subset of a pool of 102 photographs in landscape orientation. 12 of these photographs were taken from Study 6, of which 2 photographs were from each *Aesthetic Hexagon* corner (see Chapter Summary of Chapter 2 for a description of the *Aesthetic Hexagon*). Of the 90 newly selected photographs, 30 of them were chosen from the International Affective Picture System (IAPS; Lang, et al., 1997), while the rest were newly selected from online sources by two researchers.<sup>43</sup> As with previous studies, these newly selected photographs represented the corners of the *Aesthetic Hexagon* in equal proportions, and the photograph contents were diversified as much as possible.

From this photograph pool, each participant was presented a selection of 12 photographs from each *Aesthetic Hexagon* category, amounting to a total of 72 unique photographs. Unlike any past study, each photograph content appeared only once per participant, and each photograph was allocated to one manipulation condition. Through this

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<sup>42</sup> Although Study 9 was run after the present study, Study 9's image rating data were also included in the aggregate data during the final write up of the thesis, since Study 9 made use of similar settings. For the Study 9 dataset, the block where participants rated only images was used.

<sup>43</sup> The two researchers were Yvette Garfen, a third year UCL BSc Psychology student, and myself.

between-participants design, it was possible to focus solely on the fixed effects of the manipulations, whilst maximising the diversity of image contents.

Note that the fixed effects were within-participants, given that all participants were exposed to all manipulations, a 4 (visual angle and viewing distance manipulations)  $\times$  4 (brightness and contrast manipulations). The manipulations themselves are elaborated below.

**5.2.2.2.1. Visual angle and viewing distance.** For the size manipulation, the 72 photographs were semi-randomly assigned in equal numbers to a 2 (viewing distance; 57cm vs. 390cm)  $\times$  2 (visual angle; 10.98°  $\times$  14.64° vs. 21.77°  $\times$  38.70°) within-participants factorial design. The allocation was semi-random because each of the four size conditions were planned to contain equal numbers of photographs randomly selected within each *Aesthetic Hexagon* category. The design thus resulted in each participant viewing four actual size conditions: 150cm  $\times$  200cm, 75cm  $\times$  100 cm, 21.92cm  $\times$  29.23cm, and 10.96cm  $\times$  14.61cm.

The close distance (57cm) conditions were presented on a computer screen, whereas the long distance (390cm) conditions, as in Studies 5 and 6, used a projector (200W Epson EBX03) to project images onto a wall. A photometer (Tacklife LM01) was used to calibrate the amount of light emitting from the computer screen and wall. Two white rectangles in the size of images of the small and large visual angle conditions were put onto the screen and the wall, respectively. The screen's settings were adjusted so that the small rectangles on the screen and wall both emitted 4.1 lux from both viewing distances. The large rectangles on the screen and wall both emitted 17.5 lux from both viewing distances. The size conditions are presented in Figure 43.

**"Due to copyright restrictions the electronic version does not contain some images. They are, however, available in the printed version in the UCL Library"**

Figure 43. The four size conditions in Study 7. Note that the two conditions on the right side (marked in red) represent how stimuli in size conditions (i.e. large vs. small) were presented in Studies 5 and 6.

**5.2.2.2.2. Brightness and contrast.** All 72 images per session were randomly subjected to one of four brightness manipulations, namely 1) high brightness, 2) low brightness, 3) high contrast, 4) low contrast, in equal numbers. The size conditions are presented in Figure 44.

`bmp_contrast.m` in MATLAB 2016b (MathWorks, Inc., Natick, MA, USA) was used to manipulate brightness and contrast of the images. Global brightness of an image was calculated using the logarithmic average of luminance (Y) from the YUV system, as suggested by Li and Chen (2009). Global contrast of an image was calculated via the root mean square (RMS) of Y of that particular image (Peli, 1990). Images in the two brightness conditions (i.e. low vs. high brightness) were matched in contrast. Likewise, image in the two contrast conditions (i.e. low vs. high contrast) were matched in brightness. The mean brightness and contrast levels for each brightness and contrast conditions are presented in Table 25.

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Figure 44. The four brightness and contrast conditions in Study 7.

Table 25. Descriptive statistics for the brightness and contrast conditions (Study 7).

	Mean Brightness Levels	Mean Contrast Levels
High Brightness Condition	0.48 ( <i>SD</i> = 0.19)	0.20 ( <i>SD</i> = 0.06)
Low Brightness Condition	0.15 ( <i>SD</i> = 0.09)	0.19 ( <i>SD</i> = 0.07)
High Contrast Condition	0.33 ( <i>SD</i> = 0.16)	0.29 ( <i>SD</i> = 0.06)
Low Contrast Condition	0.33 ( <i>SD</i> = 0.16)	0.14 ( <i>SD</i> = 0.05)

*Note.* Each calculation is based on the set of 102 stimuli. Descriptive statistics represent mean values.

**5.2.1.3. Procedure.** The general set-up and procedure of the experiment was identical to those Studies 5 and 6, apart from the following changes. There were two main blocks, one using the computer monitor (short viewing distance condition) and one using the wall (long viewing distance condition). Half of the participants attended the short viewing distance condition first, whereas the other half of the participants took part in the long viewing distance condition first. Within each block, the ordering of the two visual angle conditions (small vs. large visual angle) and the four brightness conditions were randomised in appearance order. All participants were given three practice trials prior to each block.

## 5.2.2. Results

**5.2.2.1. Manipulation checks.** Because each participant looked at one image per session, test-retest reliability was not available. The 12 image contents from Study 6, averaged across all possible size, brightness, and contrast conditions, were rated consistently between studies. This was the case for sublimity,  $r = 0.94$ ,  $p < .001$ , beauty,  $r = 0.98$ ,  $p < .001$ , S+B,  $r =$

0.99,  $p < .001$ , and S-B,  $r = 0.97$ ,  $p < .001$ . As with previous works, there was a moderate and positive correlation between sublimity and beauty,  $r = .47$ ,  $p < .001$ .

Between-participants agreement measured as “mean-minus-one” (MM1) correlations (Vessel et al., 2018), too, was good for sublimity, 0.68 ( $SD = 0.35$ ), beauty, 0.77 ( $SD = 0.26$ ), S+B, 0.77 ( $SD = 0.28$ ), and S-B, 0.63 ( $SD = 0.30$ ). A one-way ANOVA revealed that MM1 scores were not equal across rating types,  $F(3, 152) = 8.80$ ,  $p < .001$ . Tukey HSD pairwise comparisons further revealed that S-B and sublimity ratings were significantly lower in MM1 than beauty and S+B,  $ps < .05$ .

**5.2.2.2. Visual angle and viewing distance effects.** The analytic approach was similar to those of the past two studies. Linear mixed modelling was used using *R*'s `lmer()` function of the *lme4* package (Bates, Maechler, Bolker, & Walker, 2015).

For the size effect, ratings were predicted by visual angle (i.e. small vs. large visual angle), viewing distance (i.e. short vs. long viewing distance), judgement type (i.e. sublimity vs. beauty), and all possible interactions between the three variables. There was a main effect of visual angle,  $F(1, 123.80) = 11.82$ ,  $p < .001$ , indicating that the larger the visual angle, the greater the general ratings of sublimity and beauty, regardless of the viewing distance condition. The descriptive and inferential statistics output are presented below (Table 26 and Table 27). Visualisation of the output is presented in Figure 45.

The only other significant effect was the interaction between visual angle and judgement type,  $F(1, 5294.40) = 3.99$ ,  $p < .05$ . The interaction was derived from the fact that sublimity ratings were higher for photographs presented in large visual angle than small visual angle,  $t(423.00) = 3.87$ ,  $p < .001$ , whereas visual angle did not influence ratings of beauty,  $t(423.00) = 1.14$ ,  $p > .05$ . When photographs were presented in small visual angle, beauty was higher than sublimity,  $t(49.30) = 2.27$ ,  $p = .03$ , whereas sublimity and beauty ratings did not differ when photographs were presented in large visual angle,  $t(49.30) = 0.87$ ,  $p > .05$ . While the significant interaction between visual angle and judgement type appeared to be marginally stronger for the long viewing distance condition, this was not large enough for the model to lead to a statistically significant triple interaction between the three predicting variables,  $F(1, 5294.40) = 0.14$ ,  $p > .05$ .

To account for the correlation between sublimity and beauty, a model was constructed where sublimity was predicted by visual angle, distance, and their interaction, with beauty as a covariate. When this was done, sublimity was predicted by visual angle only,  $F(1, 68.54) = 13.39$ ,  $p < .001$ . When, beauty was predicted by the three main predicting variables, with sublimity as a covariate, no predictors predicted the outcome variable. These results replicate the findings from above, that visual angle appears to affect sublimity but not beauty, and that viewing distance does not seem to play a major role. A full inferential statistics table is provided in Table 28.

To confirm the interaction between visual angle and rating type, a model was re-fitted to only contain visual angle, rating type, and their interaction. The results of this new model replicated the past results. There was a main effect of visual angle,  $F(1, 1017.50) = 12.44, p < .001$ , and an interaction effect visual angle and rating type,  $F(1, 5435.10) = 3.96, p < .05$ . The interpretation of the interaction effect was identical to that of the full model mentioned in the previous paragraph. As before, there was no main effect of rating type,  $F(1, 38.00) = 2.82, p > .05$ , indicating that sublimity and beauty did not differ in their values across the size conditions. A visualisation of this model is provided in Figure 46. For completeness, a visualisation of a model including distance and judgement type is presented in Figure 47.

Lastly, the role of actual image size was estimated by comparing ratings of same visual angle conditions in different distances. When this was done for all 6 possible comparisons (2 comparisons for general rating differences between distance conditions; 4 comparisons for these differences for sublimity and beauty each), no comparison was significant at  $p < .05$ , thus indicating that actual size did not play a role in determining ratings of sublimity and beauty.

Table 26. Size effects, descriptive statistics table (Study 7).

		Sublimity rating	Beauty rating
Large Dist.	Large V.A.	0.51 ( $SD = 0.31$ )	0.52 ( $SD = 0.29$ )
	Small V.A.	0.45 ( $SD = 0.30$ )	0.49 ( $SD = 0.28$ )
Small Dist.	Large V.A.	0.48 ( $SD = 0.31$ )	0.50 ( $SD = 0.28$ )
	Small V.A.	0.46 ( $SD = 0.30$ )	0.49 ( $SD = 0.28$ )

Note. "V.A." = Visual Angle. "Dist." = Distance. The unit of measure is ratio (from 0 to 1).<sup>44</sup> Descriptive statistics represent mean values.

Table 27. Size effects, inferential statistics table (Study 7).

	<i>df</i>	<i>F</i>	<i>p</i>
Visual Angle (V.A.)	1, 123.80	11.82	<b>&lt; .001</b>
Distance (Dist.)	1, 37.10	1.36	.25
Judgement Type	1, 38.00	2.82	.10
V.A. × Dist.	1, 5393.70	2.20	.14
V.A. × Judgement Type	1, 5294.40	3.99	<b>.046</b>
Dist. × Judgement Type	1, 5294.40	0.01	.92
V.A. × Dist. × Judgement Type	1, 5294.40	0.14	.71

Note. Bold show inferential statistics that are significant at  $p < .05$ .

<sup>44</sup> The change of response range from pixel numbers (0 to 400) to ratio (0 to 1) was done to prepare for data comparisons between different studies. From now, all rating measures are presented in ratios.



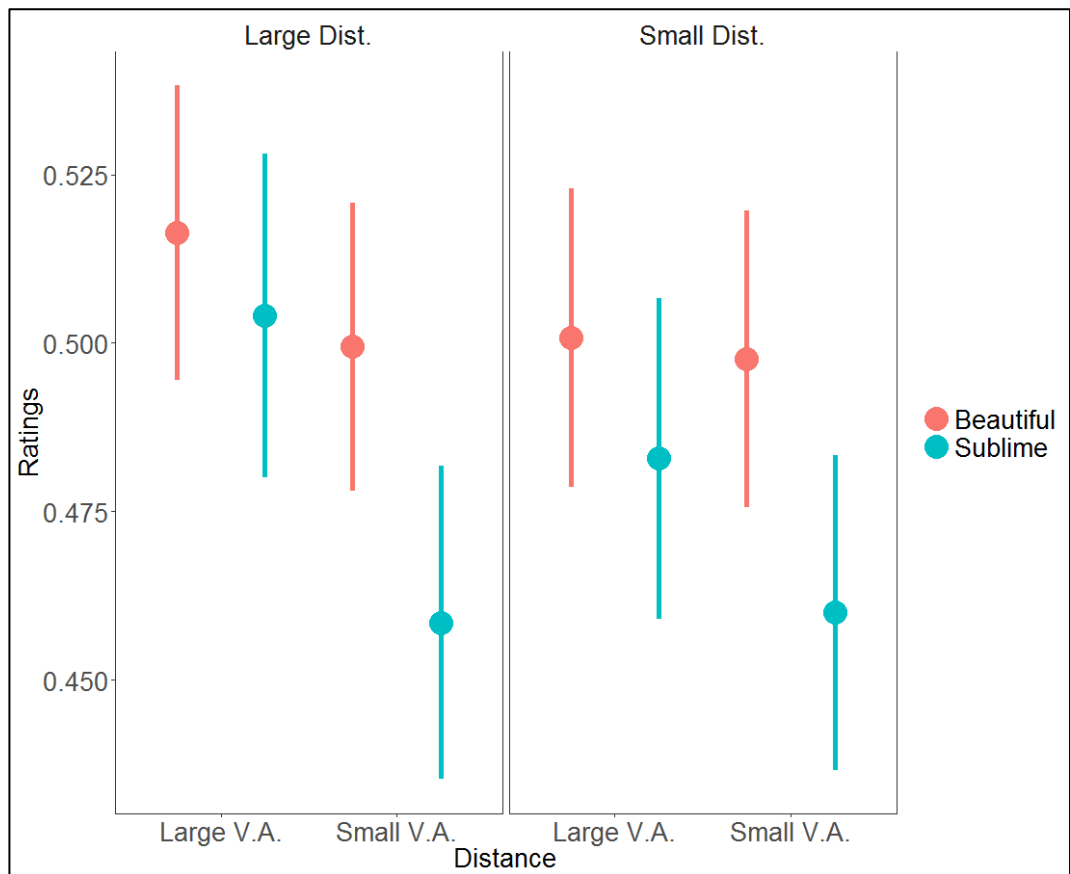


Figure 45. Size effects visualisation, with mean  $\pm 1$ SE (Study 7).

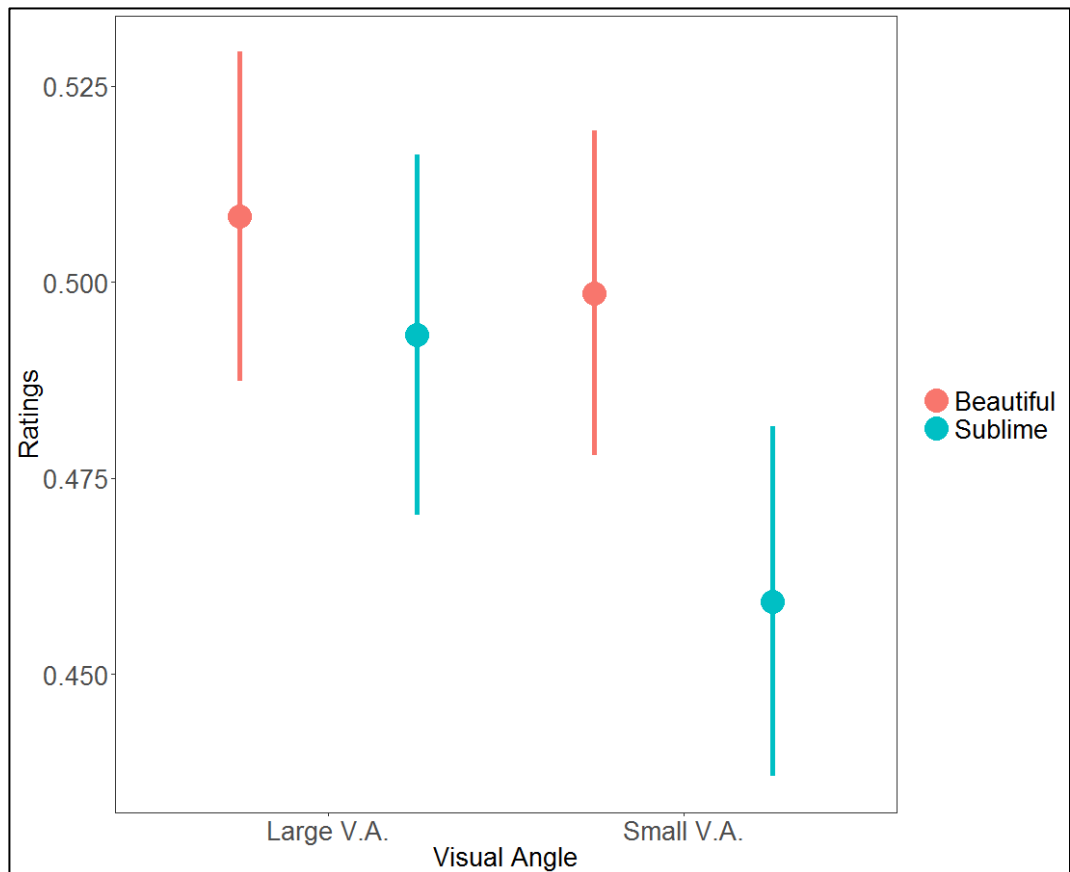


Figure 46. Visual angle effect visualisation, with mean  $\pm 1$ SE (Study 7).

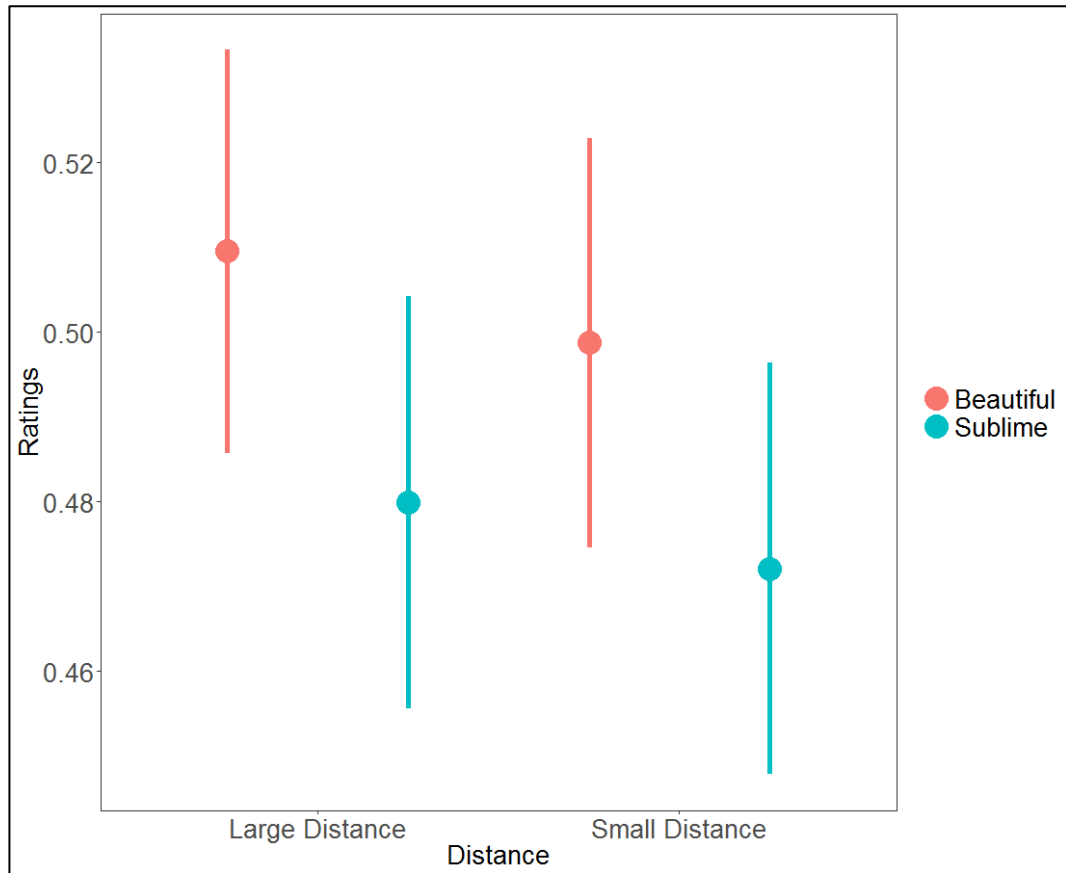


Figure 47. Distance effect visualisation, with mean  $\pm$ 1SE (Study 7).

Table 28. Size effects for separate predictors, inferential statistics table (Study 7).

	Predicting sublimity			Predicting beauty		
	<i>df</i>	<i>F</i>	<i>p</i>	<i>df</i>	<i>F</i>	<i>p</i>
V.A.	1, 68.54	13.39	< .001	1, 80.60	0.72	.40
Dist.	1, 39.29	0.34	.56	1, 40.31	1.55	.22
V.A. $\times$ Dist.	1, 2639.08	2.40	.12	1, 2636.78	0.18	.67
(Covariate)	1, 2706.13	46.50	< .001	1, 2776.21	20.57	< .001

Note. "V.A." = Visual Angle. "Dist." = Distance. Bold show inferential statistics that are significant at  $p < .05$ .

**5.2.2.3. Brightness and contrast effects.** The effects of brightness and contrast manipulations were analysed in a similar way as before, using linear mixed modelling. In a single model, ratings were predicted by brightness/contrast manipulation (i.e. low brightness vs. high brightness vs. low contrast vs. high contrast), judgement type (i.e. sublimity vs. beauty), and the interaction between brightness/contrast manipulation and judgement type. The brightness and contrast manipulations were put in as a single factor, since all images appeared as one of the four manipulations. The only significant effect was the judgement type main effect,  $F(1, 5328.10) = 19.31, p < .001$ , with sublimity being generally rated lower than beauty.

This difference between sublimity and beauty levels appeared to happen across all four brightness/contrast conditions, given the lack of brightness/contrast condition and judgement type interaction,  $F(1, 5328.10) = 0.31, p > .05$ . Least squares means comparisons of means revealed that the difference between sublimity and beauty was only significant in the high brightness and low contrast conditions,  $ps < .01$ . Least squares comparisons further revealed that for both sublimity and beauty ratings, ratings did not differ across the four brightness/contrast conditions.

Lastly, there were no differences in general ratings across the four brightness/contrast conditions,  $F(1, 97.50) = 0.79, p > .05$ . Descriptive and inferential statistics tables are provided below (Table 29 and Table 30). Visualisations of the effects are provided in Figure 48.

The findings provide evidence that brightness and contrast do not affect sublimity and beauty ratings. Even when brightness and contrast manipulations were individually compared in two sets of analyses, i.e. low brightness vs. high brightness, and low contrast vs. high contrast, the general pattern remained the same, but with the elimination of judgement type main effects. When the correlation between sublimity and beauty was accounted for (by having one of the two as a dependent variable and the other as a covariate), brightness and contrast's lack of predictive outcomes were replicated. The results of these additional analyses are not provided, since they do not add much to the general outcome of the results.

Table 29. Brightness and contrast effects, descriptive statistics table (Study 7).

	Sublimity rating	Beauty rating
High Brightness	0.47 ( $SD = 0.31$ )	0.50 ( $SD = 0.29$ )
Low Brightness	0.48 ( $SD = 0.30$ )	0.51 ( $SD = 0.28$ )
High Contrast	0.47 ( $SD = 0.30$ )	0.49 ( $SD = 0.28$ )
Low Contrast	0.48 ( $SD = 0.31$ )	0.51 ( $SD = 0.28$ )

*Note.* Descriptive statistics represent mean values.

Table 30. Brightness and contrast effects, inferential statistics table (Study 7).

	<i>df</i>	<i>F</i>	<i>p</i>
Brightness/Contrast	3, 97.50	0.79	.50
Judgement Type	1, 5328.10	19.31	<b>&lt; .001</b>
Brightness/Contrast × Judgement Type	3, 5328.10	0.31	.82

*Note.* Bold show inferential statistics that are significant at  $p < .05$ .

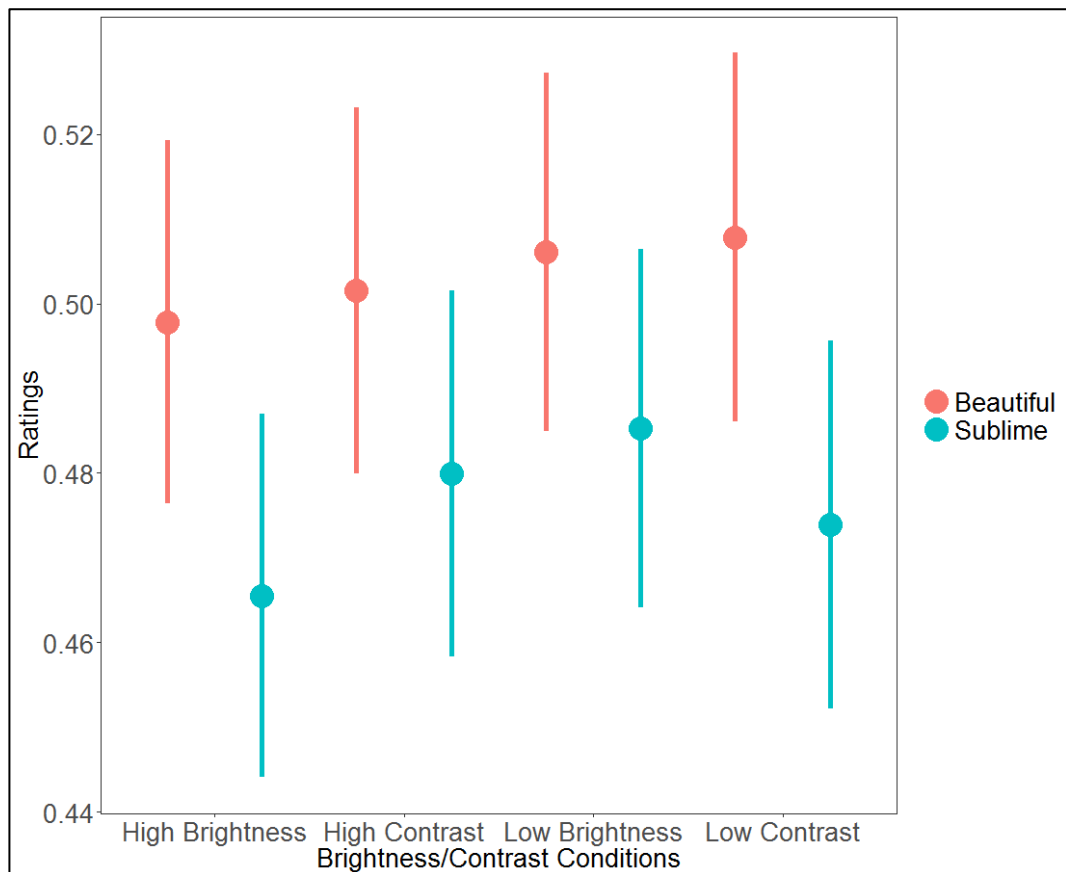


Figure 48. Brightness/contrast effects visualisation, with mean  $\pm$ 1SE (Study 7).

### 5.2.3. Discussion

The interaction between size and judgement type re-emerged, as has been the case for Study 5. The effect seemed to be explained by visual angle, as viewing distance played no substantial role. There was also little evidence of the importance of actual image size on ratings. This means that an image being viewed as small or large on the retina seems the most relevant determinant of any size effect on sublimity and beauty. That has the interesting implication that an image on a mobile phone potentially can have the same sublimity as a large painting in an actual gallery. When considering the roles of brightness and contrast on ratings, brightness and contrast played negligible roles in determining sublimity and beauty ratings.

### 5.3. Study 8

The results from Study 7 revealed visual angle as a key mechanism of the observed size effects. In Study 8, the visual angle effect was re-evaluated in light of an aggregated dataset consisting of data from Studies 5, 6, 7, and 9. Firstly, using the aggregated dataset, the overall effect of visual angle on sublimity and beauty was analysed. This served as a replication of the previously found visual angle effect, but with greater power and generalisability. Secondly, the degree of visual angle effect was explored by correlating it to various emotion-, aesthetics-, and content- related item characteristics. By looking into item characteristics, this analysis would

provide insights into the mechanism of the visual angle effect. Thirdly, the brightness and contrast effects were also re-evaluated, using a continuous measure of brightness and contrast.

### 5.3.1. Methodology

**5.3.1.1. Datasets.** The aggregated dataset comprised of the results from the ratings tasks of Studies 5, 6, 7, and 9. All studies were based on similar experimental settings, e.g. experiment room, materials used (projector & laptop), language of testing, etc., and involved at least one of the following two visual angle conditions of photograph presentation:  $10.98^\circ \times 14.64^\circ$  and  $21.77^\circ \times 38.70^\circ$ .

Observations were selected where photographs were presented centrally, with colour, and without the presence of other modalities. This resulted in 7770 valid trials (3120 small visual angle), spread across 168 unique photographs and 149 participants.

**5.3.1.2. Analytical method and key variables selection.** For the general size effect analysis, the analysis method was largely identical to that of past works. Ratings were predicted by stimulus visual angle (i.e.  $10.98^\circ \times 14.64^\circ$  vs.  $21.77^\circ \times 38.70^\circ$ ), judgement type (i.e. sublimity vs. beauty), and their interaction. The study number was added in as a covariate, to account for differences that may have emerged from study settings. The entire aggregated data were entered into a single linear mixed model.

The visual angle effect was further explored by analysing individual item characteristics. As was done in Jacobsen and Höfel (2002), linear regression beta coefficients were used as data-points for further analysis. That is, for each of the 168 photographs, ratings were regressed on visual angle, judgement type, and their interaction. The resulting three beta coefficients deriving from three predicting variables (for each image) were then correlated with a number of item-based characteristics. The following are the interpretations of the three beta coefficients:

- Visual angle main effect coefficient ( $n = 168$ ): the degree to which the change of visual angle from small to large affects both sublimity and beauty ratings negatively. That is, the smaller the coefficient, the more positive visual angles affect sublimity and beauty. The larger the coefficient, the more negative visual angles affect sublimity and beauty.
- Judgement type main effect coefficient ( $n = 168$ ): the degree to which sublimity ratings are greater than beauty ratings for both visual angle conditions. That is, the smaller the coefficient, the lower average sublimity ratings are compared to beauty ratings. Conversely, the larger the coefficient, the higher sublimity ratings are compared to beauty ratings.
- Interaction coefficient ( $n = 168$ ): the degree to which increased visual angle increases sublimity is smaller than it increases beauty, or the degree to which the difference

between sublimity and beauty is larger in the small visual angle condition than in the large visual angle condition. In other words, the smaller the interaction coefficient, the greater likelihood that an image follows the interaction pattern observed from Study 7's results. The larger the coefficient, the more likely the effects are the opposite.

These three beta coefficients were then correlated with the following item characteristics variables (note that some variables are not applicable to all photographs):

- Mean sublimity, beauty, S+B and S-B ratings ( $n = 168$ ). These measures were derived by aggregating sublimity and beauty ratings by items. The by-item aggregation is justified by the good between-cohort reliability and between-participants agreement scores demonstrated throughout the thesis.
- Valence, arousal, and dominance normative ratings ( $n = 51$ ), taken from the International Affective Picture System (IAPS) manual (Lang et al., 1997). These three dimensions determine to what degree a photograph elicits valence (i.e. unhappy vs. happy), arousal (i.e. relaxed vs. excited), and dominance (i.e. dominated vs. in controlling).
- Anger, disgust, fear, sadness (all above  $n = 9$ ), amusement, awe, contentment, excitement (all above  $n = 18$ ) normative ratings. These eight discrete emotional variables – four positive and four negative emotions – are ratings provided by Mikels and colleagues (2005), based on their subset of IAPS images.
- Canonical size ( $n = 168$ ). In line with the view that photograph size preference depends on the real-world size of the depicted content of a photograph (Konkle & Oliva, 2011), all 168 photograph contents were coded into three size categories, namely ‘smaller than a human body’, ‘around the size of a human body’, and ‘larger than a human body.’
- Content ( $n = 168$ ). All photographs were dichotomously coded into either having or not having prominent elements of animals, humans, landscape, mountains, sky, and sea/water in their content.

For the analyses of brightness and contrast, each photographic image was assessed in terms of its brightness (logarithmic average of luminance (Y) from the YUV system; Li & Chen, 2009) and contrast (root mean square of luminance (Y); Peli, 1990). These raw values themselves were used as continuous predictors. A linear mixed model predicted ratings from brightness, judgement type, and their interaction. A second model predicted ratings based on contrast, judgement type, and their interaction. In both models, visual angle and study number were inserted as a covariates, to control for variances that may emerge from the two visual angle conditions and different experimental conditions.

### 5.3.2. Results

**5.3.2.1. Overall visual angle effects.** Using the aggregated dataset, there was a main effect of visual angle,  $F(1, 120.00) = 57.67, p < .001$ , indicating that the greater visual angle, the more sublime and beautiful a photograph was rated. The lack of a significant main effect of judgement type,  $F(1, 221.20) = 2.43, p > .05$ , implies that across the two different visual angle conditions, people tended to rate beauty similarly to sublimity.

There was an interaction between visual angle and judgement type,  $F(1, 7587.80) = 18.01, p < .001$ , meaning that the effect of visual angle was different between sublimity and beauty ratings. Post hoc examinations of the interaction effect revealed that the increase of visual angle significantly increased both sublimity,  $t(206.90) = 8.74, p < .001$ , and beauty,  $t(206.10) = 4.52, p < .001$ , ratings, respectively. When photographs were presented with small visual angles, they were more beautiful than sublime,  $t(239.60) = 2.30, p = .02$ . However, photographs presented in large visual angles were as sublime as they were beautiful,  $t(232.70) = 0.79, p > .05$ . As such, with the datasets from four studies put together, the role of visual angle is essentially similar to the outcomes from Study 7. Descriptive and inferential statistics tables are presented in Table 31 and Table 32. The outcomes are shown in Figure 49.

Table 31. Visual angle effect, descriptive statistics table (Study 8).

	Sublimity rating	Beauty rating
Large V. A.	0.49 ( $SD = 0.31$ )	0.52 ( $SD = 0.29$ )
Small V. A.	0.45 ( $SD = 0.31$ )	0.47 ( $SD = 0.30$ )

Note. "V.A." = Visual Angle condition. Descriptive statistics represent mean values.

Table 32. Visual angle effect, inferential statistics table (Study 8).

	<i>df</i>	<i>F</i>	<i>p</i>
Visual Angle (V.A.)	1, 120.00	57.67	< <b>.001</b>
Judgement Type	1, 221.20	2.43	.12
V.A. × Judgement Type	1, 7587.80	18.01	< <b>.001</b>
(Covariate)	3, 204.10	0.92	.43

Note. Bold show inferential statistics that are significant at  $p < .05$ .

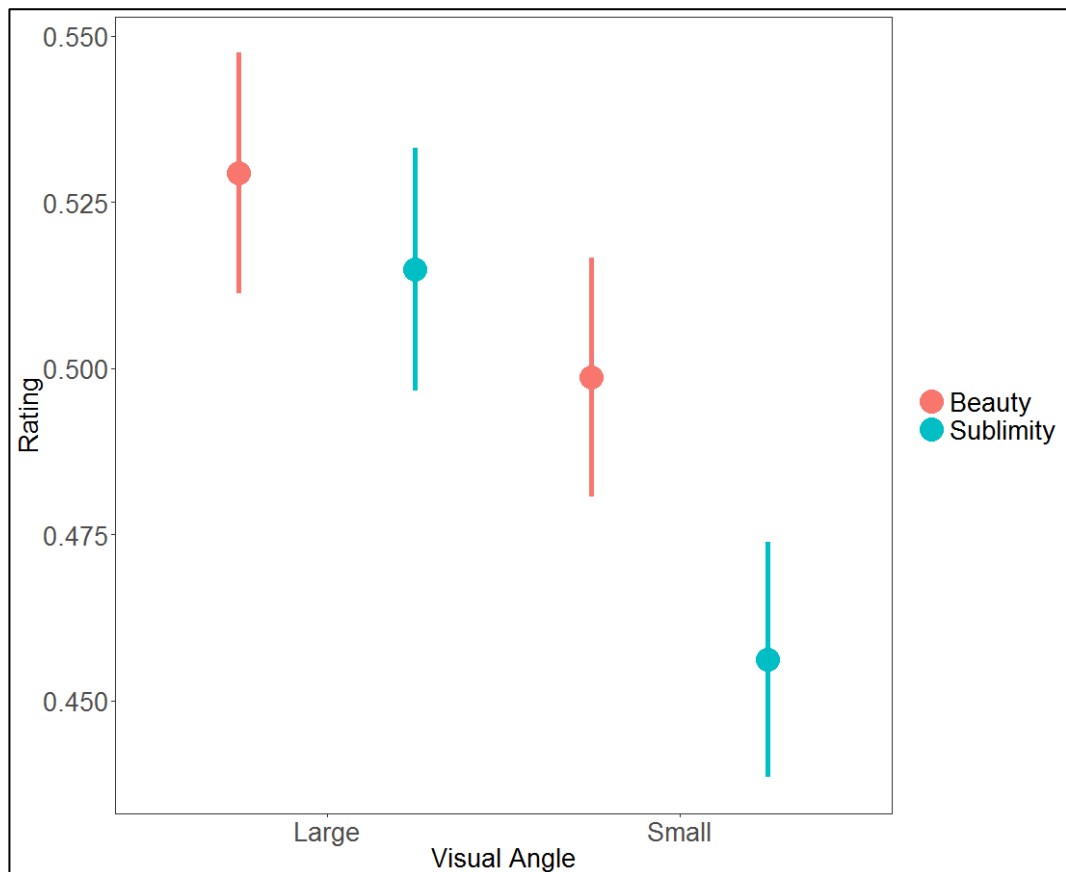


Figure 49. Visual angle effect visualisation, with mean  $\pm 1$ SE (Study 8).

Sublimity and beauty were correlated in the overall data,  $r = 0.32$ ,  $p < .001$ . To explore visual angle's effects on sublimity and beauty after taking into account of this correlation, two more models were run. Each model predicted visual angle's effect on one response variable, while the remaining response variable was taken in as a covariate. Study number was taken as a covariate in both models. In both models, visual angle predicted increase of both sublimity,  $F(1, 120.80) = 44.66$ ,  $p < .001$ , and beauty,  $F(1, 109.10) = 20.97$ ,  $p < .001$ . These results further confirm increased visual angle's positive effects on sublimity and beauty ratings.

**5.3.2.2. Determinants of the visual angle effect.** To explore if some items are more susceptible to the visual angle manipulation than others, an item-based analysis was run, using the three beta coefficients. Figure 50 demonstrates the existence of variations between items in the three beta coefficients. The figure depicts outliers (items located 1.5 times the interquartile range below the first quartile, or above the third quartile), in other words items that were especially susceptible to the visual angle and judgement type interaction (e.g. Fingal's Cave) and the general visual angle (e.g. an underwater cave & a misty forest with tall trees) effects. Note the presence of objects where the increase of visual angles decreased sublimity and beauty ratings (e.g. a marabou stork & a wooden watchtower under a blue sky).



Analysing the beta coefficients themselves, the visual angle beta coefficients differed significantly from zero,  $t(167) = 9.29, p < .001$ , as did the interaction beta coefficients,  $t(167) = 3.90, p < .001$ . Judgement type beta coefficients did not differ from zero,  $t(167) = 1.22, p > .05$ . These outcomes confirms the earlier linear mixed modelling.

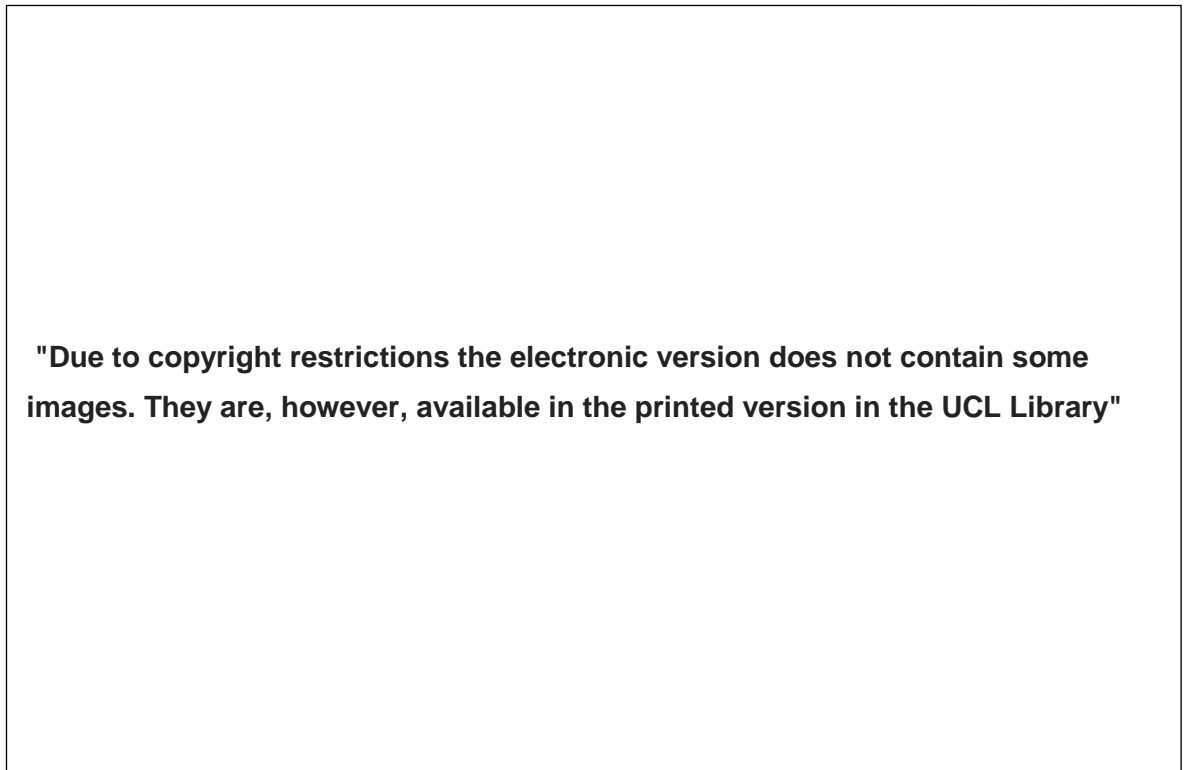


Figure 50. Boxplots for each of the beta coefficients of visual angle effect (right), judgement type effect (centre), and the visual angle – judgement type interaction effect (left) (Study 8).

What specific items characteristics correlate with an item's degree of being affected by the visual angle manipulation? Correlations were computed between the three beta coefficients and the aforementioned set of emotional and aesthetic item characteristics variables (all correlates are presented in Table 33; Table 34 also present a set of correlations between the item characteristics variables). The beta coefficient of the visual angle main effect was correlated with the average sublimity ratings,  $r(168) = -0.24, p = .001$ , and S+B ratings,  $r(168) = -0.22, p = .005$ .<sup>45</sup> As such, the increase of visual angle having a positive effect on both sublimity and beauty ratings was strongest for images that were high in sublime or high in sublimity and beauty (approximately Powerful/Imposing or Marvellous/Astonishing categories from the *Aesthetic Hexagon*; the *Aesthetic Hexagon* is reproduced in Figure 51). Conversely, such effects of visual angle was negative for those images low in sublimity or low is sublimity and beauty (approximately Boring/Disgusting and Dreadful/Fearful).

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<sup>45</sup> The degrees of freedom are presented to denote the number of stimuli involved in the calculations.

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Figure 51. The *Aesthetic Hexagon* (Study 8).

The beta coefficient of the judgement type main effect was negative correlated with valence,  $r(51) = -0.75, p < .001$ , and dominance,  $r(51) = -0.87, p < .001$ , and positively correlated with arousal,  $r(51) = 0.66, p < .001$ . Furthermore, the judgement type coefficients was positively correlated with fear,  $r(9) = 0.82, p = .007$ , awe,  $r(18) = 0.49, p = .04$ , and excitement,  $r(18) = 0.51, p = .03$ , but negatively with contentment,  $r(18) = -0.72, p = .001$ . This indicates that the more sublimity than beauty a photo evokes across both visual angle conditions, the more an item is unpleasant, dominating (the viewer), arousing, fearful, awe-inspiring, exciting, but less content – an idea that links the present results well with Burke’s (1759/2008) general picture. The beta coefficient of the interaction effect was not associated with any of the variables.

Looking into canonical size of photograph content, three one-way ANOVAs were run, predicting the three beta coefficients. Of these, only the judgement type main effect was predicted significantly by canonical size,  $F(2,165) = 15.08, p < .001$ . Tukey’s HSD revealed that images with content coded as ‘smaller than a human body’ were significantly rated as more beautiful than sublime in both visual angle conditions than those of the ‘around the size of a human body’,  $p < .001$ , and ‘larger than human body’,  $p < .001$ , categories. The latter two categories were not significantly different,  $p > .05$ . Neither the visual angle main effect,  $F(2,165) = 1.89, p > .05$ , nor the interaction between visual angle and judgement type,  $F(2,165) = 0.39, p > .05$ , was affected by canonical size. Sample images of the three canonical size categories are presented in Figure 52.

Table 33 Correlation table: Visual angle effects beta coefficients and item characteristics (Study 8).

	Sublimity ( <i>n</i> = 168)	Beauty ( <i>n</i> = 168)	S+B ( <i>n</i> = 168)	S-B ( <i>n</i> = 168)	Valence ( <i>n</i> = 51)	Arousal ( <i>n</i> = 51)	Dominance ( <i>n</i> = 51)	
Visual Angle	<b>-0.24**</b>	-0.13	<b>-0.22**</b>	-0.11	-0.09	-0.24	0.18	
Judgement Type	<b>0.48***</b>	<b>-0.54***</b>	-0.05	<b>1.00***</b>	<b>-0.75***</b>	<b>0.66***</b>	<b>-0.87***</b>	
Interaction	-0.12	0.02	-0.06	-0.13	0.09	-0.07	0.03	

	Anger ( <i>n</i> = 9)	Disgust ( <i>n</i> = 9)	Fear ( <i>n</i> = 9)	Sadness ( <i>n</i> = 9)	Amusement ( <i>n</i> = 18)	Awe ( <i>n</i> = 18)	Contentment ( <i>n</i> = 18)	Excitement ( <i>n</i> = 18)
Visual Angle	-0.60	-0.42	-0.39	-0.12	-0.23	-0.20	-0.08	-0.24
Judgement Type	0.37	-0.18	<b>0.82**</b>	0.58	-0.31	<b>0.49*</b>	<b>-0.72***</b>	<b>0.51*</b>
Interaction	-0.57	-0.03	-0.55	-0.48	0.27	-0.14	0.07	-0.13

Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ . Significant correlates are marked in bold.

Table 34. Correlation table: Item characteristics (Study 8).

	Valence ( <i>n</i> = 51)	Arousal ( <i>n</i> = 51)	Dominance ( <i>n</i> = 51)					
Sublimity	-0.10	<b>0.73***</b>	<b>-0.54***</b>					
Beauty	<b>0.83***</b>	-0.06	<b>0.52***</b>					
S+B	<b>0.44**</b>	<b>0.44**</b>	-0.03					
S-B	<b>-0.75***</b>	<b>0.66***</b>	<b>-0.87***</b>					

	Anger ( <i>n</i> = 9)	Disgust ( <i>n</i> = 9)	Fear ( <i>n</i> = 9)	Sadness ( <i>n</i> = 9)	Amusement ( <i>n</i> = 18)	Awe ( <i>n</i> = 18)	Contentment ( <i>n</i> = 18)	Excitement ( <i>n</i> = 18)
Sublimity	0.15	-0.43	<b>0.70*</b>	0.62	-0.28	<b>0.80***</b>	-0.36	<b>0.74**</b>
Beauty	-0.23	-0.55	0.16	0.35	0.13	<b>0.43**</b>	<b>0.83***</b>	0.31
S+B	0.02	-0.51	0.55	0.57	-0.18	<b>0.90***</b>	0.08	<b>0.80***</b>
S-B	0.37	-0.18	<b>0.82**</b>	0.58	-0.31	<b>0.49*</b>	<b>-0.72***</b>	<b>0.51*</b>

Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ . Significant correlates are marked in bold.

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Figure 52. Sample of canonical size coding. From left to right, “smaller than a human body”, “around the size of a human body”, and “larger than a human body” (Study 8).

Of the image contents, there were only two significant outcomes. Namely, Images with landscapes,  $t(163.00) = 3.06, p = .002$ , and sky,  $t(107.52) = 3.31, p = .001$ , benefitted the most from the increase of visual angle on both sublimity and beauty ratings. The outcome is in line with the previously mentioned finding linking positive visual angle effects with images of high sublimity and high sublimity and beauty, given that images with landscapes and the sky are generally considered more sublime and beautiful.

**5.3.2.3. Brightness and contrast effects.** In exploring the role of brightness, there were no main effects of brightness,  $F(1, 106.70) = 1.32, p > .05$ , and judgement type,  $F(1, 365.40) = 0.11, p > .05$ , nor an interaction between them,  $F(1, 6026.00) = 3.60, p > .05$ , indicating that brightness did not influence sublimity and beauty ratings in any way. It was a similar story for contrast. There were no main effects of contrast,  $F(1, 63.70) = 0.29, p > .05$ , and contrast – judgement type interaction,  $F(1, 7026.00) = 2.01, p > .05$ , although there was a marginal effect judgement type,  $F(1, 687.60) = 4.25, p = .04$ . Inferential statistics are present in Table 35 and Table 36.

Table 35. Brightness effect, inferential statistics table (Study 8).

	<i>df</i>	<i>F</i>	<i>p</i>
Brightness	1, 106.70	1.32	.25
Judgement Type	1, 365.40	0.11	.74
Brightness × Judgement Type	1, 6026.00	3.60	.06
Study (Covariate)	1, 211.40	3.68	<b>.01</b>
Visual Angle (Covariate)	1, 12085.40	141.25	<b>&lt; .001</b>

*Note.* Bold show inferential statistics that are significant at  $p < .05$ .

Table 36. Contrast effect, inferential statistics table (Study 8).

	<i>df</i>	<i>F</i>	<i>p</i>
Contrast	1, 63.70	0.29	.59
Judgement Type	1, 687.60	4.25	<b>.04</b>
Contrast × Judgement Type	1, 7026.00	2.01	.16
Study (Covariate)	3, 217.30	3.01	<b>.03</b>
Visual Angle (Covariate)	1, 12071.70	144.49	<b>&lt; .001</b>

*Note.* Bold show inferential statistics that are significant at  $p < .05$ .

#### 5.4.4. Discussion

Study 8 provided an extension to Study 7's outcomes, by re-evaluating the visual angle effect using an aggregated dataset involving data from four separate studies. In the new analysis, the overall visual angle effect still held. While the increase of stimulus visual angle appears to increase both sublimity and beauty, the effects seem more sensitive for sublimity than for beauty. Furthermore, mechanisms of the visual angle effects were further explored – items with high sublimity and S+B levels were most effective in having their overall ratings increased through increase of visual angle. Lastly, when the previously discussed brightness and contrast effects from Study 7 were re-evaluated using an improved analytical methodology, brightness and contrast did not appear to play important roles in determining sublimity and beauty ratings.

### 5.4. Chapter Summary

In Study 7, the size effects discussed in Studies 5 and 6 were further elaborated, by separating size into three visual mechanisms, namely visual angle, viewing distance, and actual object size. Results from Study 7 indicated that the previously found size effects, that the increase of perceived stimulus size results in the increase of both sublimity and beauty ratings, and that the effect is more noticeable in ratings of sublimity, is predicted best by visual angle. Viewing distance and actual stimulus size did not appear to play major roles. When brightness and contrast of stimuli were explored on their effects on sublimity and beauty, no noticeable main nor interaction effects emerged.

Study 8 expanded these results by aggregating four datasets, thereby providing analyses of enhanced power and generalisability. Across four studies, the visual angle effect was replicated, such that while the increase of stimulus visual angle increased both sublimity and beauty – thereby confirming the adage, “bigger is better” (e.g. Silvera et al., 2002) – the effect was greater for sublimity. This latter implication reflects the narratives of the present thesis and some empirical publication (Studies 11 and 12), that while sublimity and beauty are related as positive aesthetic experiences, they still represent different processes affected by different manipulations.

Analysing items in Study 8 revealed that visual angle's positive influence on both sublimity and beauty seemed strongest among items that elicited high levels of sublimity and high levels of both sublimity and beauty. It was not surprising to find that items with contents of landscapes and the sky were most likely to benefit from the increase of visual angle, since these contents are most associated with high sublimity and beauty. However, no item characteristics predicted the degree to which an item was more prone to follow the interaction effect. It should also be added that items that were considered to elicit more sublimity than beauty were those that evoked unpleasantness, arousal, a sense of being dominated, and fear, and were not small. This outcome aligns well with Burke's (1759/2008) theories of sublimity and beauty, specifically on his idea that sublimity represents something terrifying and fearful, as opposed to beauty that elicits pleasure and agreeable qualities. As in the previous set, brightness and contrast effects did not emerge as significant predictors, misaligning with previous reports (e.g. Lyssenko et al., 2016).

#### **5.4.1. The Size Effect as Visual Angle Effect**

The precedence of visual angle over actual size and viewing distance in predicting the size effect may be explained by a couple of reasons. In Holway and Boring's 1941 study that tested "retinal image" theories against "size constancy" theories – a systematic comparison between visual angle and actual size in size perception – the authors concluded that retinal image theories only works when no other information apart from retinal size is available. In other words, in conditions where participants had visual cues to determine how far an object was (i.e. normal binocular observation) and where no such cues were available (e.g. viewing through a small vision tunnel), it was in the latter condition that size perception happened in accordance to visual angles. Conversely, actual stimulus size became the determinant of size perception in the former condition.

In light of this conclusion, the present study's setting of a dark room would to some extent have eliminated distance cues. Since distance cues were less available, participants would have had a difficult time to estimate the actual size of the object, in which case they would have replied mostly on the image on the retina.

Even if some measure of distance estimation was available, it is possible that because of the high task demand (complex stimuli were rated on unusual if not unfamiliar aesthetic dimensions), participants may have been too concerned at the task in hand to readily estimate stimulus viewing distance. The assumption here is that mental processing requires resources that compete against each other, such that a more immediate and resource consuming task may attenuate processing or saliency of peripheral and task-irrelevant information. This means that the apparent size was based on what was most immediately available, i.e. what was evident on the retina.

Conversely, where participants have to rate on a single scale, or where participants have access to distance-cues, participants could have been more responsive toward the actual size of the stimulus. Looking back at studies that support the case of actual stimulus size, these studies indeed did not take place in dark rooms (Tan, Gergle, Scupelli, & Pausch, 2003) or participants were asked to rate one subjective phenomenon (e.g. presence, Troscianko et al., 2012).

#### **5.4.2. The Lack of Brightness and Contrast Effects**

The lack of brightness and contrast effects in the present study may be explained by the fact that brightness and contrast are visual constancies, where a stimulus's relative brightness is maintained across stimuli and conditions. The assumption is that as long as participants can distinguish the content of photographs, the ratings would have been predominantly influenced by what was on the screen, rather than how it was presented.

A second possibility is that the brightness and contrast manipulations were too subtle for participants to notice in the current setup. Certainly, the manipulations were done with care, as it was not desirable that participants notice that some changes were forced upon the image (Figure 44). Unlike the study in Study 6 where each participant was exposed to non-subtle colour manipulations (i.e. colour vs. monochrome) of the same content, participants in the current work were exposed an image content only once through a session, further reducing the effects of brightness and colour. Significantly, light emitted from each complex image was not directly measured from the standpoint of participants. Therefore, brightness and contrast levels and their subsequent effects could have benefitted from with more precise measures.

It could also be the case that physical brightness and contrast *per se* by nature make little impressions on sublimity and beauty. While Burke (1759/2008) may not have been wrong to identify that dark things are unpleasant, and therefore sublime, with light and pleasant things bring beauty, it may be Burke's error to misattribute emotional associations of word use with physical realities. Darkness and brightness, as concepts, may have consistent emotional associations, which in turn are related to sublimity and beauty (e.g. Valdez & Mehrabian, 1994), but the physical degrees of darkness and brightness of complex stimuli may in themselves imply little of the emotions of those stimuli.

#### **5.4.3. Content-form Interactions and Limitations of Studies 5 to 8**

Studies 5 to 8 demonstrate that certain physical presentation forms are more important than others when it comes to their effects on sublimity and beauty. The effectiveness of presentation forms can happen either within a perceptual category, i.e. visual angle vs. viewing distance vs. actual size, or between form types, i.e. colour vs. size perception vs. brightness vs. contrast. Although it is still unclear how these forms interact especially in the real world where different forms exist in different degrees of frequencies and saliences, how something is presented can trigger aesthetic responses, sometimes selectively.



That subtleties exist should not be overlooked. Troscianko and colleagues's (2012) otherwise elegant paper was not able to replicate their Study 1's size effect in their Study 2. There are also many ways to explain how Baranowski and Hecht's (2014) report was not able to replicate any of the visual angle or actual size effects. These may include discrepancies in stimulus and participants type, task demands, and language of task, but none is compelling. Even in Studies 5 to 7 of the present thesis, no two outcomes of the size effect were exact replications, although that big is better for sublimity and beauty, and that size affects sublimity more than beauty, was detectable throughout.

The nature of the studies involved, the evaluation of complex stimuli on higher-level subjective responses, may invite such inconsistencies. As demonstrated in the aggregated data analysis of Study 8, there was wide variation between items. While linear mixed modelling, a powerful statistical tool to generalise by means of simultaneous consideration of by-item and by-participant variations, provide useful insights, as is the case for many aesthetics research (e.g. Hur et al., 2018; Vartanian et al., 2019), the variations found across items demonstrates a much more complex picture.

One consequence of this is the setting of limits of generalisability. While it is true that presentation influences the elicitation of sublimity and beauty, it must be readily acknowledged that content, not the form of presentation, is still the major determinant of variation in sublimity and beauty. This is why, although there was a tendency for items to have higher sublimity and beauty ratings with increased visual angle, there were also items that were uninfluenced by the change of presentation form, because what is sublime but not beautiful will remain so regardless of the presentation forms. That in large would explain the high degrees of consistency between cohorts and within participants across different manipulation conditions.

Acknowledging the impact of content, Study 8 considered if the effects of presentation form may depend on specific content characteristics, such as elicited emotions, aesthetic emotions, and canonical size. These analyses account for content-form interactions. It was thus observed that some mundane contents, i.e. low in sublimity and low in sublimity and beauty, do not benefit from their increase of visual angle. The enlargement of an insect photograph would rarely become more sublime and beautiful no matter how large it is, whereas a photograph of a landscape with a prominent sky, would benefit most from physical enlargement. One can venture to guess that George Stubbs may have had a good hunch on this trick, painting his noble but otherwise eventless *Whistlejack* in 1762. The painting, depicting a horse, stands at an imposing  $292 \times 246.4$  cm at London's National Gallery, and still attracts attention.

**Chapter 6. Study 9: Music and Cross-modality**

## 6.1. Introduction

Many aesthetic experiences involve modalities other than vision and are multi-modal (Briellmann & Pelli, 2017; Gerdes, Wieser, & Alpers, 2014; Marin, 2015). Be it a walk through a park or a cinematic experience, one makes aesthetic judgements through an aggregate experience of what is both be seen and heard. Take an example of a recently premiered blockbuster. A battle scene has its own aesthetics in terms of its visual action sequence, arousing background music, and its dramatic narrative building up to the battle context. All these components can be enjoyed separately. Yet when they come together in the right way, they seem to create an extra sense of immersion and enjoyment. Conversely, in the wrong combination of modalities, the overall experience can be disappointing.

What is the science behind the combination of modalities, especially the interactions between visual and auditory stimuli? In the context of the present thesis, what denotes sublimity and beauty in music? While all studies in the thesis so far explored the sublimity and beauty of photographs, music is, after all, one of the most common art forms in everyday life (e.g. Rentfrow & Gosling, 2003), and it is associated with strong emotional responses (e.g. Harrison & Loui, 2014; Hunter, Schellenberg, & Schimmack, 2008, 2010; Salimpoor, Benovoy, Larcher, Dagher, & Zatorre, 2011).

The present Study explored the following two question: on the one hand, what do sublimity and beauty means when music is presented by itself? Mode type (i.e. major key vs. minor key vs. atonal), tempo (i.e. slow vs. fast), and style/composer (i.e. Baroque/Bach vs. Romantic/Chopin vs. Atonal/Schoenberg) of musical stimuli were considered. On the other hand, how do photographs and music interact when both are presented simultaneously? The relative contributions of images and music on their overall combined aesthetic evaluation of such cross-modal experiences were explored.

### 6.1.1. A Musical Sublime: Mode, Tempo, and Style as Predictors of the Sublime

Following debates surrounding the sublime and beautiful from the eighteenth century (e.g. Burke, 1759/2008), musicologists have commonly ascribed sublimity and beauty to musical descriptions. Sublime music, for instance, has been associated with “intensifying dissonance” (Wurth, 2009) and “truly horrible harmony” (Morrow, 1990), which evoke impressions of obscurity, complexity, incomprehensibility (Korstvedt, 2000; Wurth, 2009). These characters give rise to music that is “not always correct” (Johnson, 1986). As an emotional consequence, such sublime music is “not lovely”, “terrible”, and “deep [in] melancholy” (Johnson, 1986), even if it portrays a form of mixed delight in the end, e.g. “pleasing melancholy” (Johnson, 1986) or “sweet dread” (Allanbrook, 2010).

That said, descriptions of sublime music have not always been consistent. On the one hand, sublime music is “rapid” with “quick transitions” (Johnson, 1986), evoking a sense of “shock and awe” (Allanbrook, 2010). Yet slow tempo, e.g. “where notes are long” (Johnson,

1986) or “slow movement” (Allanbrook, 2010), has also been attributed to giving rise to a musical sublimity. The latter view derives from the assumption that slow notes give impressions of largeness. Vastness, indeed, is an important predictor of the sublime, as has been systematically argued by the likes of Burke (1759/2008).

In contrast to the unpleasant and tumultuous natures of sublime music, beautiful music is constructed without discords, leaving impressions of “sweetness and elegance” (Johnson, 1986) and “tenderness” (Morrow, 1990). Grace, agreeableness, and delicacy, are among words that describe such music (Scott, 2003). There is little surprise in that beautiful music, as opposed to sublime music, has been described as “pastoral” (Webster, 2005).

In empirical studies, a number of musical cues have been linked with certain emotive (e.g. pleasure) and cognitive (e.g. ambiguity) outcomes, many of which are associable with the aforementioned passions of the sublime and beautiful. Studies have looked at the roles of mode (i.e. major vs. minor keys) and tempo (i.e. slow vs. fast) on judgements of happiness and sadness. While major key and fast tempo are associated with happiness, minor key and slow tempo are linked with sadness (Cohen, 1991; Gerardi & Gerken, 1995; Hevner, 1935, 1937; Horn & Costa-Giomi, 2011; Isbilen & Krumhansl, 2016; Poon & Schutz, 2015). These associations are considered robust, as they are also reported among children (Dalla Bella, Peretz, Rousseau, & Gosselin, 2001).

Conversely, musical stimuli with mixed emotional cues, e.g. major key with slow tempo or minor key with fast tempo, are likely to result in ambiguity caused by the trigger of both pleasant and unpleasant emotions (Hunter et al., 2008, 2010). Between the two cues, tempo may still play a larger role than mode, as has been demonstrated using both complex (Hevner, 1937) and controlled (Gagnon & Peretz, 2003) melody stimuli.

Ambiguity can be achieved in other ways, too. Atonal music, a style of music that lacks a tonic reference point, i.e. lack of key (thus highly dissonant), has long been associated with ambiguity. Listeners often report feeling challenged when listening to atonal music (Mencke, Omigie, Wald-Fuhrmann, & Brattico, 2019). Underscoring the complex nature of atonal music, people exhibit difficulties in cognitively processing (e.g. recall task) atonal music compared to traditional tonal music (Vuvan, Podolak, & Schmuckler, 2014).

Perhaps owing to the unpredictability and difficulty of the style, atonal music is associated with the perception of roughness (Plomp & Levelt, 1965; Mencke et al., 2019), which may link with why atonal and heavily dissonant styles of music have been often used to represent unpleasantness (e.g. Blood, Zatorre, Bermudez, & Evans, 1999) and “fearsome emotions” (Flores-Gutiérrez et al., 2007). Still, some studies such as by Gagnon and Peretz (2003) have utilized atonal music to represent emotional neutrality, reflecting the view that atonal music is less emotionally intense compared to tonal music (Daynes, 2010).

There are reasons to believe that such musical cues, such as tempo, mode, and key, may have specific links with the sublime and beautiful. According to philosophical theories, the

sublime represents an aesthetic delight associated with belittlement, difficulty, and fear. In contrast, the beautiful is often associated with pleasure (Burke, 1759/2009). It may thus be that musical cues eliciting unpleasantness or mixed emotions – via minor key, atonality, or mixed emotional cues – may be sublime, whereas cues soliciting unmixed pleasure – via major key or non-mixed emotional cues – may be beautiful.

### **6.1.2. Cross-modality: Visual vs. Auditory Information**

Most aesthetic activities involve the simultaneous presentation of multiple sensory modalities. Recent studies have documented that visual information can assist the comprehension of lyrics in music, and can enhance auditory pitch perception (Jesse & Massaro, 2010; Platz & Kopiez, 2012; Thompson, Russo, & Livingstone, 2010). Likewise, background music can alter the emotional interpretation, comprehension, and recall of film scenes depending on the emotional fit between the scene and music (Bolivar, Cohen, & Fentress, 1995), and it can also enhanced experienced emotional intensities of facial (Logeswaran & Bhattacharya, 2009) and pictorial (Baumgartner, Lutz, Schmidt, & Jancke, 2006) stimuli. The general assumption is that there are certain correlations between auditory and visual sources of information, which can be used in the advantage of overall aesthetic experiences. All this seems to happen without the need of conscious control or explicit task-orientated strategies from the experienter's perspective (Spence & Deroy, 2013).

Despite the growing research on cross-modal interactions between auditory and visual stimuli over a wide range of methodologies and stimuli types (Gerdes et al., 2014; Marin, 2015), the literature is still at an early stage regarding the relative contributions of each modality in an overall cross-modal experience. In other words, when a pleasant image appears along with a non-pleasant piece of music, is there a general and systematic way in which modalities combine to result in an overall sublimity or beauty experience?

Although previous works have shown that participants can extract affective information from both video and audio when they are simultaneously presented (DePaulo, Rosenthal, Eisenstat, Rogers, & Finkelstein, 1978), the issue of relative modality contribution in cross-modality comes from research of kinematic cues in music perception. Although people perceive and experience happiness to happy music regardless of the emotional body language of a performer, for sad music, the emotional body language takes priority in determining the overall emotion (Krahé, Hahn, & Whitney, 2015). In a similar study yet in more controlled settings, Vuoskoski and colleagues (2014 & 2016) have observed that overall felt and perceived emotions are affected by what is both auditorily and visually suggested, although the effect size of visual cues was larger than that of musical cues for perceived emotions. It has also been suggested that the overall emotional meaning audio-visual stimuli may follow the modality with stronger arousal (Lee, Latchoumane, & Jeong, 2017).

### **6.1.3. Limitations of Past Works and Current Study**

The primary aim of the present study was to extend the results of earlier chapters, which all used purely visual stimuli. The first set of analyses set out to understand if specific musical cues, such as mode, tempo, and style, may predict evaluations of sublimity and beauty when music alone was presented. The second set of analyses explored the mechanisms of cross-modality, where the relative roles of visual and auditory information on overall impressions from audio-visual stimuli were investigated.

The present work provides theoretical and methodological developments. Firstly, the present research explores music on the dimensions of the sublime and beautiful. This is in contrast to most studies in the past, where the psychological effects of music are represented primarily by emotional measures, often circumscribed to the categories of happiness and sadness (e.g. Logeswaran & Bhattacharya, 2009). While emotions are often important in aesthetic experiences, they are by no means the only concepts linked with the complex experience of art. Besides, emotions reported in aesthetic experiences are not necessarily the emotions one actually experiences. Therefore, an aesthetic understanding of aesthetic phenomena via the sublime and beautiful, a set of historically rich yet also scientifically studied concepts (e.g. Hur and McManus, 2017), was sought.

In generalising the findings, music pieces that have already been verified as experimental objects such as the piano music of Bach and Chopin (Isbilen and Krumhansl, 2016) were selected. However, atonal music was also introduced into the framework, atonal music being a neglected style of music in research (Mencke et al., 2019). Furthermore, although both tonal/minor key works and atonal works have been treated as evoking unpleasantness in the past (Flores-Gutiérrez et al., 2007; Hevner, 1935), the present set of studies is one of the first studies to provide a direct comparison between the two styles, in a uniquely aesthetic context. This provided the second novelty of the present study.

The present research also departs from previous work by introducing a wide range of naturalistic stimuli. Previous studies in music have mostly generalised findings based on a small number if not single pieces of music (e.g. Vuoskoski et al., 2014, 2016) or of abstract sounds (e.g. Lee et al., 2018), a design that compromises generalizability and statistical power (Judd, Westfall, & Kenny, 2017; Westfall, Kenny, & Judd, 2014). In comparison, the current study involves a total of 72 naturalistic stimuli (randomly paired naturalistic photographs and piano music), and accordingly attempted for an enhanced generalizability of findings. Lastly, where previous cross-modality works used kinematic performance cues as visual information for musical performances (e.g. Vuoskoski et al., 2014, 2016), two unrelated sets of visual and auditory stimuli were used. By disconfounding inherent correlations between visual and auditory sources of information, a purer form of cross-modality was assessed.

## 6.2. Methodology

### 6.2.1. Participants

Thirty-nine participants (35 female,  $M_{age} = 18.95$ ,  $SD_{age} = 1.26$ ) from University College London were recruited in return for course credit. All participants provided written consent prior to the start of the study.

### 6.2.2. Stimuli

**6.2.2.1. Visual stimuli.** 36 photographs were selected from a pool of approximately 400 photographs from previous studies (Studies 1 to 8). The items were selected to approximate the six corners of the *Aesthetic Hexagon* (see Methodology section of Chapter 2), such that six items represented each hexagon category. The final 36-item set had sublimity and beauty ratings that were moderately, but not significantly, correlated,  $r(36) = 0.28$ ,  $p > .05$ . This enabled the presentation of a set of balanced stimuli throughout the task.

**6.2.2.2. Musical stimuli.** 36 six-second long clips of music were selected, divided equally in numbers into three categories of style/composer, namely Baroque/Bach, Romantic/Chopin, and Atonal/Schoenberg. Previous empirical works have often used J. S. Bach's *Well Tempered Clavier* (henceforth WTC) to study the roles of low level musical cues such as tempo and mode on musical emotions (Cohen, 1991; Horn & Costa-Giomi, 2011; Isbilen & Krumhansl, 2016; Poon & Schutz, 2015). As a work of historical significance, the WTC is one of the first musical studies to explore all 24 major and minor keys, from C major, C minor, C# major, C# minor, up to B minor. Still, the WTC represents one aspect of Western music, namely – if one may grossly generalise – the eighteenth century Baroque style. To derive generalisations of the roles of musical cues across different styles, two further set of works of similar musical structures were considered. The first was Frédéric Chopin's *Preludes*, a work inspired by Bach's WTC, and like its predecessor a study of the 24 keys using the 19<sup>th</sup> century idiom of Romanticism. Poon and Schutz (2015) have previously explored musical emotions using both Bach's WTC and Chopin's *Preludes*. The other selection derived from post-1908 piano works by Arnold Schoenberg, to represent the style of atonality from the 20<sup>th</sup> century. Given that one composer was chosen to represent each stylistic period and the three composers are similar in their musical reputation, this was a way to keep the levels of artistic variability consistent.

There are other advantages of using any solo piano music clips for experimental works. The use of such stimuli means that contingent musical factors, such as song text (e.g. as in vocal music) or the number and type of instruments (as in symphonic music) are controlled. Furthermore, given the selection of stimuli, relationships between specific musical structures and psychological outcomes can be established without overtly sacrificing aesthetic integrity and everyday relevance.

For the music of the Bach/Baroque and Chopin/Romantic categories, the music was divided in equal numbers by mode type (i.e. major vs. minor keys) and tempo (i.e. slow vs. fast). Since the atonal music of Schoenberg cannot be divided into major or minor keys, half of the Schoenberg/Atonal stimuli were slow, the other half fast. The list of stimuli can be seen in Table 37.

Table 37. List of music clips used in Study 9.

Composer	Piece	Start time (in recording)	Performer	Label	Style	Key	Tempo
Schoenberg	Op. 11; I.	00:00	M. Pollini	DGG	Atonal	None	Slow
Schoenberg	Op. 11; II.	00:27	M. Pollini	DGG	Atonal	None	Slow
Schoenberg	Op. 23; I	00:00	M. Pollini	DGG	Atonal	None	Slow
Schoenberg	Op. 23; III.	02:20	M. Pollini	DGG	Atonal	None	Slow
Schoenberg	Op. 19; II.	00:25	M. Pollini	DGG	Atonal	None	Slow
Schoenberg	Op. 19; III.	00:28	M. Pollini	DGG	Atonal	None	Slow
Schoenberg	Op. 25	01:24	M. Pollini	DGG	Atonal	None	Fast
Schoenberg	Op. 23; II.	00:02	M. Pollini	DGG	Atonal	None	Fast
Schoenberg	Op. 25	00:28	M. Pollini	DGG	Atonal	None	Fast
Schoenberg	Op. 33a	01:13	M. Pollini	DGG	Atonal	None	Fast
Schoenberg	Op. 23; IV.	00:20	M. Pollini	DGG	Atonal	None	Fast
Schoenberg	Op. 25	00:45	M. Pollini	DGG	Atonal	None	Fast
Bach	WTC Book 2; E-flat major (Fugue)	00:16	D. Barenboim	Warner	Baroque	Major	Slow
Bach	WTC Book 2; E major	00:00	D. Barenboim	Warner	Baroque	Major	Slow
Bach	WTC Book 1; A-flat major (Fugue)	00:00	A. Hewitt	Hyperion	Baroque	Major	Slow
Bach	WTC Book 2; G major	00:00	A. Schiff	Decca	Baroque	Major	Fast
Bach	WTC Book 2; B major	00:00	A. Hewitt	Hyperion	Baroque	Major	Fast
Bach	WTC Book 2; A major (Fugue)	00:04	A. Hewitt	Hyperion	Baroque	Major	Fast
Bach	WTC Book 2; F minor	00:00	D. Barenboim	Warner	Baroque	Minor	Slow



Bach	WTC Book 2; G minor	00:00	A. Hewitt	Hyperion	Baroque	Minor	Slow
Bach	WTC Book 1; D-sharp minor	00:00	A. Schiff	Decca	Baroque	Minor	Slow
Bach	WTC Book 2; D-sharp minor	00:00	A. Schiff	Decca	Baroque	Minor	Fast
Bach	WTC Book 2; G-sharp minor	00:00	A. Schiff	Decca	Baroque	Minor	Fast
Bach	WTC Book 2; B minor	00:00	A. Schiff	Decca	Baroque	Minor	Fast
Chopin	Preludes; A major	00:01	I. Pogorelich	DGG	Romantic	Major	Slow
Chopin	Preludes; F-sharp major	00:00	I. Fliter	Linn	Romantic	Major	Slow
Chopin	Preludes; D-flat major	00:00	I. Pogorelich	DGG	Romantic	Major	Slow
Chopin	Preludes; C major	00:00	I. Pogorelich	DGG	Romantic	Major	Fast
Chopin	Preludes; B major	00:03	I. Pogorelich	DGG	Romantic	Major	Fast
Chopin	Preludes; E flat major	00:00	I. Fliter	Linn	Romantic	Major	Fast
Chopin	Preludes; A minor	00:00	I. Fliter	Linn	Romantic	Minor	Slow
Chopin	Preludes; E minor	00:00	I. Pogorelich	DGG	Romantic	Minor	Slow
Chopin	Preludes; B minor	00:00	I. Fliter	Linn	Romantic	Minor	Slow
Chopin	Preludes; B-flat minor	00:00	I. Fliter	Linn	Romantic	Minor	Fast
Chopin	Preludes; F minor	00:02	I. Fliter	Linn	Romantic	Minor	Fast
Chopin	Preludes; D minor	00:42	I. Fliter	Linn	Romantic	Minor	Fast

*Note.* DGG stands for Deutsche Grammophon. A. Hewitt's WTC refers to the second recording done for Hyperion.

For works in the Bach/Baroque and Chopin/Romantic categories, the mode of a piece was determined by the key designated to the piece by the composer. For all clips, tempo was assessed by measuring the attack rate, where the number of note attacks for each excerpt were manually calculated. Further descriptions of this calculation can be found in works by Poon and Schutz (2015), and Horn and Costa-Giomi (2011). Given some inconsistencies – for example the slow music of Chopin was much slower than the slow music of Bach – the playback speed of some of the stimuli was modified, but to degrees that signs of modifications were

unnoticeable, and that did not affect pitch. The average attack rate for each category of musical stimuli is presented in Table 38.

Table 38. Mean attack rate for musical stimuli (Study 9).

		Baroque/ Bach	Romantic/Chopin	Atonal/Schoenberg
Major	Fast	40.00 ( $n = 4$ )	43.33 ( $n = 4$ )	
	Slow	11.00 ( $n = 4$ )	9.00 ( $n = 4$ )	
Minor	Fast	43.33 ( $n = 4$ )	43.33 ( $n = 4$ )	
	Slow	8.00 ( $n = 4$ )	9.00 ( $n = 4$ )	
Atonal/Schoenberg	Fast			8.83 ( $n = 6$ )
	Slow			39.67 ( $n = 6$ )

Using attack rate for each stimulus as a dependent variable, the tempo categorization was validated. In the first analysis, attack rate was predicted via a 3 (style/composer: Baroque/ Bach vs. Romantic/Chopin vs. Atonal/Schoenberg)  $\times$  2 (tempo: slow vs. fast) ANOVA. Only tempo predicted a difference in attack rate, with stimuli of the slow category ( $M_{attack\ rate} = 9.11$ ) having lower attack rates than those of the fast tempo category ( $M_{attack\ rate} = 40.61$ ),  $F(1,30) = 805.74$ ,  $p < .001$ . No other effects including the interaction were significant. When attack rate was assessed via a 2 (style/composer: Baroque/Bach vs. Romantic/Chopin)  $\times$  2 (mode type: major vs. minor)  $\times$  2 (tempo: slow vs. fast) three-way ANOVA using only the Bach/Baroque and Chopin/Romantic stimuli, there was again a main effect of tempo. Across the stimuli, stimuli of the slow tempo category ( $M_{attack\ rate} = 9.25$ ) had lower attack rates than those of the fast tempo category ( $M_{attack\ rate} = 41.08$ ),  $F(1,16) = 559.10$ ,  $p < .001$ . While there was a triple interaction between the three predicting variables,  $F(1,16) = 4.97$ ,  $p = .04$ , Bonferroni correction would adjust the interaction as inconsequential. No other effects were statistically significant, demonstrating that the stimuli selection fit the categorical descriptions.

Finally, the clips were adjusted for loudness by equating the maximum amplitude between stimuli, before being adjusted for background noise. The first and last seconds of each clip were faded out.

### 6.2.3. Design and Procedure

The procedure and settings were similar to those from previous chapters. The testing took place in the same dark room as before, and based on MATLAB 2016b (MathWorks, Inc., Natick, MA, USA) on a laptop. The laptop was connected to a 200W Epson EBX03 projector, through which images were projected on a wall of the room. Where music was required, music was projected from a set of two standing LTC Multicav 3-way stand speakers located diagonally left and right from the viewer as to not obstruct the view of the projected images.

Three experimental blocks comprised the study, in the order of an image only block (Block 1), a music only block (Block 2), and an image with music block (Block 3). For Block 1, participants were presented with 18 out of the pool of 36 images. While the images were randomly selected per participant, it was ensured that *Aesthetic Hexagon* was equally represented, meaning that there were 3 images per hexagon category. For Block 2, all 36 clips of music were presented. Lastly, for Block 3, all 36 images were randomly paired with an image, with the randomisation unique for each participant. To clarify, for each participant, the 18 images a participant looked at in Block 1 reappeared in Block 3, but this time with a music clip. All 36 clips of music a participant looked at in the Block 2 reappeared in Block 3, but this time accompanied by an image.

All images in Blocks 1 and 3 were presented 390cm away from the viewer, with visual angles of  $21.77^\circ \times 38.70^\circ$  (i.e.  $150\text{cm} \times 200\text{cm}$ ). In the music-only Block 2, a grey rectangular outline in identical size as the images from Blocks 1 and 3 was presented on the wall during the playing of music. All music clips were played via the speakers in a volume loud enough for the smallest sound to be perceived without difficulty.

As was the case for the studies throughout the thesis, the experimenter gave a standardised characterisation of the sublime and beautiful to each participant, before explaining the general procedures. Likewise, participants rated the levels of sublimity and beauty of each stimulus, using a response grid identical to previous designs. A brief training block consisting of rating three images preceded the main blocks. A single session took approximately 45 minutes per participant.

## 6.3. Results

### 6.3.1. Analytic Approach

Unless specified otherwise, all inferential statistics were calculated using linear mixed modelling. The technicalities and advantages of using linear mixed modelling was presented in Chapter 1c. When predicting the ratings of sublimity or beauty, the other rating variable was always inserted into the models as a covariate. This was done due to sublimity and beauty's known significant correlations seen throughout all past studies in the thesis.

### 6.3.2. Manipulation Checks for Image Ratings

Firstly, whether the results of the current work replicate those of past works was assessed. Taking data from Block 1 (image only), sublimity and beauty ratings were averaged by item, then compared against the items's average ratings from Studies 3 to 7. Comparing the two sets of sublime ratings, the ratings were consistent,  $r = 0.89, p < .001$ . Beauty ratings were also consistent,  $r = 0.96, p < .001$ . Likewise, there were high consistencies for both S+B,  $r = 0.94, p < .001$ , and S-B,  $r = 0.90, p < .001$ . For each individual, sublimity and beauty ratings were correlated. Across participants, sublimity and beauty had a mean correlation of  $r = 0.35$ .

Figure 53 reflects the general replication of the data from past works. Note that the *Aesthetic Hexagon* is largely intact.

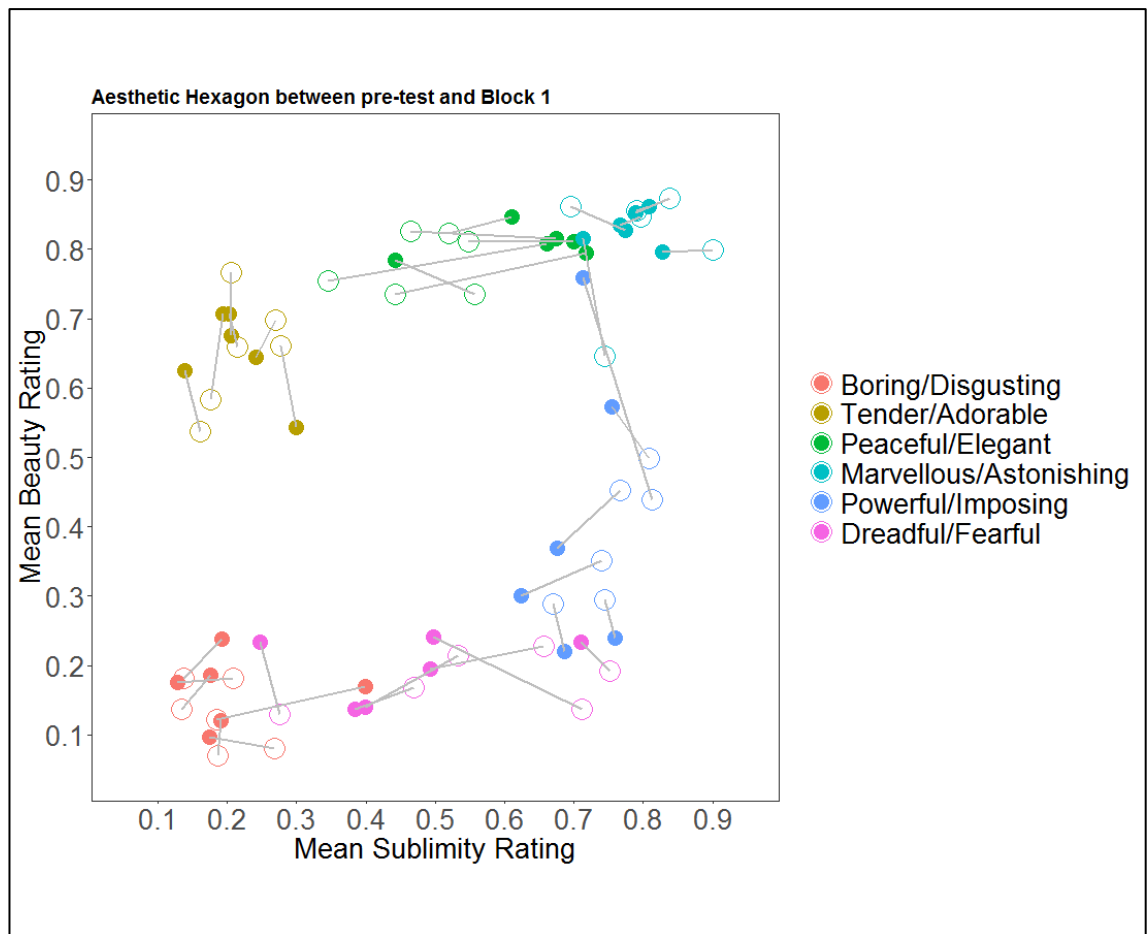


Figure 53. Between-study consistency for image ratings (Study 9).

*Note.* Open circles represent averaged ratings from Studies 3 to 7. Filled circles represent averaged ratings from Study 9, with the grey lines demonstrating how much the rating for each image changed. The images are divided up into the six *Aesthetic Hexagon* categories.

### 6.3.3. Mode Type, Tempo, and Style, and the Musical Sublime

The predictors of sublimity and beauty in music were explored, when music was presented on its own (Block 2). For each individual, sublimity and beauty ratings were correlated. Across participants, sublimity and beauty had a mean correlation of  $r = 0.31$ . Using linear mixed modelling, the role of style/composer (i.e. Baroque/ Bach vs. Romantic/Chopin vs. Atonal/Schoenberg) on aesthetic evaluations was analysed.

Using this method, style/composer played important roles for both the prediction of sublimity,  $F(2, 39.41) = 3.18, p = .05$ , and  $F(2, 39.84) = 39.36, p < .001$ . Post hoc comparisons revealed no differences between Baroque/Bach and Romantic/Chopin for evaluations of sublimity,  $t(33.40) = 1.81, p > .05$ , or beauty,  $t(32.90) = 0.09, p > .05$ . As this outcome suggests that the aesthetic experience among tonal music may be generalisable across composers and

styles, the differentiation between Baroque/Bach and Romantic/Chopin was no longer considered.

What factors predict a music piece's elicitation of sublimity and beauty? Two models were run, where mode type (i.e. major vs. minor vs. atonal), tempo (i.e. slow vs. fast), and their interaction predicted sublimity in one model and beauty in the other. Full descriptive and inferential statistics are provided in Table 39 and Table 40, respectively. Visualisation provided in Figure 54.

When sublimity was predicted by mode type, tempo, and their interaction, there was a main effects of mode type,  $F(2, 51.12) = 17.10, p < .001$ . Post hoc comparisons reveal that music clips in minor key were more sublime than those in the major key,  $t(49.00) = 4.88, p < .001$ , and those in the atonal style,  $t(48.10) = 4.87, p < .001$ . Major key clips and atonal style clips did not differ in sublimity,  $t(60.10) = 0.20, p > .05$ . There was also a main effect of tempo,  $F(1, 56.96) = 5.18, p < .05$ , with fast music eliciting more sublimity than slow music. The interaction between mode type and tempo did not reach significance,  $F(2, 34.22) = 0.23, p > .05$ .

A similar set of analyses were run predicting beauty. Only the main effect of mode type was significant,  $F(2, 45.58) = 44.69, p < .001$ . Specifically, post hoc comparisons revealed that clips in the major key were more beautiful than those in the minor key,  $t(41.50) = 2.02, p = .05$ , whereas clips in the minor key were more beautiful than those in the atonal style,  $t(48.30) = 7.18, p < .001$ . In predicting beauty, no significance was reached for the main effect of tempo,  $F(1, 45.65) = 0.15, p > .05$  nor for the interaction between mode type and tempo,  $F(2, 34.91) = 1.25, p > .05$ .

Table 39. Mode type and tempo effects, descriptive statistics table (Study 9).

		Sublimity rating	Beauty rating
Atonal	Fast	0.40 ( <i>SD</i> = 0.27)	0.30 ( <i>SD</i> = 0.20)
	Slow	0.33 ( <i>SD</i> = 0.26)	0.36 ( <i>SD</i> = 0.24)
Major	Fast	0.45 ( <i>SD</i> = 0.28)	0.70 ( <i>SD</i> = 0.18)
	Slow	0.34 ( <i>SD</i> = 0.24)	0.65 ( <i>SD</i> = 0.21)
Minor	Fast	0.59 ( <i>SD</i> = 0.23)	0.62 ( <i>SD</i> = 0.23)
	Slow	0.53 ( <i>SD</i> = 0.28)	0.61 ( <i>SD</i> = 0.24)

*Note.* Descriptive statistics represent mean values.

Table 40 Mode type and tempo effects, inferential statistics table (Study 9).

	Predicting sublimity			Predicting beauty		
	<i>df</i>	<i>F</i>	<i>p</i>	<i>df</i>	<i>F</i>	<i>p</i>
Mode Type	2, 51.12	17.10	< . <b>.001</b>	2, 45.58	44.69	< . <b>.001</b>
Tempo	1, 56.96	5.18	<b>.03</b>	1, 45.65	0.15	.70
Mode Type × Tempo	2, 34.22	0.23	.79	2, 34.91	1.25	.30
(Covariate)	1, 1210.89	15.56	< . <b>.001</b>	1, 1235.97	19.79	< . <b>.001</b>

Note. Bold show inferential statistics that are significant at  $p < .05$ .

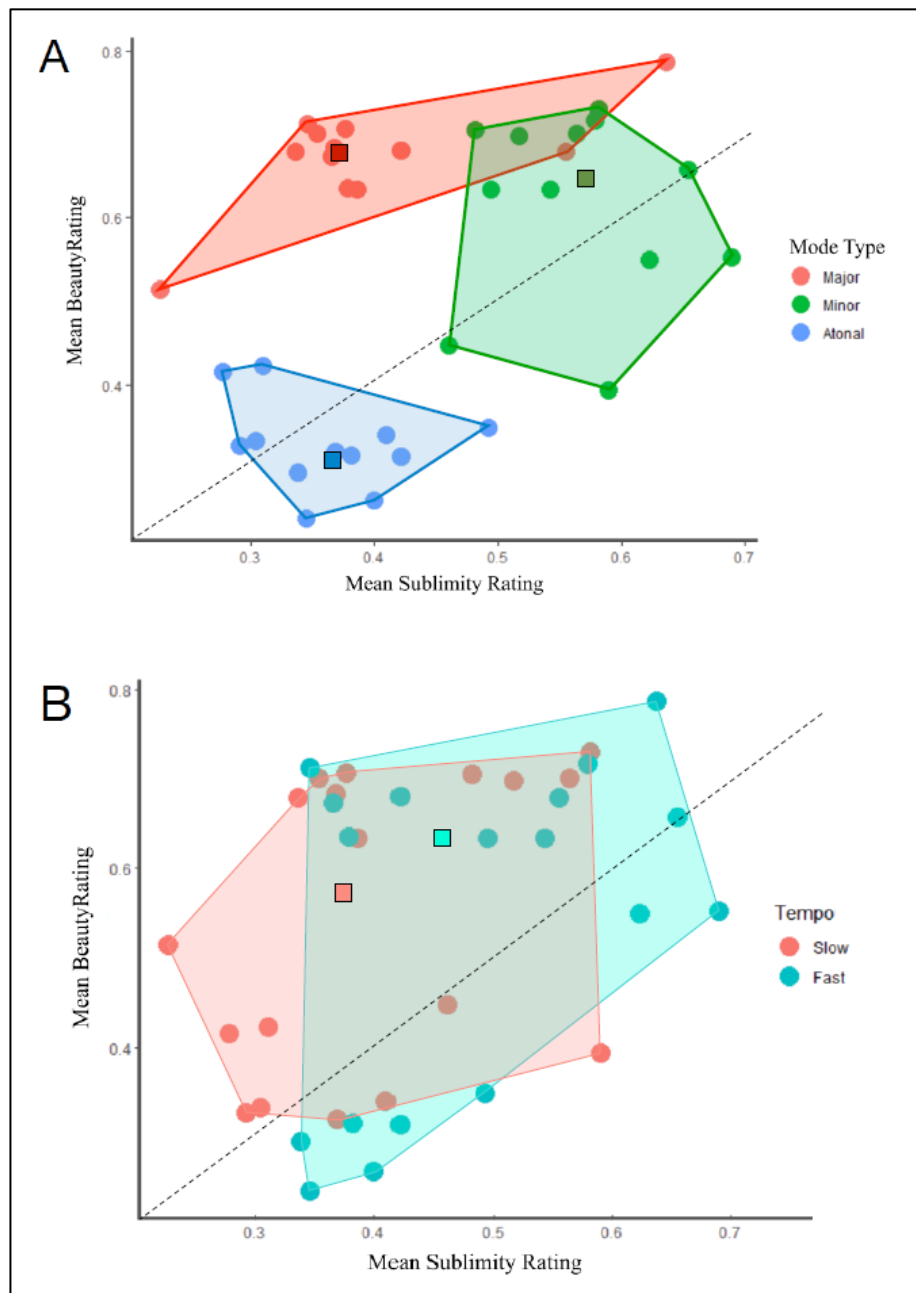


Figure 54. Mode type and tempo effects visualisation, on mode type (A) and tempo (B). Data are aggregated by item and across participants. Squares indicate median values of each variable level. (Study 9).

The presented results demonstrate that sublimity and beauty are affected by different musical components. Sublimity is affected by both mode type and tempo, whereas beauty is only influenced by mode type. To what degree does mode type affect sublimity and beauty differentially? Also, is tempo's effect on sublimity significantly different from tempo's effect on beauty? To answer these questions, a new linear mixed model was constructed, but this time with sublimity and beauty entered as a variable, i.e. judgement type, in addition to mode type and tempo. Any interaction between judgement type and the two main manipulations (i.e. mode type & tempo) would indicate that sublimity and beauty differ in these manipulations at statistically significant levels. The full model outcome is presented in Table 41.

Table 41 Mode type, tempo, and judgement type effects, inferential statistics table (Study 9).

	<i>df</i>	<i>F</i>	<i>p</i>
Mode Type (M.T.)	2, 50.53	38.48	< . <b>001</b>
Tempo	1, 54.95	2.32	.13
Judgement Type	1, 56.32	16.99	< . <b>001</b>
M.T. × Tempo	2, 30.00	1.14	.33
M.T. × Judgement Type	2, 30.00	33.11	< . <b>001</b>
Tempo × Judgement Type	1, 30.00	6.87	<b>.01</b>
M.T. × Tempo × Judgement Type	2, 30.00	0.58	.56

*Note.* Bold show inferential statistics that are significant at  $p < .05$ .

The model output demonstrated significant interactions between mode type and judgement type,  $F(2, 30.00) = 33.11, p < .001$ . Pairwise comparisons revealed that although sublimity and beauty are similarly elicited for the minor key,  $t(50.20) = 1.63, p > .05$ , and the atonal style,  $t(50.20) = 1.05, p > .05$ , there was more beauty than sublimity in the major key,  $t(50.20) = 8.38, p < .001$ . In other words, while mode type appeared to affect both sublimity and beauty, the specific effects of mode type on the two rating were different.

The model further confirmed a tempo and judgement type interaction,  $F(1, 30.00) = 6.87, p = .01$ . While slow music was significantly linked with beauty more than sublimity,  $t(55.20) = 4.88, p < .001$ , fast music was not distinguishable between the two judgement types overall,  $t(55.20) = 1.96, p > .05$ .

#### **6.3.4. The Relative Importance of Music and Photographs on Aesthetic Evaluations of their Combined Presentations**

In Blocks 1 (image only block) and 2 (music only block), it was observed that both images and music produce wide varieties of sublimity and beauty responses. To answer the question of how music and images combine to produce an overall sublimity and beauty experiences, in Block 3 participants rated one's overall sublimity and beauty experiences when images and music were presented simultaneously for 6 seconds.

Exploring the general shape of the rating data from Block 3, correlating sublimity and beauty ratings for each participant, then averaging the correlations resulted in a positive correlation,  $r = 0.25$ . This means that the overall sublimity-beauty relationship in Block 3 was similar to the observed relationship from previous blocks, i.e. 0.35 (Block 1) and 0.31 (Block 2).

To compute the relative aesthetic influences of image-based experiences and music-based experiences when both image and music are simultaneously presented, raw sublimity and beauty ratings from both Blocks 1 and 2 were entered as the four predicting variables in predicting the sublimity and beauty ratings given in Block 3. This was possible because the same images and music appeared again in Block 3, and each participant's unique ratings in Blocks 1 and 2 were used to explain their unique responses in Block 3<sup>46</sup>.

Sublimity in Block 3 was predicted by positive ratings of sublimity ratings in both images,  $\beta = 0.40$ ,  $F(1, 44.84) = 69.92$ ,  $p < .001$ , and music,  $\beta = 0.17$ ,  $F(1, 109.47) = 23.61$ ,  $p < .001$ , and by a little negative ratings of beauty in images,  $\beta = -0.10$ ,  $F(1, 135.77) = 4.31$ ,  $p = .04$ . The beauty ratings of music did not influence the sublimity ratings of trials in Block 3,  $\beta = 0.05$ ,  $F(1, 184.89) = 2.31$ ,  $p > .05$ . In other words, when an image that is sublime and non-beautiful, and a music clip that is sublime are presented simultaneously, this is likely to result in a visuo-musical stimulus that is also sublime. Yet the sublimity of the image was more than two times (i.e.  $0.40/0.17 = 2.35$ ) as important as the sublimity of the music clip, and the difference between the two beta coefficients was statistically significant,  $Z = 4.10$ ,  $p < .001$ . The comparison between the two beta coefficients followed the equation by Clogg, Petkova, and Haritou (1995).<sup>47</sup>

Beauty in Block 3, on the other hand, was only predicted by beauty ratings in both images,  $\beta = 0.59$ ,  $F(1, 41.65) = 226.65$ ,  $p < .001$ , and music,  $\beta = 0.21$ ,  $F(1, 49.10) = 30.85$ ,  $p < .001$ . Beauty in Block 3 was not influenced by sublimity ratings of images,  $\beta = 0.02$ ,  $F(1, 53.33) = 0.36$ ,  $p > .05$ , and music,  $\beta = 0.01$ ,  $F(1, 527.64) = 0.14$ ,  $p > .05$ . Thus the beauty of a visuo-musical stimulus is determined by how beautiful the image and music is, yet in a way that the beauty of the image was almost three times (i.e.  $0.59/0.21 = 2.81$ ) as influential and the beauty of the music clip. The difference between the two beta coefficients was significant,  $Z = 6.87$ ,  $p < .001$ . A full table of inferential statistics is provided in Table 42.

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<sup>46</sup> Because only half of the images from Block 1 reappeared in Block 3 per participant, the linear mixed modelling analysis only made use of half of the data in Block 3. To avoid the incurrence of data loss, an alternative analysis was considered, where all image and music stimuli were averaged by stimuli across participants, and those averaged ratings predicted individually unique Block 3 data. While this alternative aggregation-based method made use of the entire responses from Block 3, the method does not respect the unique ratings given per participant in the predicting variables. Because the initial analytical approach still generalises over all 36 images and 36 music clips, and maximizes the advantage of the linear mixed modelling technique, the initial method is reported. Besides, every outcome from this initial method was confirmed in the alternative method.

<sup>47</sup>  $Z = \frac{\beta_1 - \beta_2}{\sqrt{(SE\beta_1)^2 + (SE\beta_2)^2}}$



In sum, the sublimity of a visuo-musical stimuli is influenced primarily by the sublimity of its components, where the beauty of those stimuli is influenced only by the beauty of its components. For both sublimity and beauty, the role of images were far greater than that of the music. Figure 55 presents a summary of the findings.

Table 42. Sublimity and beauty ratings effects, inferential statistics table (Study 9).

	Predicting sublimity				Predicting beauty			
	$\beta$	$df$	$F$	$p$	$\beta$	$df$	$F$	$p$
1. Sublimity	0.40	1, 44.84	69.92	< .001	0.02	1, 53.33	0.36	.55
1. Beauty	-0.10	1, 135.77	4.31	.04	0.59	1, 41.65	226.65	< .001
2. Sublimity	0.17	1, 109.47	23.61	< .001	0.01	1, 527.64	0.14	.70
2. Beauty	0.05	1, 184.89	2.31	.13	0.21	1, 49.10	30.85	< .001
(Covariate)	0.22	1, 636.60	21.57	< .001	0.13	1, 653.45	24.16	< .001

Note. The numbers refer to block numbers. Block 1 was an image only block. Block 2 was a music only block. Bold show inferential statistics that are significant at  $p < .05$ .

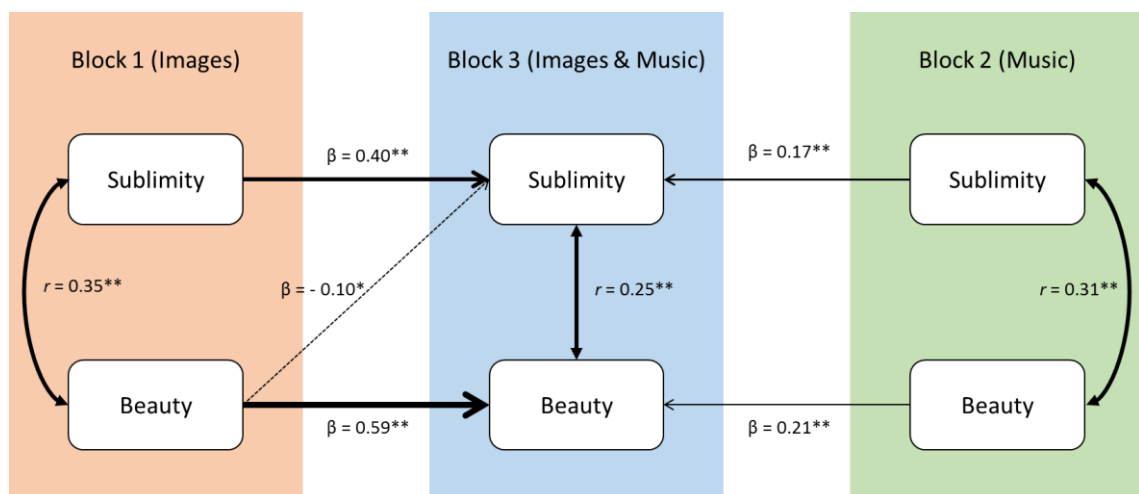


Figure 55. Summary of findings (Study 9).

Note. For linear mixed modelling analysis (unidirectional arrows), standardised beta coefficients are presented. Correlation coefficients (bidirectional arrows) are averaged correlations across participants.  $^{**}p < .001$ ,  $^*p < .05$

#### 6.4. Discussion and Chapter Summary

In Study 9, participants rated individual photographs and music clips for their evoked sublimity and beauty, before they then rated a block of trials where both photographs and music pieces appeared simultaneously. Distinct musical cues predicted the elicitation of sublimity and/or beauty in individual music clips, with mode type (i.e. major key vs. minor key vs. atonality) generally playing a larger role than tempo (i.e. slow vs. fast). When photographs and music clips appeared together, the overall experience was predicted by the aesthetic values of both the photograph and music clip, although photographs had a significantly larger influence.

Past works in philosophy have often assumed the sublime and beautiful as separate if not opposite constructs. For example, Burke (1759/2009) contrasts sublimity against beauty in terms of physical representations and their resulting cognitive-emotive consequences. In this framework, Burke's operationalisation of sublimity concerns fear, magnitude, and might, whereas beauty associates with pleasure, smallness, and families of experiences linked with "weakness and imperfection." Such categorisations were not uncommon at the time.

Yet the current work demonstrates that this is not always true; regardless of the number or types of modality present via all three experimental blocks, the reported experience of sublimity and beauty are positively and moderately correlated. This replicates the previous chapters. Thus there seems to be reliable evidence that between studies of participants, designs, and modalities, the experience of sublimity also assumes the experience of beauty, or at least in judgements.

This is not to say, however, that sublimity and beauty always share a common mechanism. While the major key was the predominant predictor of beautiful music, the minor key was most important for evoking sublimity in music. Tempo only affected sublimity marginally, with faster music evoking more sublimity. Given that the major key is often linked with positive emotions and minor key with negative emotions (e.g. Hevner, 1937), these results fit the mould of philosophical notions of sublime experiences entailing elements of negative emotionality within the concept of delight. That music in the minor key and fast tempo, which according to Hunter and colleagues (2008) constitute mixed emotions, was most sublime supports this "sublimity as mixed emotions" viewpoint.

Nevertheless, it would be wrong to confine sublimity to mixed emotions *per se*. Music clips in the major key with slow tempo, which is known to evoke mixed emotions, were considered to be the lowest in the reported sublimity of all combinations of musical cues. Assuming that it is mode type that really is driving the aesthetic effects, it can be that positivity in music (i.e. major key) may be an antithesis to truly sublime experiences, at least when it comes to ratings. Furthermore, where Hunter and colleagues (2008) reported slow music to evoke mixed emotions in general, it was fast tempo that evoked more sublimity than slow tempo – again, going against the tradition that sublimity is essentially a mixed emotion.

Relatedly, atonal music was another likely candidate for evoking mixed emotions, as it elicits ambiguity and challenge despite its influence in 20<sup>th</sup> century composition presumably linked with some form of aesthetic-emotional gratification (Mencke et al., 2019). Given atonal music to evoke "fearsome emotions" (Flores-Gutiérrez et al., 2007), atonal music also fits the bill to evoke sublimity in music. Yet regardless of tempo, atonal music elicited as much sublimity as music in the major key, and much less than music in the minor key. Interpretation wise, the result on atonality suggests either that music in the bright major key is particularly low in sublimity or that the cragginess of atonal music can also be as moderately sublime as major key music. Given that no control conditions were taken into account, this is difficult to verify.

However, it is possible to give weight to the latter option, since works in both major keys and slow tempo (e.g. some Finale codas of Anton Bruckner symphonies) and atonality (e.g. Alban Berg's Violin Concerto) can elicit memorably strong emotions too.

Beauty, as seen as an elicitor of "mere positive pleasure" by Burke, was straightforwardly predicted by the major key. This implies that sublimity and beauty may operate on differing modes of musical experience, suggesting that there can be more than a single aesthetic experience with music, and that some musical cues can have selective aesthetic experiences.

Exploring the relative contributions of visual and auditory components in the aesthetic evaluation of visuo-auditory stimuli, the visual component was thrice as influential as the auditory component for both sublimity and beauty. The finding essentially concurs with that of Vuoskoski and colleagues (2014), who considered perceived expressivity of a visible musician playing the piano. It may have been the case that by design, the visual elements were more salient than the auditory ones. In both Vuoskoski et al.'s and the present study's designs, visual stimuli – either photographs of nature or videos of a moving human body – were more relatable than the abstractness portrayed through music. In reality, this may reflect how a bad soundtrack is not as detrimental to a cinematic experience as a bad visual storyline on screen.

Yet visual components need not be so relatable, and with enough abstractness and ambiguity to match the abstractness of music, the superiority of visual information over auditory information may be attenuated. This is something to be investigated in future studies. Recapitulating the earlier view that sublimity and beauty may operate on different mechanisms, sublimity of a visuo-auditory stimulus was primarily predicted by the sublimities of the visual and auditory components, whereas beauty was predicted only by the beauty experiences of both components.

Differing from past works from other authors, the generalisability of findings is a particular strength of the present work. The results were based on a large number of stimuli, and by adopting linear mixed modelling, the findings considered subtle variations across stimuli and participants. The results also come with enhanced interpretability. Where past works have predominantly used emotions to quantify the effects of music (e.g. Hevner, 1937), the current study is one of the first of its kind to link certain components of music to an aesthetic outcome. Emotions are important in any aesthetic experience, but hardly unique for aesthetic purposes. The loss of a close friend offers an entirely different texture of sadness to of Mozart's Requiem, in which case the discrete emotion alone cannot encompass the latter's overt aesthetic impetus. This is especially so in the case of music, which is decidedly created as an artwork, and thus aimed for some sort of aesthetic response. It is thus important that aesthetic responses should be assessed through aesthetic measures.

While this chapter demonstrates the general phenomenology of the sublime and beautiful, little is known, for example, of the underlying semantics and meaning underneath

what people call sublime. This is especially crucial in cross-modal settings, as there is little guarantee that the sublimity evoked by a photograph would correspond to exactly the same quality of sublimity raised by a music piece. Future studies must elaborate on this whilst being cognisant of features that distinguish music from visual things, such as time. Similarly, further research must explore the nature of sublimity and beauty in relation to preferences and human behaviour. Atonal music is a special case here – while atonal music has been rated relatively low in both sublimity and beauty, atonal works are frequently programmed and attended to in concert halls and opera houses. What drives people to attend performances they don't explicitly see as beautiful or sublime? Are there mediating variables that could allow difficult sounding music to be attractive? The present work lays on empirical groundwork for understanding the sublime and beautiful beyond the visual domain.

## **Chapter 7. Study 10: Online Survey on the Sublime**<sup>48</sup>

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<sup>48</sup> The project was conceived as part of a week-long visit to the University of Vienna's Department of Basic Psychological Research and Research Methods in March 2016. Plans of an online survey study was discussed at that time, following a presentation I gave on the sublime. The collaboration resulted in the publication, Pelowski, Hur, Cotter, Ishizu, Christensen, Leder, and McManus (2019), which forms the basis of the chapter. Based on many exchanges of drafts mainly between Matthew Pelowski and myself, Matthew Pelowski produced the final draft of the paper. All visualisations are produced by Matthew Pelowski, and the Bootstrap Exploratory Graph Analysis is entirely the work of Alexander Christensen. Parts of the publication is altered to fit the thesis. I have received permission from Matthew Pelowski to have the published paper be used as a chapter of this thesis.

## 7.1. Introduction

The sublime has long been a core topic in aesthetics and discussions of profound human experiences. In the thesis, sublimity and beauty have been assumed as proxies of profundity and pleasure, respectively. Using the shorthand, it was possible to generalise that while sublimity and beauty are related experiences, they may still be differentially attuned to certain visual (Studies 5 to 8) and auditory mechanisms (Studies 9).

Yet sublimity boasts a rich phenomenology, in its long history. Often connected to powerful or overwhelming experiences, the sublime has been associated with not only grand nature, but also with human encounters, music, and art. Descriptions of the sublime range from 15<sup>th</sup> century poetry to 20<sup>th</sup> century descriptions of technology, and from Africa to East Asia.

With the vast possibilities, what are the boundaries and phenomenology that one can call sublime experiences? In psychology, the sublime is often ill- or under-defined, and it is still common practice that researchers adopt their own eclectic versions in designing their studies, interpreting their data, or even when choosing suitable sublime-inducing stimuli (Hur & McManus, 2017). These issues run in parallel to related arguments that the sublime experience, although it *may* exist, is largely assumed to happen to everyone.

This leads to four basic questions: How do episodes of sublime happen in real life, and does the sublime happen to everyone? What triggers the sublime? What emotions might be used to describe experiences? Can sublime reports be meaningfully organised into one or more types? These questions are asked in an online survey, and analysed via network modeling and a latent class analyses.

### 7.1.1. Review – Past Discussions of the Triggers and Emotions of the Sublime

Given the vastness of the sublime literature as well as the richness of the phenomenon of the sublime itself, it is necessary to review and organise the literature of the sublime in a way most meaningful to the present empirical aims. In this context, the following literature review includes two key aspects that inform the main research question; (1) what triggers, settings, or other contextual factors bring about the sublime experience, (2) what emotions and cognitions are reported as key to a sublime events? Several major theories are condensed into Table 43. Note that many of these theories have already been discussed in the Introduction of the thesis.

Table 43. A wealth of explanations, but little consensus: overview of some key theories regarding factors in sublime experience (Study 10).

Author (period)	Noted stimuli/aspects	Noted emotions	Cognitive/insight component?
Longinus (1st century AD; Roberts, 1899)	<ul style="list-style-type: none"> <li>• elevated or lofty rhetoric, language (communication/communicator is elevated “above the ordinary” and becomes persuasive).</li> <li>• five sublime-evoking features: “great thoughts, strong emotions, certain figures of thought and speech, noble diction, and dignified word arrangement”</li> <li>• also topics of death, blood, rage, natural disasters</li> </ul>	<ul style="list-style-type: none"> <li>• veneration, marvelous, surprise, passion, ecstasy, joy, exultation.</li> <li>• BUT ALSO dismay, fear (“pathetic”/“inferior” type)</li> </ul>	<ul style="list-style-type: none"> <li>• “great thoughts” (included with five key features). Must strike vehemently upon the mind.”</li> <li>Includes “the faculty of grasping great conceptions”</li> <li>• emphasis on transcendence of reality through heroic communicator</li> </ul>
<b>Romanticism</b>			
Dennis, John (1693/1939)	<ul style="list-style-type: none"> <li>• Nature/natural forces: mountains (Alps), rivers, volcanoes. Vast, rugged, or great phenomena, uncommonness, beauty.</li> <li>• sense of infinity: objects “unbounded,” “unlimited,” “spacious”.</li> <li>• wasted areas or ruins (Cooper, Part III, Sec. 1, 390–91)</li> <li>• (Addison) especially visual stimuli: evoke greatness, uncommonness, and beauty. NOT from rhetoric. However NOT visual art.</li> </ul>	<ul style="list-style-type: none"> <li>• pleasure, harmony, appreciation, grandeur, awe, astonishment</li> <li>• BUT ALSO sense of overwhelming power, fear, terror, horror, despair, repulsion, smallness.</li> <li>• freedom</li> </ul>	<ul style="list-style-type: none"> <li>• suggested mismatch of schema: “horrors inconsistent with reason” (Dennis)</li> <li>• metacognitive reflection, transformation or schema change (Cooper).</li> </ul>

Author (period)	Noted stimuli/aspects	Noted emotions	Cognitive/insight component?
Baillie, John (1747/1967)	<ul style="list-style-type: none"> <li>• anything that “raises the mind to fits of greatness, “extends” one’s being, and “expands it to a kind of immensity”.</li> <li>• art, nature, literature, music (music of ‘grave’ sounds with long notes), science, BUT NOT involving smell, taste, touch (“contain nothing that is exhalted”).</li> <li>• involves vastness, uniformity, unfamiliarity</li> <li>• particularly outdoors/open spaces.</li> </ul>	<ul style="list-style-type: none"> <li>• exultation, pride, freedom, resonance (mind consumed by one uniform sensation)</li> </ul>	<ul style="list-style-type: none"> <li>• disposes mind to enlargement of itself and gives conception of mind's own powers.</li> </ul>
Burke, Edmund (1759/1958)	<ul style="list-style-type: none"> <li>• range of stimuli: literature, art, nature, literary characters (Death and Satan in Milton’s Paradise Lost) with dark, uncertain, and confused quality and with “some sort of approach toward infinity” (p. IV).</li> <li>• terror-inducing stimuli (but fictitious).</li> <li>• either intense light or darkness--can obliterate the sight of an object</li> <li>• NOT beautiful</li> </ul>	<ul style="list-style-type: none"> <li>• awe, pleasure</li> <li>• BUT ALSO horror, terror, negative pain, tightness</li> <li>• existential safety</li> </ul>	<ul style="list-style-type: none"> <li>• NO: Burke (p. 58), “the mind is so entirely filled with its object, that it cannot entertain any other.”</li> </ul>
Kant, Immanuel (1764/2011, 1790/1986)	<ul style="list-style-type: none"> <li>• “not contained in anything in nature” [although spurred by nature], only in “mind”</li> <li>• 3 types (two main)</li> <li>• (1) mathematical: considerations of infinity/ concepts expanding beyond scope of reason.</li> <li>• (2) dynamical sublime:</li> </ul>	<ul style="list-style-type: none"> <li>• splendor, greatness (mathematical)</li> <li>• overwhelmed, terror (dynamical).</li> <li>BUT ALSO detachment, perceived existential safety, fear without being afraid</li> </ul>	<ul style="list-style-type: none"> <li>• tied to human “reason,” or “presentation of an indeterminate concept” and “shows a faculty of the mind surpassing every standard of Sense,” but also able to appreciate importance (“one's</li> </ul>



Author (period)	Noted stimuli/aspects	Noted emotions	Cognitive/insight component?
Wordsworth, William (1770 - 1850)	<p>overwhelming nature, which one is unable to grasp the magnitude of.</p> <ul style="list-style-type: none"> <li>• (3) moral sublime, tied to attempt of rational mind/imagination to comprehend greatness, highlighting “noble”</li> <li>• not beauty: connected to form of object having "boundaries," and “is what pleases in the mere judgment. The sublime "is to be found in a formless object" and is what pleases immediately through its opposition to the interest of sense” (§ 23).</li> <li>• cases where mind attempts to “grasp at something towards which it can make approaches but which it is incapable of attaining,” leading mind to lose consciousness (self-awareness?), and yet allowing the spirit to grasp the sublime, if fleetingly.</li> </ul>	<ul style="list-style-type: none"> <li>• awe,</li> <li>• BUT ALSO fear/terror, relief/catharsis, potential enlightenment</li> </ul>	<p>ability to subsequently identify such an event as singular and whole”).</p> <ul style="list-style-type: none"> <li>• enlightenment</li> </ul>
Coleridge, Samuel Taylor (1772 - 1834)	<ul style="list-style-type: none"> <li>• sublime not contained in stimulus, but attributed to stimulus following induced contemplation of eternity.</li> </ul>	<ul style="list-style-type: none"> <li>• infinity</li> <li>• NOT terror/awe</li> </ul>	

**German Idealism**

Author (period)	Noted stimuli/aspects	Noted emotions	Cognitive/insight component?
Hegel, Georg Wilhelm Friedrich (1770 - 1831)	<ul style="list-style-type: none"> <li>• true sublime only with poetry (e.g., Old Testament Psalms). NOT visual scenes/art</li> <li>• stage in symbolic expression, significance and form disconnected, but not through mere fantastic enlargement.</li> <li>• stimuli which bring about recognition of the one absolute substance of god, through recognition of the nullity of objective fact, leading to a spiritual exultation.</li> <li>• NOT beauty</li> </ul>	<ul style="list-style-type: none"> <li>• exultation, wonder, serenity</li> <li>• EITHER positive/negative (grief or happiness)</li> <li>• NO confusion</li> <li>• self-awareness or reflection (like confession), self-respect.</li> </ul>	<ul style="list-style-type: none"> <li>• recognition of the one absolute substance of God through recognition of the nullity of objective fact.</li> <li>• self-awareness or reflection, new self respect</li> </ul>
Schiller, Friedrich (1793/1993, 1801/1993)	<ul style="list-style-type: none"> <li>• 2 main types:</li> <li>• (1) practical sublime: overcome bodily reaction to natural conditions/desires for self-preservation through will.</li> <li>• (2) theoretical sublime: maintain through Reason an independence from Nature, dealing with infinity or boundlessness, allowing transcendence and conceiving of more than perceived.</li> <li>• mechanism involving cases where an impulse to maintain circumstances/"self-preservation drive" comes up against its limits (through danger, loss of control), yet "cognition" drive to mark or change circumstances allow to</li> </ul>	<ul style="list-style-type: none"> <li>• joyfulness</li> <li>• BUT ALSO woefulness, shock, enrapture</li> <li>• practical sublime: pain (reminding of danger), desire to escape/resist, fear (if danger un-resistible).</li> <li>• theoretical sublime: impotence, powerlessness, aversion, melancholy, BUT NO fear/pain</li> </ul>	<ul style="list-style-type: none"> <li>• first drive is an impulse to mark or change circumstances, thereby "give expression to our existence," which always amounts to "gaining conceptions"</li> </ul>

Author (period)	Noted stimuli/aspects	Noted emotions	Cognitive/insight component?	
	<p>maintain control, and the rational nature to “experience its freedom from limits” allowing “inner perceptions of existence</p> <ul style="list-style-type: none"> <li>• nature and art (greater)</li> <li>• potentially requires presence of one's body.</li> </ul>			
Schopenhauer, Arthur (1819/1995)	<ul style="list-style-type: none"> <li>• range of stimuli from weakest (Light reflected off stones; endless still desert, no immediate threat but cannot support life) to turbulent nature, to fullest feeling from facing Immensity of Universe.</li> <li>• stimuli does not invite contemplation/observation, but overpowering or dangerous, could destroy observer.</li> <li>• also noted artistic contemplation, especially music (e.g., symphonies; mass) a means, albeit temporary, to escape the confines of one's will</li> </ul>	<ul style="list-style-type: none"> <li>• pleasure</li> <li>• BUT ALSO threat, danger</li> <li>• NO existential safety</li> </ul>	<ul style="list-style-type: none"> <li>• No. Does not invite contemplation</li> </ul>	
<b>Neo-Kantian</b>		<ul style="list-style-type: none"> <li>• alternative to Romantic sublime involving contemplation or immediate experience of the physical existence of objects themselves, bypassing reason, especially in mountains and ruins.</li> </ul>	<ul style="list-style-type: none"> <li>• contemplation</li> </ul>	<ul style="list-style-type: none"> <li>• bypassing reason, but involving contemplation of experience</li> </ul>

Author (period)	Noted stimuli/aspects	Noted emotions	Cognitive/insight component?
Dessoir, Max (Emery, 1973)	<ul style="list-style-type: none"> <li>• objects exhibiting superior might, thus prompting “tragic” realization of life’s unrealizable oppositions,” such as fate.</li> </ul>	<ul style="list-style-type: none"> <li>• self-forgetfulness, personal fear replaced by well-being, security</li> </ul>	
<b>Modern/Post Modern</b>			
Lyotard, Jean-François (1994)	<ul style="list-style-type: none"> <li>• urban landscape, skyscrapers, large cities, in addition to natural scenes</li> </ul>	<ul style="list-style-type: none"> <li>• socio-political sense of hopelessness, lack of control, alienation, “aporia” (impassable doubt)</li> </ul>	
<b>Contemporary cognitive/psychological focus</b>			
Tsang (1998)	<ul style="list-style-type: none"> <li>• no one common property of sublime objects.</li> <li>• involve limit situations, whereby one comes up against previously assumed thresholds in contemplation of natural order, self-preservation, capacity.</li> </ul>	<ul style="list-style-type: none"> <li>• NO DEFINING EMOTIONS</li> </ul>	<ul style="list-style-type: none"> <li>• encountering limits (schema/conceptions), leads to self-realization of the limit of existence.</li> </ul>
Kelter & Haidt (2003)	<ul style="list-style-type: none"> <li>• Cases combining (1) perception of vastness, great physical size, but also any stimuli that challenge one’s accustomed frame/schema of reference in many domains including “physical space, time, number, complexity of detail, ability, even volume of human experience,” and (2) need for accommodation</li> <li>• also from prominent (i.e., political) personalities</li> </ul>	<ul style="list-style-type: none"> <li>• awe (used interchangeably)</li> <li>• stimulus-focus/self-diminishment</li> <li>• rooted from social dominance in interpersonal relations</li> <li>• sense of belonging to larger groups, prosocial behavior</li> </ul>	<ul style="list-style-type: none"> <li>• challenge to conceptions, which leads to expansion and update of perceiver’s frame/schema.</li> </ul>

Author (period)	Noted stimuli/aspects	Noted emotions	Cognitive/insight component?
Konečni (2011)	powerful experience triggering stimuli (“sublime stimulus-in-context”), with the guarantee of “existential safety”	<ul style="list-style-type: none"> <li>thrills/chills, being moved, overwhelmed, "wow effect"</li> <li>(mixture of fear and joy)</li> <li>BUT ALSO</li> </ul>	existential safety
Kuiken, Campbell, & Sopčák (2012)	<ul style="list-style-type: none"> <li>literary works (empirical study)</li> <li>2 types:</li> <li>(1) sublime</li> </ul> <p>Disquietude: subjective feeling “inexpressible recognition/realization of no-longer-having” what one once almost had, and Inexpressible Realization (Celan’s Death Fugue, Owen’s Exposure, etc.)</p> <ul style="list-style-type: none"> <li>(2) sublime</li> </ul> <p>Enthrallment: “not-yet-having” what one might yet have (Shelley’s Mont Blanc, Coleridge’s Frost at Midnight, etc)</p>	<ul style="list-style-type: none"> <li>unpleasure, absence, “inexpressible” recognition/realization, BUT ALSO pleasure, "felt shift" toward self-perceptual depth, poignancy</li> <li>sublime</li> <li>Disquietude: loss, discord,</li> <li>sublime</li> <li>Enthrallment: discord, unattainability, Inexpressible Realization, Self-perceptual Depth, wonder/reverence</li> </ul>	
Skorin-Kapov (2016)	<ul style="list-style-type: none"> <li>no one common property of sublime objects.</li> <li>cases of break between expectations/sensibility and one’s powers of representation.</li> </ul>	<ul style="list-style-type: none"> <li>surprise, recuperation, admiration, responsibility, awe,</li> <li>BUT ALSO</li> <li>apprehension</li> </ul>	

Author (period)	Noted stimuli/aspects	Noted emotions	Cognitive/insight component?
Pelowski et al. (2017, 2017b)	<ul style="list-style-type: none"> <li>• Any stimulus, but three potential times when sublime feelings might be reported:</li> <li>• (1) interaction with a stimulus that is cognitively discrepant (in violation of expectations/schema), mixed with general lack of personal involvement or existential safety, allowing enjoyment, and aligning with literature tied to stimuli that evoke beauty, rarity, or physical grandeur but which expand past capacity for one to process or control the experience,</li> <li>• (2) circumstances have strong tie to self, but initially a stimulus and/or emotion matches schema to a degree that one experience harmony or resonance, yet so far as to overpower or overwhelm, leading to felt threat or loss of control.</li> <li>• (3) transformative outcome, whereby some cognitive or affective content is at first troubling and discrepant, but perhaps with a stronger tie to the self, forcing both discomfort and the individual to change their expectations or schema as in case one.</li> </ul>	<ul style="list-style-type: none"> <li>• type 1: pleasure, awe, cognitive reflection, changing one’s mind, insight, novelty, BUT NO discomfort, fear.</li> <li>• type 2: harmony, resonance, overpowering, threat, loss of control</li> <li>• type 3: pleasure, awe, cognitive reflection, changing one’s mind, insight, novelty, BUT ALSO discomfort, anger, catharsis, transformation.</li> </ul>	<ul style="list-style-type: none"> <li>• type 1 and 2</li> </ul>

### **7.1.1.1. What triggers or context?**

**7.1.1.1.1. Nature.** Natural scenes of overpowering scale—towering mountains, roaring rivers, expansive deserts or sunsets— have often been associated with the sublime. Dennis (in Nicolson, 1973, p. 59), for example, after crossing the Alps, documented a pleasurable experience yet “mingled with Horrors, and sometimes almost with despair.” Cooper (1709/2001) suggested a sense of grandeur or astonishment at the infinity of spaces and of his smallness against the universe. In the words of Burke (1759/1958), especially relevant are natural triggers that are powerful, rugged, terror-inducing, and obscure.

**7.1.1.1.2. Rhetoric/poetry.** Perhaps the earliest systemization of the sublime, by the Roman philologist Longinus (Roberts, 1899; see also Havel, 2006; Leitch, 2001), in the 1<sup>st</sup> century AD, started with the sublime in rhetoric or poetry. Communication could be elevated “above the ordinary,” becoming persuasive, transporting the perceiver and evoking veneration. Subsequent eighteenth century British thinkers as Alison, Shaftesbury, and Burke (1759/1958) also show support that poetry is a powerful trigger of sublime passions, via the triggering of imaginations.

**7.1.1.1.3. Visual arts, music, and architecture.** Addison (1773/1718) suggested that visual artworks, although able to evoke beauty, could not evoke greatness (as could nature), and thus could not be sublime. Burke (1759/1958, § IV) suggests likewise, saying he does not “know of any paintings, bad or good, that produce” strong passions. Schiller (1801/1993), on the other hand, sees art as an ideal trigger of the sublime, even more so than nature’s role. Related is Schopenhauer’s (1819) enthusiasm for music’s role in sourcing sublime emotions (symphonies and church mass). Elsewhere, music appears commonly in descriptions of the sublime in musicology (see Chapter 5 Introduction). Likewise, architecture – especially large churches – also appears as important sources of the sublime (see Introduction).

**7.1.1.1.4. People.** Alison (in Hipple, 1957), stressed that sublime feelings can arise from human figures. More than two centuries later, Keltner and Haidt’s (2003) model of sublime experiences is based on similar grounds, that the experience of power in awe originates from experiences with fellow human beings. Menninghaus et al. (2015) argued that notable human events (death, marriage) were in fact probably more powerful, and potentially more sublime, than nature. The 20th century avant-garde painter Barnett Newman also noted the viewpoint that others can trigger sublime emotions. When asked of how sublimity can be created in art, he aptly replied, “It’s no different, really, from meeting another person. One has a reaction to the person physically” (MoMA, 2006). In contrast, authors as Konečni (2011) argue against the notion that other people can evoke sublime experiences.

**7.1.1.1.5. Others.** Sublimity, however, has also been associated with eclectic types of objects. These include ruins (Simmel, 1958), scientific discoveries (Baillie, 1747/1967), gardening (Hirschfeld, 1779; Mortensen, 1998), urban/industrial landscapes (Tandt, 1998), loud sounds (thunder, cannons; Blair, 1783/1965), spiritual encounters (Hegel, 1920; Perlovsky, 2012), and drug use (e.g., Drake, 2018).

The wide range of triggers is reflected in empirical studies on sublimity and sublimity-like experiences. Most common are again representations of nature, either via photographs (Gordon, Stellar, Anderson, McNeil, Loew, & Keltner, 2017; Hur, Gerger, Leder, & McManus, 2018; Ishizu & Zeki, 2014) or short video clips (Piff, Dietze, Feinberg, Stancato, & Keltner, 2015). Visual artworks are also common—both abstract (Eskine, Kacinek, & Prinz, 2012; Seidel & Prinz, 2017) and figurative (Ortlieb, Fischer, & Carbon, 2016)—as well as sculpture (Era, Candidi, & Aglioti, 2015), architecture (Joye & Verpooten, 2013; Konečni, et al., 2007), prose/poetry (Kuiken, Campbell, & Sopčák, 2012), and music (Konečni et al., 2007; Zentner, Grandjean, & Scherer, 2008).

#### **7.1.1.2. What emotions or cognitive processes define sublime experiences?**

**7.1.1.2.1. Fear.** A point of contention involves the presence of fear, terror, or senses of danger (see Hur, Gerger, Leder, & McManus, 2018; Ishizu & Zeki, 2014). These were specifically argued for by several authors (Addison, 1773/1718; Burke, 1759/1958; Schopenhauer, 1819/1995) and were either suggested as a primary response, present throughout an encounter and perhaps mixed with pleasure or some other cognitive/affective component, or as an initial response which is then overcome or replaced by pleasure/security (e.g., Dessoir, see Emery, 1973; Table 1). Supporting this notion, Eskine et al. (2012), who used fear-inducing movie clip primes before viewing paintings, found that fear rather than simple arousal increased subjective sublimity ratings (see also Ortlieb et al., 2016 for a fear-based sublimity account). However, fear is downplayed by the likes of Kant (1790/1986) and Baillie (1747/1967), who focus more on the positive side of sublimity. Yet the relationship between fear and sublimity is a complex one, with some evidence supporting the independent existence of a fearful and a non-fearful type of sublimity (e.g. Gordon et al., 2016).

**7.1.1.2.2. Cognitive aspects: self-awareness and transformation.** While the affective elements of sublimity is often emphasised (Burke, 1759/1958), sublimity is also tied to the idea of learning, insight (Longinus), or novelty (Konečni, 2011). These terms also suggest a potential connection to cognitive processes of transformation. As suggested for aesthetic or everyday contexts (Pelowski & Akiba, 2011), these typically involve a process of matching schema to environment and finding the former somehow wanting, which in turn requires a revision or adjustment. This is mentioned, if only implicitly, by several authors (Dennis, 1693/1993; Kant, 1790/1986, Table 1), and explicitly by Keltner and Haidt (2003; see also Morley, 2010).



Sircello (1993) in fact suggested a thread of “epistemological transcendence” running through sublime accounts, whereby experiences embody a cognitive failure, leading to reconsidering limitations (see also Pelowski et al., 2017).

Others argue for the opposite—tying the sublime to situations whereby one loses themselves so completely in an experience that they have no reflective awareness (Brennan, 1987; Emery, 1973; Mortensen, 1998; Shiota et al., 2007)—aligning with a “flow”-like (e.g., Csikszentmihalyi, 1990) or harmonious/emotionally resonance (Pelowski et al., 2017) experience.

### **7.1.1.3. Are there different types of sublimity, or even does sublimity exist at all? It**

is also possible that there are several distinct sublime types. Such viewpoint has had its support from the early days, with Longinus, for instance, suggesting no less than five types of the sublime. While Kant’s (1790/1986) most famous delineation concerns the mathematical and dynamic sublime, his lesser known earlier encounter with the sublime divides the sublime into the three types of the ‘terrifying/awful’, ‘noble/lofty’, and ‘magnificent/splendid’ (1764). The list goes on.

In terms of empirical works, Gordon et al. (2016) considered individuals’s ability to report a threat-based sublimity (e.g. storm, Second World War) and positive sublimity (Aurora Borealis, cloud formations, etc.). The researchers did suggest the possibility of evoking the two varieties, however with participants tending to better recall a positive variety. Such an emotion-based division of sublimity was also suggested by Hur et al. (2018), where stimuli of ‘high-fear’ and ‘low-fear’ sublimity were consistently reported in their rating data.

On the other hand, there may not be any pattern to be found (Forsey, 2007; Sircello, 1993). When individuals are asked about sublime experiences, any distinct thread uniting and/or differentiating distinct sublime experience between individuals may not be found.

## **7.1.2. Current Study**

By asking participants to recall a sublime encounter and using a mix of quantitative, scale-based measures and qualitative descriptions, the current study aimed to provide first systematic answers to the following questions: (1) Do individuals report having had a sublime encounter in their lifetimes? Does this occur to everybody? (2) For those who reported having experienced at least one sublime episode, how did their most sublime encounter take place? What were the triggers? (3) What are the psychological associates of the most sublime encounter these individuals experienced? (4) Are there different sublimity types observed among these sublime experiences? These questions are answered on the basis of a large online survey.

## **7.2. Methodology**

### **7.2.1. Participants**

The study had a sample of 402 participants (325 female,  $M_{age} = 21.6$ ,  $SD = 5.9$ , 18 to 74 years), reduced from an initial set of 422 (20 participants were excluded based on not meeting minimum age requirements or other quality checks, see Results). Surveys were primarily distributed within the Faculty of Psychology, University College London, and at the Faculty of Psychology, University of Vienna, with most participants completing the survey for class credit. Surveys were also made available to respondents through colleagues of the authors at other universities in the US and Europe (See Table 44 for a breakdown of nationalities and other population demographics). All participants provided informed consent. The study was approved by the ethics committee of the University College London. The sample size was based on a planned collection period of six months, with all individuals responding during that period included, and with the final sample judged to be large enough for the goals of reliably estimating the incidence of sublime experience and the planned correlational and latent analyses (e.g., using procedures with small samples for the planned methods; Nylund, Asparouhov, & Muthén, 2007).

Table 44. Demographic and background information of study participants (Study 10).

factor	all participants (N = 402)	"Yes Sublime" (n = 240)
<b>sex</b>	Female = 324 ( 80.6%)	Female = 192 ( 80.0%)
<b>Age</b>	21.6 (SD = 5.9)	22.2 (SD = 6.6)
<b>Nationality</b>		
Austria	19.70%	20.00%
UK	19.40%	20.80%
Germany	17.40%	16.30%
China	10.90%	8.30%
USA	3.70%	5.80%
Singapore	3.50%	2.90%
Romania, Malaysia, India, Spain, France, Italy, Korea	3-1%	---
<b>highest level education</b>		
High school degree or lower	41.80%	35.40%
undergraduate degree	52.00%	56.30%
postgraduate	6.20%	8.30%
<b>studied art/art history</b>	No = 86.6%	No = 84.6%
<b>studied aesthetics/philosophy</b>	No = 73.6%	No = 70%
<b>familiar with/studied theories of sublime</b>	---	No = 89%

### 7.2.2. Procedure

The study was administered via the Qualtrics online survey platform (www.qualtrics.com). Participants were given a login address and password and asked to visit the survey site within a specified date range. Upon logging in, participants were presented with a set of study purposes, i.e. “investigating individual’s sublime experiences.” This was followed by a brief description of sublime, based on that in the Oxford English Dictionary but extended by the authors.<sup>49</sup> This was written to provide participants with some general idea of sublime, and observe if individuals had had such experiences. At the same time, this was carefully constructed so as to be extremely broad and to minimize prompting towards any specific types of responses or underlying contexts, and in fact to leave open the possibility that individuals may have never had sublime encounters (both were confirmed in the results below). The OED was meant to give a sense of a sober and objective sourcing and, importantly, to avoid any direct connection to the research team (thus avoiding issues with social influence). Participants were further told that the researchers were interested in both people who had experienced a sublime encounter as well as those who had not, and that the survey would be tailored to both groups with no time savings in either case. Finally, participants were informed that, if they had ever had a sublime experience, they were to recall the single most notable sublime encounter in their lives that is also not a combination or composite of different events. They were asked to complete the survey in one session (typically 30-45 minutes).

### 7.2.3. Materials: Survey Questions

Surveys were divided into multiple sub-sections, in the following order:

**7.2.3.1. Sublime experience incidence and description.** First, participants were asked whether they had experienced a sublime feeling. Those answering ‘no’ were directed to the “General sublime understanding” subsection, whereas those answering ‘yes’ responded to a number of questions about their experience. These included: (1) *Free description*—First, participants were given the opportunity to describe their encounter in their own words. This was done to collect anecdotal responses without any priming from the following scale-based questions. (2) *Location, media, and age*—Participants then described where they had

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<sup>49</sup> The working definition that was given to participants was as follows: “The Oxford English Dictionary defines sublime experience as those encounters that ‘produce an overwhelming sense of awe, vastness, grandeur, fear/terror, or other powerful emotion.’ They are often reported in encounters with nature (imaging standing on a vista looking at the Grand Canyon), manmade wonders or scenery, works of art, or other objects/experiences that are felt to ‘expand beyond us,’ overwhelm, or be bigger than, more powerful than, or beyond the comprehension of, ourselves. On the other hand, sublime reactions might also involve quite intimate settings, small things, and personal objects that deliver a similar experience. The nature of the sublime, and the reason for this feeling, it seems, may depend greatly on the person having the experience. Thus, the reason for this survey!” Note again, *this is not actually the OED definition*. It was devised by the authors to provide a broad and general idea of typical concepts of the sublime without prompting participants necessarily toward any particular description.

experienced the sublime (outdoors in nature, public space/city, etc.) and what type of stimulus (nature, art, music, etc.) using both provided lists and free answer. They were also asked at what age they had the experience and questions regarding any notable colors, smells, or sounds, whether they had experienced the stimulus before. (3) *Experience and time*—Participants also answered questions assessing factors related to time (e.g., length of the experience and the notable sublime portion; was the sublime experienced in one session or between repeat encounters; as well as how often they had similar reactions, whether they had ever made a special effort to try to revisit the stimulus, etc.). (4) *Stimulus meaning and evaluation*—We then asked participants to provide a short written answer to the question “What did the experience mean?” as a means of assessing their general understanding or contextualization of the event (see Pelowski, 2015). Participants also reported whether their reactions might have been intended and whether they thought that their own history, expectations, or mood might have been important.

(5) *Felt emotion or other experiential factors*—Participants then reported on their affective and cognitive experience using a list of 72 terms. The collection of terms was again based on the literature review and previous theoretical models on profound/aesthetic experience (see Pelowski et al., 2017). The terms were accompanied by 9-point scales (“While I was having my experience, I felt [term]”; 0 = “not at all” to 8 = “extremely”), allowing the assessment of both binary yes (‘0’)/no (‘≥1’) answers and relative magnitude. This method has proven to be a useful way of differentiating major emotional factors in aesthetic or media experiences (Pelowski, 2015).

**7.2.3.2. Background and personality.** Following the sublime encounter description, all participants (including those who had answered ‘no’ above) completed a set of standardized questions for background and other individual differences. This included questions assessing general education, previous training in aesthetics and the arts, current involvement in aesthetic-related occupations and general art or aesthetic interest and attitudes (following Pelowski et al., 2017; Leder, Gerger, Dressler, & Schabmann, 2012). Addition included were a number of personality constructs. However, due to space considerations, this aspect of the study was deemed beyond the scope of the present paper. Order of sections was standardized for all participants; ordering of individual questions was randomized.

As a means of ensuring attention given to answers, seven questions were repeated in different points of the survey (see below).

### 7.3. Results

All data were analyzed for quality and test-retest reliability. Participants were removed who showed significant differences in the repeated set of seven manipulation check questions (paired *t*-test at  $p < .05$ ). Participants with monotonous answering patterns were also eliminated (i.e.,

entire sections with the same number on the scales), or those who did not complete all survey portions. This led to the removal of seven individuals. However, the manipulation check and a general analysis of the written answer portions suggested that the remainder of individuals had taken the survey quite seriously. Twelve individuals whose age was below 18 (age for consent) were also omitted.

The demographics of the participant population, including the entire sample and only those who did report sublime experience, are reported in Table 44. Overall, the participants were largely novices in regards to having studied art or art history ('No' = 86.6%), philosophy/aesthetics ('No' = 73.6%), or other courses that might give a background knowledge of the sublime. Among even those who did report sublime experiences, 89% suggested that they had never studied or were otherwise exposed to sublime theories. There were no significant differences in regards to the above factors and those who did or did not report feeling sublime.

### **7.3.1. Incidence: Have People ever had Sublime Experiences: How Often?**

Beginning with the first main research question, overall, 59.7% ( $n = 240$ ) of participants reported having had at least one sublime experience, thus suggesting that such events are indeed at least relatively common among the participants. Among the individuals with sublime encounters, about one-third (32.5%) reported that their sublime feeling had only happened once in their lives. Whereas, 37.1% suggested that they had sublime experiences about once a year; 22.9% said once a month; only 5% said once a week and 2.5% reported experiences once a day.

### **7.3.2. Experience Descriptions: Triggers and Contexts**

The analysis next considered those individuals who had answered 'yes' to having sublime experiences. This involves first the discussion of the more qualitative descriptions of the experiences and discussion of triggers. These are briefly discussed below with full break-down of answers provided in Tables 2-6. Some examples of the participants's written answers to the various questions are also provided.

**7.3.2.1. Duration, participant age, and general conditions.** The mean age of participants at the time of their experiences was 19.2 ( $SD = 5.8$ ; Median/Mode = 18.5/18). The mean number of years in the past when the experience occurred was 3.0 ( $SD = 4.5$ ; Median/Mode = 1.5/1), again with a range of zero to 51 years. A significant positive correlation was found between participants's current age and the age at which they reported having the experience ( $r = .74$ ,  $p < .001$ , 95% CI = [.69 - .79]).

The total duration (Table 45) of the experiences, as perceived by the participants, showed a wide range—from a few seconds to multiple days. The mode and median were 30 and 25 minutes, respectively. The portion of the experience during which individuals had actually felt sublime, showed a mode and median of 10 minutes (generally, about 30-50% of the entire

experience). About half (55.4%) of respondents suggested that they immediately had a sublime feeling upon encountering the stimulus; those who reported that the sublime feeling took some time to develop reported a mean time required of 28 minutes. The majority (66.4%) suggested that their experience arose from their first meeting with the stimulus.

Table 45. Sublime experience and time duration (Study 10).

<b>How long did the Sublime portion of your experience last? (minutes)<sup>a</sup></b>	
Mean (SD)	109.2 (631.0)
Median/Mode	10/10
Min-Max	.01 - 7200
<b>How long did the entire experience last? (minutes)<sup>a</sup></b>	
Mean (SD)	240.4 (1542.0)
Median/Mode	25/30
Min - Max	.08 - 20160
<b>Did you immediately have a sublime feeling after encountering the object/stimulus?</b>	
I immediately felt sublime	55.4% (n = 124)
It took some time to develop	33% (74)
I don't know	11.6% (26)
<b>If it took time, how long did the Sublime feeling take to develop? (minutes)<sup>a</sup></b>	
Mean (SD)	28.0 (43.7)
Median/Mode	10/5
Min - Max	.5 - 200
<b>Did your experience involve only one encounter, or did you leave and come back?</b>	
It ended as a single encounter	62.1% (149)
I left and came back at least once within that day/session	8.8% (21)
I became fascinated with the object/setting for an extended period longer than one session	29.2% (70)
<b>Have you ever made a special trip or gone out of your way to revisit the stimulus?</b>	
No	67.5% (
Yes	32.5
	(78)

*Note.* <sup>a</sup> If respondent provided time range, the midpoint was used in scoring. “A couple” coded as ‘2’ minutes; “a few” coded as ‘3’ minutes.

**7.3.2.2. What Triggers evoked the sublime?** The specific triggers for the experiences are listed in Table 46. These are divided into main categories based on classifications from two independent raters. Looking to the table, it can immediately be seen that a range of trigger types spanning most of the possibilities in the literature review is found.

The majority (50.8%) of cases involved nature, led by interactions with landscapes—such as viewing from the top of a mountain—which composed about 40% of this group. This was followed by seascapes and sky (e.g., cloud formations), and with a small number of individuals mentioning animals—herd of wild horses; swimming with a pod of orcas. The

second most noted trigger type (14.6%) was experiences with other persons—both intense one-to-one conversations and being in a crowd, such as at a festival. This was followed by human-made environments (12.9%) such as cityscapes or involving individual buildings. On the other hand, art, design, or other visual media only represented 5.8% of cases. Lower incidence was also found for music (8.3%) and other media (theater, books, poetry). One person mentioned sports (scoring a goal), while several mentioned drug experiences. In keeping with the above connection to natural or landscape/cityscape stimuli, the majority (53.8%) noted that the encounter occurred outdoors. Also of note, although most triggers, across the types, tended to match conceptions of powerful or overwhelming encounters—rushing water, great views, speakers, losing oneself in a crowd—there were also multiple examples suggesting infinity—fireflies in the forest; contemplating the stars/universe—and triggers suggesting very intimate aspects—tiny shrimp swimming in a pool; a quiet dinner for two; walking in the rain and watching the lamplight reflected off the cobblestones of Paris.

Table 46. Sublime experience specific triggering object/events (Study 10).

<b>Nature (50.8%)</b>	<ul style="list-style-type: none"> <li>• <b>landscape (42.5%):</b> mountains as landscape (9); Fjords (5); view from mountain peak (4); volcano (3); gorge/canyon (3); desert (2); Kings-Canyon Australia; camping trip; Ayers rock; high view of rocks and woods; paragliding-lifting from ground; high Alpine road; View of hills of Tuscany, Italy; driving through Aceh, Indonesia; watching earthquake and landslide (Langtang, Nepal); plain of stones and barbed wire; Grand canyon; mountains with red/gold trees-Kyoto, Japan; Forrest, Hawaii; Horton Plains Natural Park; Sun reflected on glaciers; Horseshoe bend, Arizona; Nant Ffrancon Valley, Wales; leaves falling from trees; river-mountain-pink cloud-cottages (Rheine, Germany); trees-Hyde Park; Scottish Highlands; vast Danube landscape</li> <li>• <b>sea/water (25%):</b> waterfall (3); sea and cliffs (3); river (2); mountain lake (Traunsee); Loch Ness; Staffelsee at sunrise; hundreds of islands in sea-Halong Bay, Vietnam; Norwegian cruise; breathing salt air; sea and 100 orcas (Kaikoura, New Zealand); expanse of sea when driving (Koh Chang, Thailand); Malta coast, sudden feeling of universe; sea kayaking; diving with coral (Red Sea, Jordan); on Catamaran in Atlantic (Newfoundland); Black Sea (Batumi, Georgia); Azenhas Do Mar (Sintra, Portugal); Philippines sea; Seven Sisters Cliff (Sussex); swimming close to shark; sunset in complete silence on boat; waves</li> <li>• <b>sky (22.5%):</b> sunset (4); sunrise (4); clear starry sky (3); skydiving (2); laying in Navajo desert watching night sky; watching sky from train; rays of light through dense clouds; Falling snow in Alps; lightning strike; stary sky (with marijuana); Mountains and sky melting into one; Northern lights; talking philosophy and looking at sky on mushrooms; Sitting on bench looking at trees and sky; sky from mountain; flying</li> <li>• <b>other (10%):</b> herd of wild horses (Montana); Wisteria; memories from childhood, forest in autumn; Fireflies in woods; insects in mountains; Insects and spiders; orcas; deer in forest; monotony while hiking in barren environment at end of stay abroad; turtle and night sky (Pacuare, Costa Rica); tiny shrimp swimming around hand in rock pool; thinking of universe</li> </ul>
<b>Person (14.6%)</b>	<p>conversation (3); talking to mother (3); being in crowd (2); with partner in home (2); watching fight (2); talking to mentor; grandfather at cemetery; niece crawling; looking in mirror with partner; watching sons; niece surgery; passionate embrace; people praying around me; sad phone call; performing play; listening to poem, singer (2), university lecture; sex; Love; ballroom; Leeds festival; woman saving an elderly woman's self-respect</p>
<b>Human-made environment (12.9%)</b>	<p>New York (3); Empire state building (2); London skyline (2); city buildings (2); church (2); Buddhist temple (2); Taj Mahal; St Paul's Cathedral; Parliament of Vienna from tram; Edinburgh castle; Forbidden City, China; Paris lamplight and rain glistening off pavement; buildings from bus; park and huge castle; Chongqin, Hongyadong; pagodas (Bagan, Myanmar); Vienna Hofburg castle; Machu Pichu ruins; Chichen Itza (Mexico); top of St. Stephen's cathedral; La Sagrada Familia; view of civilization from plane; small closed radio studio; door</p>
<b>Visual art (5.8%)</b>	<ul style="list-style-type: none"> <li>• <b>painting, drawing (78.6%):</b> painting in museum (3); Jesus drawing in museum; art object in Japan; Summertime 1948 by Jackson Pollock; paintings by Van Gogh; painting by Dali in Spain; Un Mundo by Angeles Santos; making paintings in bedroom; artworks in church with candles</li> <li>• <b>sculpture, installation (21.4%):</b> David by Michelangelo; installation by Pierre Hyghe at Documenta 13; Terracotta soldiers</li> </ul>

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<b>Music</b> <b>(8.3%)</b>	<ul style="list-style-type: none"> <li>• <b>personal listening (60%):</b> listening to music in bedroom (4); Cantonese pop song by An Yong; listening to song while walking on empty street; Song reminding of childhood/fairytales; Driving while listening to Panama's Always; Music on TV; listening to music sitting under tree in park; This will destroy you- the Mighty Rio Grande</li> <li>• <b>public listening (40%):</b> church choir (3); outdoor concert (2); Outdoor music festival-Burning Spear (Reggae) and LSD; Maestranza Theatre, Seville-Daniel Barenboim concert; Palace of Auburn Hills-Demi Lovato; dancing in gym; concert hall</li> </ul>
<b>Other media</b> <b>(5.4%)</b>	Poem (2); Poem-The waste land, T.S. Eliot; Book-Elegance of the hedgehog; Book-Under the volcano, Malcolm Lowry; Book-No trifling with Love by Alfred de Musset; Movie-Dracula, thinking of person crawling on wall; Youtube video; ballet at amphitheater-Plovdiv, Bulgaria; Play at London Theatre-the Tempest, Shakespeare; play-dark setting; Play (reading)-Ionesco's Exit the King
<b>Other</b> <b>(2.1%)</b>	Drug experience (2)—on LSD; alcohol and marijuana; Performing own music; Scoring a goal in a tournament; bloody sheets being washed and the bloody water gushing from everywhere in a warzone.

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**7.3.2.3. Notable aspects of triggers, experience meaning.** Answers to supporting questions about the triggers and the experience are reported in Table 47. When asked whether there were any aspects of the trigger that participants were particularly drawn to, 55.0% answered 'yes'. However, there did not appear to be a general pattern or division to responses. Rather, people tended to either reiterate the elements mentioned in the trigger type—“*the distant end of the fjord*”—or to specify details—“*brushstrokes; detail of the artists hand*”; “*All the city lights.*” On the other hand, when asked if anything about the setting played an important role, 65.0% said 'yes'. The subsequent explanations (broken down into main categories in Table 4) once again tended to provide a range of responses hitting many of the arguments in the literature review, albeit with no clear consensus.

The most common answer (29.5%) highlighted the unique or (positively-valenced) amazing nature of the settings—“*a desert-an unusual setting*”; “*I suppose standing at the top of the first castle I have ever been in added to the feel*”. Several (7.1%) also mentioned a generally positive feeling towards the setting—“*it was a beautiful country and very emotional*”; “*The whole room had an unbelievable good mood.*” Several reports (7.1%) also addressed the aspect of existential safety or being in controlled or safe environments—“*Classroom meant a fairly controlled setting*”; “*I felt comfortable to give in to my emotions.*” At the same time, several others (5.8%) mentioned the importance of being in unfamiliar or unsafe surroundings—“*A city I didn't know too well - the feeling of being somewhere unknown*”; “*Nowhere near anything that felt safe.*” Similarly, a lack of agreement regarding involvement of social aspects or other people was found: 14.1% suggested the importance of being alone or in very intimate settings— “*In the middle of desert without any other human except our group of people*”; “*The fact that it was underwater and I was unable to exchange my awe or wonder with anyone else*”; 3.8% also mentioned silence. Whereas, 9.6% noted the importance of being in a social situation.

To consider whether there might be an underlying pattern relating the setting categories and the trigger classes, a Chi-square comparison was conducted. This did show significance ( $X^2(55, N = 152) = 89.93, p = .002$ ; 'other' trigger category and 'no notable aspect' answers omitted). However, this generally suggested that nature-related triggers tended to lead to higher



rates of noting the uniqueness or amazingness of the setting and of being alone. Aspects such as being safe and/or threatened or with/without people showed no differences in their distribution; all aspect categories also emerged in at least some cases for each type of trigger.

Table 47. More about triggers: Sublime experience notable aspects, progression, and meaning (Study 10).

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<b>Were there any aspect of the stimulus that you were particularly drawn to?</b>	
No	45% (108)
Yes (note, generally reiterated trigger details)	55% (132)
<b>Did anything about your setting play an important role?</b>	
No	35% (84)
Yes	65% (156)
• unique/amazing place (29.5%, n = 46)	
• alone/intimate (14.1%, 22)	
• social (9.6%, 15)	
• positive prior rating or feeling of setting (7.1%, 11)	
• controlled/safe environment (7.1%, 11)	
• unfamiliar surroundings (5.8%, 9)	
• silence (3.8%, 6)	
• freedom (2.6%, 4)	
• juxtaposition of elements (3.2%, 5)	
• basic description of trigger (10.9%, 17)	
• other: music (3); heat/brightness (3); drugs (1); incense (1)	
<b>Would you describe your experience as largely harmonious and/or notable for a feeling of ease, or as largely dissonant/difficult?</b>	
harmonious/feeling of ease	84.2% (202)
dissonant/difficult	15.8% (38)
<b>What do you think the experience meant?</b>	
cognitive explanation, insight, personal growth/change	42.5%
appreciation of feeling/experience	35.0%
don't know/no meaning	19.6%
spiritual, religious	2.9%

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This generally wide-range of triggering characteristics, and thus lack of one specific sublime-inducing pattern, could also be found in the explanation of the meaning or significance of the experiences (Table 4). Meaning types (again coded by two independent scorers) tended to involve either answers focusing on cognitive explanations, often involving insight, learning, or change in conceptions (42.5%), or involving a general appreciation of the emotions or feelings engendered (35.0%). About twenty percent of people also explicitly stated that the experience had no meaning or that they could not understand its significance; a small but notable 2.9% explicitly mentioned a spiritual or religious significance. A Chi-square comparison of *Meaning* x *Trigger Classes* was not significant ( $X^2(10, N = 228) = 14.84, p = .138$ , 'other' trigger category answers omitted). When participants were asked if the experience was largely

harmonious and notable for a feeling of ease or largely dissonant and difficult, they predominantly chose the former (84.2%).

**7.3.2.4. Other sense modalities.** Although almost all descriptions noted a primary visual component (excluding those mentioning music), when asked about other sense modalities (Table 5), most participants (53.6%) did suggest that sound played a role. Among these individuals, the most often noted sounds were from nature (45.4%)—rushing water, wind; a few mentions of animals. This was followed by background music (25.5%), voices or people talking (14.5%), and then a few mentions of traffic or even one’s own pulse or breathing. One constant appeared to be a rather backgrounded and monotonous quality to the sounds—hums, psithurism, choirs. Interestingly, although participants were asked specifically about sounds, 12.7% specifically noted silence or the overwhelming absence of sound.

Only 24.8% of individuals noted a smell as an important aspect. The majority of answers (71.7%) again involved nature—fresh air, water, dirt, plants. Among non-nature smells, participants mentioned aspects of rooms, cleaning products; incense or burning candles (see also Table 48 for notable colors and relative darkness/brightness, again with general lack of any consensus in results).

Table 48. Sublime experience notable smells, sounds, colors (Study 10).

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<b>Notable sound?</b>	
No	46.4% (111)
Yes	53.6% (128)
• <b>Nature (45.5%, n = 50):</b> water (25); wind (16); animals (8); thunder (1)	
• <b>music (25.5%, 28)</b>	
• <b>people/voices (14.5%, 16)</b>	
• <b>silence (12.7%, 14)</b>	
• <b>other:</b> traffic (4); self (4); other (10)	
 <b>Notable smell?</b>	
No	75.4% (181)
Yes	24.6% (59)
• <b>Nature (71.7%, 43):</b> fresh air (20); water/sea (13); dirt (5); forest/plants (5)	
• <b>candles/incense (8.3%, 5)</b>	
• <b>other:</b> person (2), paint, cleaning products, book, carpet, medicine, perfume, stale, musk, airplane, sweetness.	
 <b>What notable color did the object/setting have?</b>	
• <b>cool (30.8%):</b> green (20); blue (34); purple (2); blue-green (18)	
• <b>warm (16.3%):</b> red (7); orange (4); yellow/gold (17); red-yellow-orange (11)	
• <b>white (10.4%) (25)</b>	

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- 
- **black (5.8%)** (14)
  - **grey/silver (4.6%)** (11)
  - **brown (1.7%)** (4)
  - **multiple (30.4%)** (warm+cool): 73

**Was the experience dark or bright?**

Very dark (0-3)	17.5% (42)
Mid (4-6)	31.3% (75)
Very bright (7-10)	51.3% (123)

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**7.3.2.5. Importance of prior thoughts, feelings, tie to self.** Finally, in describing whether the participants thought anything about their own background or personality played a role in the creating the experience (Table 49), a range of answers were given. The majority (57.9%) did agree. However, most mentioned basic aspects of their own proximity to the triggers—“*growing up on the beach*”; “*Buddhist upbringing*”—or general personality aspects—“*easily excited*”; “*very emotional person.*” Few (less than 10% of those reporting ‘yes’ answers above) mentioned a specific relationship with, interest in, or attitude about the triggers that would suggest a stronger tie to the self—e.g., “*desire to prove my worth (on the hike).*” Once again, nearly two-thirds of participants stated that the experience was itself *not* unique to them and probably commonly had by others. Over half (59.6%) of the participants also noted that they had not previously been doing or thinking anything particularly important that might have led to the experience. Among those who did answer ‘yes,’ most again suggested only actions related to the activity—such as hiking or being on vacation (thus, these were not quantified further).

Participants were also split between those who had been feeling specific moods or emotions before their encounter that they thought contributed to the sublime experience (49.6%) and those who had not (50.4%). Among those who answered ‘yes’ to notable prior moods/emotions, once again, a rather even spread among generally positive (28.3%: happy, joy, free, comfort/safety, love/affection, etc.) and negative emotions (37.2%: anxiety, fear, lonely, sad) were fiybd, or, for the remainder, between emotions suggesting generally high (15%: attention, excitement, anticipation) or low arousal (16.8%: physical exhaustion, calm).

Table 49. Sublime experience and importance of personal background, expectations, prior thoughts and feelings (Study 10).

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<b>Did anything about your own history or personality have something to do with your reaction?</b>	
No	42.1% (101)
Yes	57.9% (139)
<b>Had you been THINKING or DOING anything before your encounter that you think played a role in your sublime experience?</b>	
No	59.6% (143)
Yes (typically acts related to setting)	40.4% (97)
<b>Had you been FEELING anything (such as a particular emotion) before your encounter that you think played a role in your sublime experience?</b>	
No	50.4% (121)
Yes	49.6% (119)
<ul style="list-style-type: none"> <li>• <b>Positive (28.3%):</b> happy/joy (7); free (5); curiosity (4); comfort/safety (3); luck (3); love/affection (3); sympathy; lust; open; relief; reverent; strong; proud; satisfaction; gratitude; confident.</li> <li>• <b>Negative (37.2%):</b> anxiety/nervous (11); fear (7); loneliness (6); sad (5); Depressed (2); stressed (2); emptiness; social discomfort; bored; disappointed; melancholy; grief; turmoil; lost; confusion.</li> <li>• <b>High arousal (15.0%):</b> attention/excitement/anticipation (17).</li> <li>• <b>Low arousal (16.8%):</b> physical exertion/exhaustion (7); calm/relaxed (8); self reflection/rumination (4).</li> </ul>	
<b>Was your experience with that object/setting unique or commonly had by others?</b>	
It was personally unique	37.1% (89)
It is a common reaction	62.9% (151)
<b>If the object/setting was human made, do you think it was intended to create such a response?</b>	
No, response was not intended	22.9% (55)
Yes, my response was intended by the designer	22.1% (53)
Experience not based on man-made objects/settings	55% (132)

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### 7.3.3. Reported Emotions

We then turned to the list of emotions and the question of the subjective feeling or notable affective/cognitive aspects of the experiences. Descriptive statistics for all emotion scales are provided in Table 50. The 30 highest scoring emotions, with means and boxplots, as well as other notable emotion terms, based on the literature review, are shown in Figure 56.

Following the above qualitative findings, the highest scoring emotions, after a “sense of the sublime” itself, were again a collection of largely positive responses—a sense of beauty,

absorption or fascination, happiness, joy, tranquility, catharsis, contentment, etc. These were accompanied by terms dealing with a sense of power and grandeur—awe, overwhelmed, being moved, sense of powerful force, amazement/wonder—as well as more cognitive terms such as insight, novelty, enlightenment, and mindfulness—and also by self-awareness. On the other hand, generally negative terms (e.g., anger, shame, offended, disgust) tended to have the lowest magnitudes across most participants. Notably, this was also true for fear, anxiety, stress, and confusion. Over half of participants claimed that they did not feel fear at all. Whereas, over 90% mentioned awe, being moved, amazement, thrills; and 83-85% of all respondents mentioned some novelty, insight, or transformation.

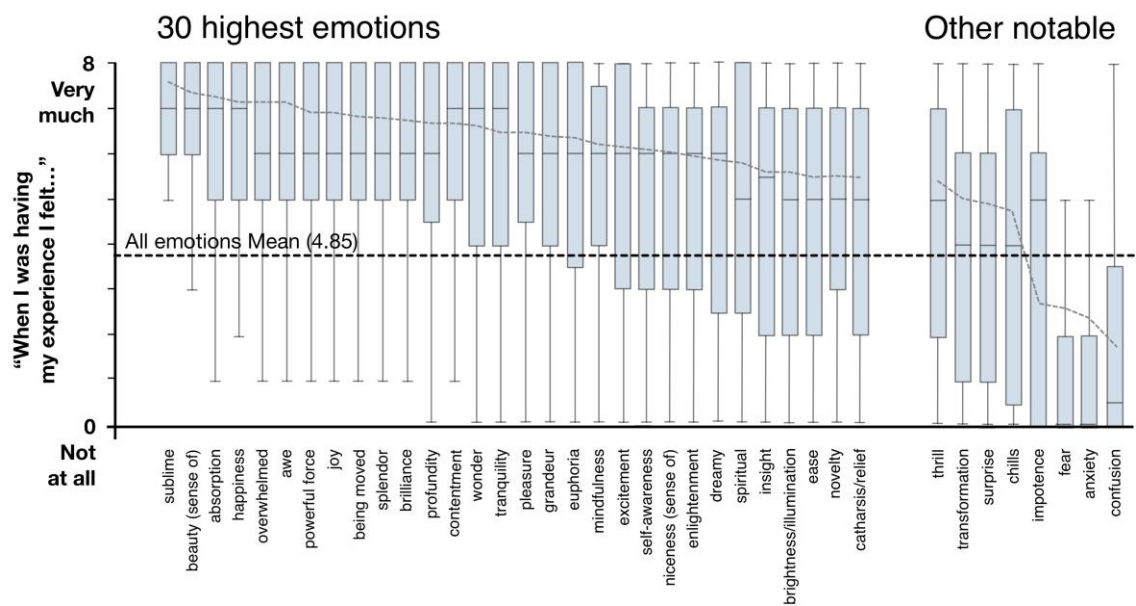


Figure 56. Boxplots of Most Noted Emotions in Reports of Sublime Experiences, as well as Other Theoretically Key Terms (Study 10).

Table 50. Emotion items with centrality metrics (with factor structure) (Study 10).

Item	Mean (SD)	Community	Hybrid Centrality
<b>Sense of Beauty</b>	<b>7.36 (2.45)</b>	<b>1</b>	<b>.94</b>
<b>Sense of the Sublime</b>	<b>7.58 (1.89)</b>	<b>1</b>	<b>.89</b>
<b>Feeling of Sensuality</b>	<b>4.75 (2.89)</b>	<b>1</b>	<b>.87</b>
<b>Amusement</b>	<b>4.79 (2.76)</b>	<b>1</b>	<b>.87</b>
<b>Feeling of Mindfulness</b>	<b>6.22 (2.62)</b>	<b>1</b>	<b>.83</b>
Sense of Prettiness	5.41 (2.91)	1	.77
Grandeur	6.45 (2.67)	1	.77
Joy	6.93 (2.54)	1	.74
Sense of Niceness	6.09 (2.62)	1	.74
Happiness	7.18 (2.47)	1	.68
At Ease	5.65 (2.75)	1	.62
Amazement/Wonder	6.63 (2.65)	1	.60
Vigor	5.41 (2.71)	1	.58
Splendor	6.83 (2.55)	1	.56
Awe	7.15 (2.59)	1	.54
Intense Absorption/Fascination	7.35 (2.26)	1	.54
Pride	4.58 (2.88)	1	.48
Softness	4.92 (2.78)	1	.46

Novelty	5.62 (2.65)	1	.45
Tranquility	6.52 (2.73)	1	.44
Excitement	6.20 (2.64)	1	.43
Contentment	6.73 (2.58)	1	.43
Smoothness	5.42 (2.74)	1	.27
Brilliance	6.80 (2.53)	1	.25
Pleasure	6.51 (2.54)	1	.23
Feeling of Thrill	5.45 (2.89)	1	.21
Feeling of Being Moved	6.85 (2.45)	1	.19
Euphoria	6.42 (2.74)	1	.06
<b>Feeling of Profundity</b>	<b>6.75 (2.45)</b>	<b>2</b>	<b>.91</b>
<b>Slow Dawning of Realization</b>	<b>4.87 (2.90)</b>	<b>2</b>	<b>.90</b>
Sudden Insight/Like Turning on a Light	5.26 (2.87)	2	.90
Enlightenment	6.00 (2.82)	2	.77
Sense of Catharsis/Relief	5.58 (2.88)	2	.58
Feeling of Transformation	5.04 (2.74)	2	.51
Epiphany	4.79 (2.82)	2	.48
Spiritual	5.81 (2.88)	2	.33
Need to Examine My Motives	3.57 (2.67)	2	.31
Insight	5.81 (2.79)	2	.25
Feeling of Changing My Mind	4.22 (2.78)	2	.19
Nostalgia	4.09 (2.93)	2	.16
Dreamy	5.89 (2.88)	2	.13
Sense of Light, Brightness, or Illumination	5.67 (2.90)	2	.11
<b>Surprise</b>	<b>4.94 (2.71)</b>	<b>3</b>	<b>.83</b>
<b>Powerful Force</b>	<b>6.97 (2.36)</b>	<b>3</b>	<b>.65</b>
Bemused	2.89 (2.32)	3	.61
Tension	4.15 (2.89)	3	.58
Confusion	2.75 (2.37)	3	.49
Need to Leave/Escape	2.35 (2.48)	3	.43
Overwhelmed	7.15 (2.25)	3	.39
Stress	2.26 (2.18)	3	.32
Shock	3.27 (2.70)	3	.28
Anxiety	2.55 (2.40)	3	.14
Chills	4.76 (3.00)	3	.11
Fear	2.65 (2.50)	3	.06
<b>Anger</b>	<b>1.63 (1.67)</b>	<b>4</b>	<b>.86</b>
<b>Offended</b>	<b>1.45 (1.41)</b>	<b>4</b>	<b>.85</b>
Guilt	1.58 (1.33)	4	.67
Grief	2.12 (2.05)	4	.64
Disgust	1.44 (1.51)	4	.53
Like Crying	4.54 (3.08)	4	.52
Emptiness	2.87 (2.46)	4	.49
Sadness	2.80 (2.56)	4	.34
Personal Impotence	3.66 (2.78)	4	.33
Sense of Being Watched	2.35 (2.28)	4	.31
Shame	1.54 (1.51)	4	.21
Embarrassment	1.79 (1.48)	4	.10
<b>Self-Awareness</b>	<b>6.13 (2.46)</b>	<b>5</b>	<b>.96</b>
Loss of Awareness of my surroundings	4.35 (2.92)	5	.73 <sup>a</sup>
Awareness of My Body/Actions	5.39 (2.72)	5	.27
<b>Like Laughing</b>	<b>3.68 (2.72)</b>	<b>6</b>	<b>.78</b>
Needing to Clap or Yell	3.48 (2.88)	6	.71

*Note.* Bold items designate core items for use in latent class analysis. Centrality scores are absolute values; they do not imply directionality of correlation. <sup>a</sup> Negative partial correlation to other items in the community.

#### **7.3.4. Network analysis of emotion and varieties of sublime experiences**

In order to reduce the number of emotion terms and, more importantly, to assess their underlying relationships and whether or not one or more varieties of experience could be detected, a network model was followed by latent class analysis.

**7.3.3.1. Network construction.** The *Triangulated Maximally Filtered Graph* (TMFG; see Massara, Di Matteo, & Aste, 2016) was used to construct the networks. The TMFG algorithm begins by connecting the four terms that have the highest sum of zero-order correlations with all other terms. Then, the algorithm connects the next term with the largest sum of zero-order correlations to three nodes already included in the network. The algorithm continues adding new terms until all terms have been added to the network. Thus, the TMFG builds the network so that “like” terms are constantly being connected to one another. The TMFG has been an effective method for producing stable network measures (Christensen, Kenett, Aste, Silvia, & Kwapil, 2018) and for identifying the dimensional structure of constructs (Christensen, Cotter, & Silvia, 2018). The TMFG method was applied via the *NetworkToolbox* package (Christensen, 2018) in *R* (R Core Team, 2018).

**7.3.3.2. Community identification (Bootstrap Exploratory Graph Analysis) and core items.** To evaluate the dimensions of the emotion terms, the *Bootstrap Exploratory Graph Analysis* (bootEGA; Christensen & Golino, 2019) was applied using the *EGAnet* package (Golino & Christensen, 2019) in *R*. This method builds on a recently developed network dimension reduction approach called *Exploratory Graph Analysis* (EGA; Golino & Demetriou, 2017; Golino & Epskamp, 2017). EGA first uses a network construction method (e.g., TMFG) to create a network model. Then, a community detection algorithm is applied, which identifies the “communities” or dimensions in the network (Golino & Epskamp, 2017). In EGA, the walktrap community detection algorithm (Pons & Latapy, 2006) is applied via the *igraph* package (Csardi & Nepusz, 2006) in *R*. The walktrap algorithm uses “random walks” or a certain number of random “steps” from one node to another node. Through these steps, community boundaries are formed. The item content and number of communities are deterministic without any direction or specification from the researcher. In addition, a series of simulation studies has demonstrated that EGA is as accurate or more accurate than more traditional methods of dimension reduction (Golino & Demetriou, 2017; Golino & Epskamp, 2017; Golino et al., 2018).

bootEGA further applies bootstrap with replacement (Efron, 1979), conducting EGA on each bootstrapped sample. The bootstrap EGA networks form a sampling distribution of networks, which allows the researcher to examine the stability of their network’s dimensions but also provides a median (i.e., the median value of each correlation between the terms in the

network) network structure, which offers a more generalizable final network structure (see Christensen & Golino, 2019). Notably, EGA and bootEGA are exploratory; however, confirmatory techniques can be applied to estimate how well the data fits this structure (e.g., Kan, van der Maas, & Levine, 2019).

To identify core emotion items representing each community, the hybrid centrality measure was applied (Pozzi, Di Matteo, & Aste, 2013), which quantifies the overall “centralness” of each terms in the network based on their connections and relative location to other terms. Thus, terms that tend to have many connections within their own community but also between communities or are most central in the network can be interpreted as representing the terms that best reflect each latent dimension and the overall network. The top 20% of hybrid centrality values in each community were designated as core terms (Christensen, Kenett, et al., 2018). These then can be used in the following class analysis to assess how individual participants tend to show patterns of answers across the core terms and thus their represented emotion communities.

**7.3.3.3. Results: network model and communities.** The final network is shown in Figure 57. The connections between terms (red or green lines) indicate a zero-order correlation surviving the TMFG algorithm. Red lines indicate negative relations, and green lines indicate positive. Thickness of lines indicates the strength of correlations. Relative distance between items also suggests the strength of their connection as a function of the entire network (i.e., items far apart would have a low correlation). The relative closeness of one term to all other terms thus also signifies its relative predictive power in positing specific answers to the other emotions within the network.

The network identified six emotion communities and 13 core items (see Table 50 for full list). These included: (1) a community of 28 items that represented generally positive emotions and appraisals with five core items including “a sense of beauty,” “sensuality,” “amusement,” “mindfulness,” as well as “sublime”. This community also included other (non-core) items such as awe, wonder, and tranquility; (2) 14 items that represented insight or transformative terms—enlightenment, transformation, epiphany, etc.—with the core items of “profundity” and “a sense of realization”; (3) 12 items that described a sense of discrepancy or tension—confusion, tension, stress, shock, anxiety—with core items of “surprise” and “powerful force”. This community also included the (non-core) term fear, however with this term having the lowest hybrid centrality score suggesting a low connectivity to this or to any other community (see Table 50); (4) 12 items represented more classically negative emotions—guilt, disgust, sadness, etc.—with core items of “anger” and “offended”; (5) three items denoted by the core item of “self-awareness” as well as awareness of one’s body; and finally (6) two items which described general felt arousal, with a core item of “feeling like laughing,” accompanied by the non-core term needing to clap or yell. This class might also be related to the



unique feeling of needing to respond bodily to an overwhelming stimulus while also feeling a need to remain reserved or to control one's reactions (e.g., see Goffman, 1974 for a discussion in social situations; see also Pelowski & Akiba, 2011).

### 7.3.5. Varieties of Sublime Experience? Latent Class Estimation.

The 13 core emotion items were then tested in one-, two-, three-, and four-class solutions (see Swanson, Lindenberg, Bauer, & Crosby, 2012; Silvia, Kaufman, & Pretz, 2009). To compare results, specific fit indices (i.e. Akaike's information criterion, AIC, and the adjusted Bayesian information criterion, BIC; following Swanson, Lindenberg, Bauer, & Crosby, 2012) are emphasised as well as inferential tests that are more robust in smaller samples (bootstrapped likelihood ratio test; Nylund, Asparouhov, & Muthén, 2007). Also calculated was entropy, an index of classification quality. Fit indices for models can be found in Table 51. Two-, three-, and four-class solutions were all found to be better than a single class. The initial use of fit indices favored the four-class solution. However, further investigation revealed this solution contained two sets of parallel profiles (relative patterns of responses) at relatively lower and higher intensity levels. Thus, this was discarded (following Silvia, Kaufman, & Pretz, 2009) in favor of two classes. A likelihood ratio test also suggested that the two-class solution was a better fit than the three-class,  $p = .17$ .

Table 51. Statistical fit indices for two-, three-, and four-class solutions (Study 10).

Fit Index	Class Solution		
	Two-Class Solution	Three-Class Solution	Four-Class Solution
AIC	8,392.03	8,191.04	8,018.33
BIC	8,531.26	8,379.00	8,255.02
Adjusted BIC	8,404.47	8,207.83	8,039.47
Entropy	1.00	.97	.97

*Note.* Lower AIC, BIC, and adjusted BIC values indicate better fit, as do entropy values above .90.

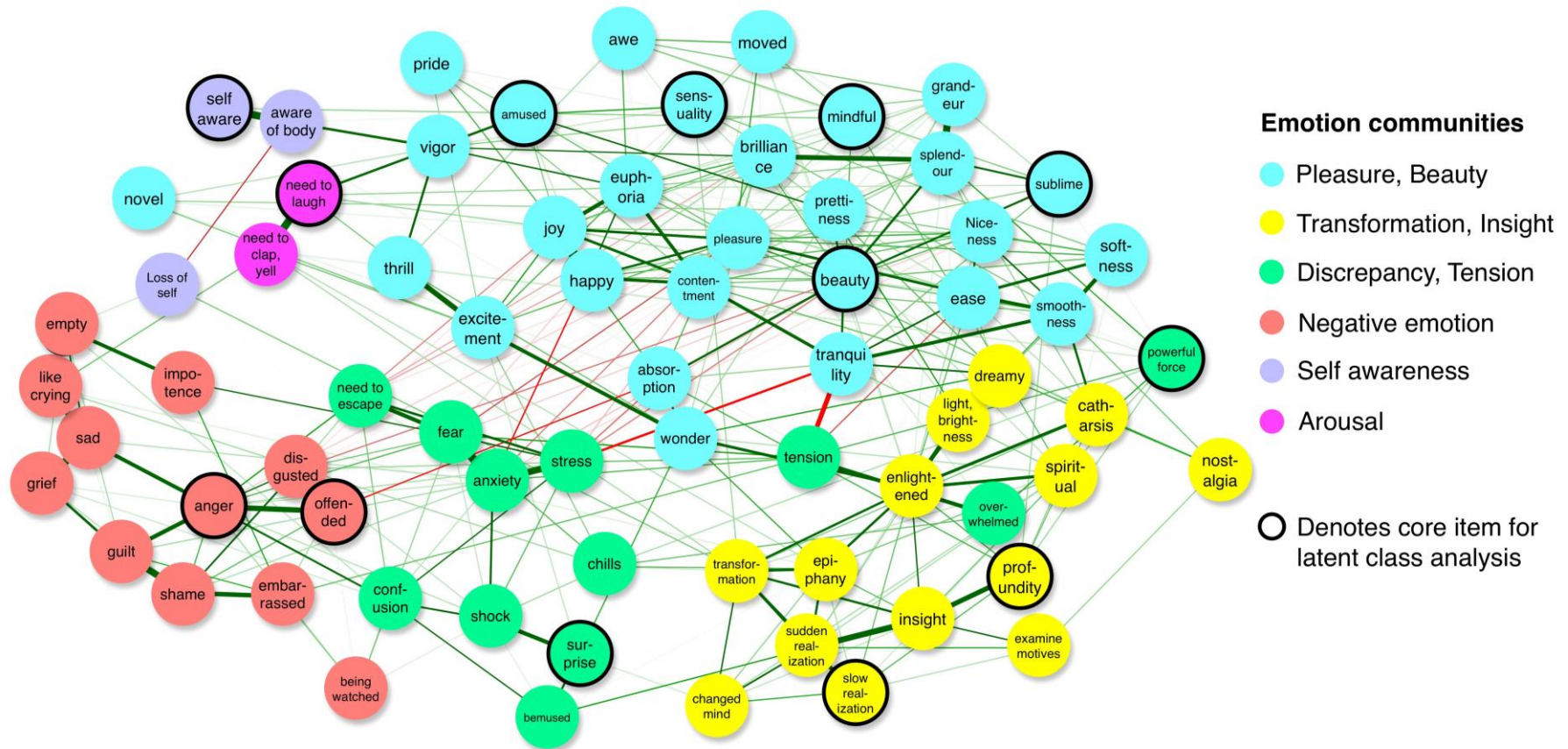


Figure 57. Network Model of partial correlations between emotions in reports of sublime experiences as well as main emotion communities and core items for latent class analysis of Sublime types (Study 10).

*Note.* Red or green lines indicate a partial correlation surviving the regularization procedure. Red lines indicate negative relations; green lines indicate positive relation. Line thickness indicates strength of correlations. Emotion communities and core items based on *Bootstrap Exploratory Graph Analysis* (bootEGA) with hybrid centrality measures. Top 20% of nodes in each community designated as core items

### 7.3.6. Interpretation and comparison of sublime classes

To further consider these classes, individuals were assigned to each of the two sublime classes (based on probability of most likely class, average probability across participants = 1.0, no marginal cases encountered). Figure 58 shows the profiles as mean emotion ratings of the core items across all assigned participants. The most notable immediate finding is that Class 1 represented the vast majority (90.8%) of all sublime reports. This class showed generally high responses regarding the pleasure/beauty, transformative/insight, discrepant/tension, self-awareness, and arousal items, and again showed very low negative emotions. On the other hand, Class 2 (9.2%) had a much smaller number of individuals and showed relatively lower (albeit still around the midpoint of the scales) positive emotions, including felt sublimity. This class also had relatively similar levels of transformative/insight, discrepancy/tension, self-awareness, and arousal items to that of Class 1. However, it had higher negative emotions.

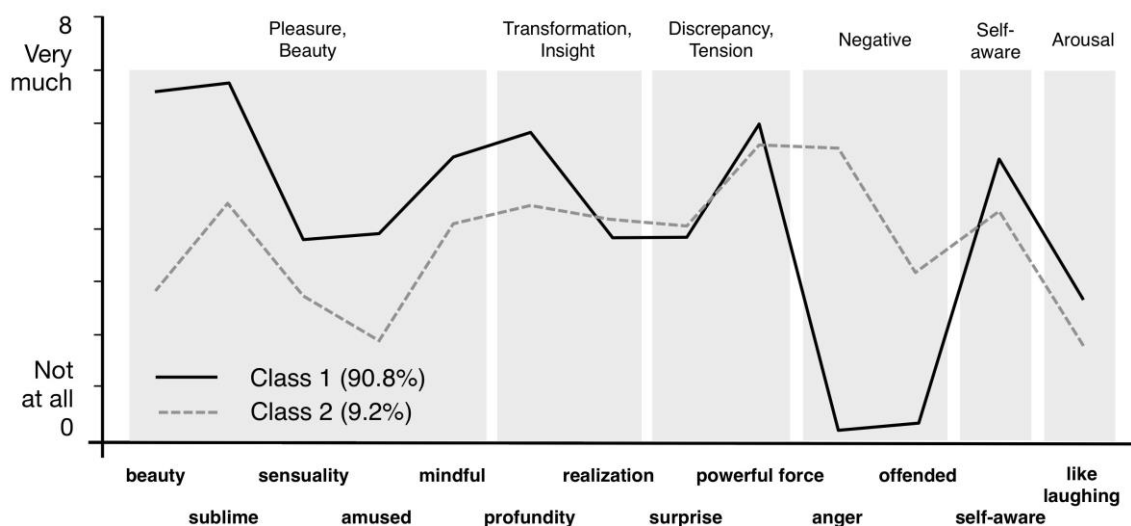


Figure 58. Profiles of two classes of Sublime, based on mean scores of core emotion items and latent class analysis (Study 10).

*Note.* Researcher-derived labels for 6 emotion communities shown at top of graph, core representative items shown at bottom.

The general consistency of the emotional sublime reports regarding felt experience, and the difference between classes, could further be seen in the comparison across trigger types. This is shown in Figure 59 and suggested a very consistent pattern for Class 1 across all emotion communities regardless of the type of the actual trigger engendering the experience. Due to the much smaller samples, sublime Class 2 showed more variance between trigger types. However, the most notable difference again appeared to involve the relative magnitude of negative emotions (especially higher for cities and buildings). The other emotion community scores tended to show similar patterns across all triggers, again with a generally lower reported level of Pleasure/beauty terms and all other community terms around the midpoint of the scales.

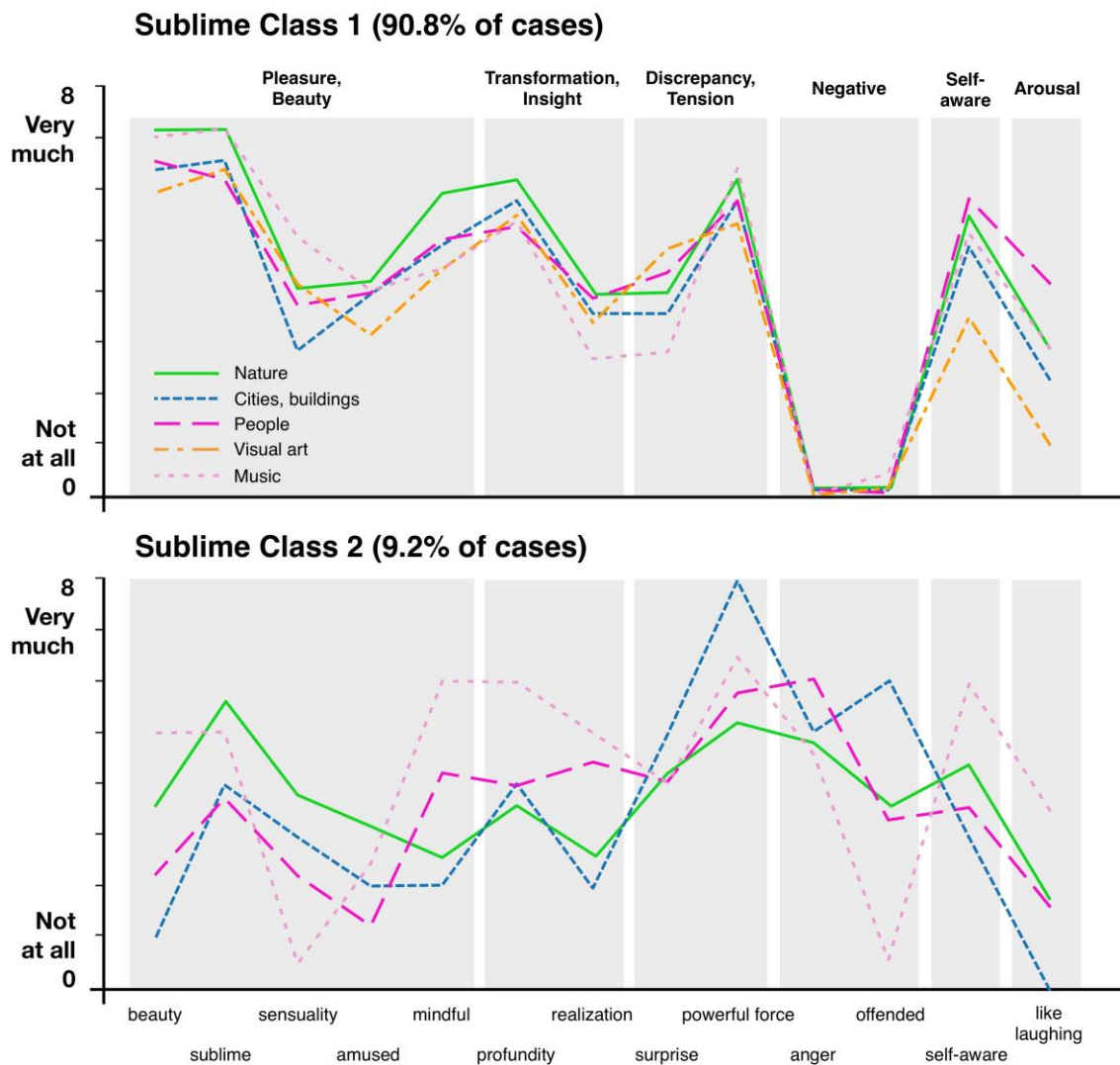


Figure 59. A consistent felt sublime across a wide range of trigger types?—Emotion patterns across core emotions and trigger types, compared between two Classes of sublime (Study 10).

*Note.* Researcher-derived labels for 6 emotion communities shown at top of graph, core representative items shown at bottom. Visual art trigger type not shown for Class 2 due to only 1 respondent in this category

Finally, briefly considered was what else might have led individuals in Class 2 to report higher negative and less positive emotions. This was done by assessing a number of qualitative factors discussed above.

Overall, very few obvious distinctions between the classes in terms of trigger-related aspects were found. Participants in both classes suggested their experiences occurred a similar number of years ago, lasted a similar duration, showed an equal ratio of first-time meetings with the stimuli; they also showed no clear differences in regard to whether or not participants were thinking or feeling anything before the encounter or had some other personality or background aspect that they thought might play a role. Participants also showed no obvious differences in the ratios of notable aspects driving their experiences.

The only notable differences involved, first, the general distribution of trigger types. Class 1, again, matched the general stimuli distribution discussed above, with nature the most

prominent, followed by cities/architecture, people, and then a handful of reports on art or other media. In Class 2, the majority (54.55% versus 10.6% of Class 1) reported sublime experiences with people. The written descriptions of Class 2 also suggested a potential difference, whereby the reports tended to recall rather violent or terrifying encounters. This was especially true of the cases involving people (e.g., a violent attack by one's mother, a fight in school; the near death of a loved one). In the cases of nature as well, several participants mentioned terrifying situations such as meetings with spiders, while one individual mentioned losing hope in humanity from a book. Several also specifically mentioned fear or terror. (Comparison of the reported fear did also show this to be generally higher in Class 2,  $M = 6.23$ ,  $SD = 2.73$ , versus Class 1,  $M = 2.28$ ,  $SD = 2.18$ ).

At the same time, it is important to note that the above distinctions were not consistent across all reported cases. Half of Class 2 cases were again not attached to people but to other trigger types. In the written descriptions, although many did recall threat, many also mentioned more 'classic' sublime situations such as viewing mountains or listening to music, but for whom, and for whatever reason, this also involved stronger felt terror or negative responses. Class 1 also contained a substantial number of 'people' cases. Due to the small sample, this remains a question for future research. (Note that due to the fact that individuals were asked to report only one, albeit their most profound, experience, but could potentially have had others from both Class 1 and 2, personality aspects were bit cibsudered).

## **7.4. Discussion and Chapter Summary**

This study sought to provide new insight into when and how sublime experiences occur and what are the cognitive-emotional components. This was addressed by collecting data from self-reports, by novice participants with little specific training in areas related to sublime. The results do paint an intriguing and surprisingly broad, but consistent pattern of experiences.

### **7.4.1. Commonality of Sublime Experiences**

First, in regards to the initial research question of whether individuals would be able to recall and report on a distinct moment in their lives when they had felt the sublime, just under two-thirds (59.7%; 240 individuals) answered 'yes'. Among these, two-thirds again suggested that sublime experiences had happened, for them, more than once, with most suggesting sublime encounters one to several times a year. This result itself provides important evidence that the sublime as an experience seems to be a rather common, shared experience (e.g., supporting such theoretical arguments by Burke, 1759/1958; Konečni, 2011). At the same time, this evidence also points to the possibility that the sublime is not *universal*, and questions assumptions made from surveys of, for example, aesthetic experiences that these happen to everyone (e.g. Gordon et al., 2016; Menninghaus et al., 2015; Shiota, Keltner, & Mossman, 2007). What might predict

these individual differences, be it personality or simple accessibility to sublime opportunities, are targets for future research.

#### **7.4.2. When and with What was the Sublime? A Wide Range of Trigger Types**

Examining the explanations for the conditions and stimuli or triggers that had brought the experiences about, a very broad spectrum of qualitative answers were found. Although about half of participants noted natural phenomena—ranging from ‘classic’ sublimity tropes of mountains, volcanoes, seascapes, clouds, sunsets, and deserts—we also find other answers as flowers, tiny animals, cityscapes, towering buildings, music, poetry, and visual art. Also reported was evidence for some of the more obscure sublime arguments such as spiritual contexts (e.g., Hegel, 1920; Perlovsky, 2012), occurring in about 3% of cases, as well as drug usage.

Overall, the participants tended to cover almost all of the possible sublime arguments from the literature review (as also reviewed in Table 1). Thus, previous arguments that the sublime ‘must’ or cannot involve certain elements—e.g., art, people, visual elements—do not find support. Similar arguments can also be made for other contextual details, which also tended to cover a spectrum of responses. Many explanations did suggest powerful, overwhelming stimuli and even a sense of the infinite; however, others touched aspects involving intimate spaces. Some stressed the importance of being alone; others highlighted being with others. Some stressed losing control or encountering the dangerous and unfamiliar; others stressed safe, controlled environments. Experiences also ranged from seconds to several hours; came suddenly or after some time. In general, participants often suggested that the actual sublime experience, again regardless of trigger, tended to not have much to do with the prior feelings or thoughts of the participants. In fact, most suggested that the experiences they were having were expected to be similarly possible for other individuals—and perhaps speaking again to the universality of the experience.

Despite the potential for a wide range of triggers, there was evidence for an emphasis on nature (50.3% of cases), with around 90% of these descriptions involving landscape, sea/water, and the sky. This of course matches a good deal of the ‘classic’ sublime discourse (e.g., Burke, 1759/1958; Addison, 1773/1718; Kant, 1790/1986), that, while sometimes leaving open other possibilities does single out such stimuli. The current work is also in line with the work by Shiota and colleagues (2007), where nature was the most commonly evoked source of awe, in front of the likes of social interaction, art, music, and personal accomplishment.

Encounters with nature have been previously shown to evoke profound emotions (Joye & Bolderdijk, 2015; Silvia, Fayn, Nusbaum, & Beaty, 2015; Shiota, Keltner, & Mossman, 2007), which might be closely associated with sublimity. This may tie to a sense of power and the infinite, to cases of feeling small and humble (Joye & Bolderdijk, 2015; Piff et al., 2015), or to meetings with actually physically large objects. For example, Keltner and Haidt’s (2003) two

central pillars of sublime/awe reactions were also a sense of *vastness* and *accommodation*. It is also often the case that examples of large physical objects are used as objects that evoke the sublime (e.g. Keltner & Haidt, 2003; Konečni et al., 2007; Konečni, 2011). It is then not surprising that when some participants mentioned the Human-made environment (12.9%), the third highest trigger type following nature (50.8%) and people (14.6%), the most mentioned triggers were of vast physical size (e.g. cathedrals), amounting to more than 60% of all participants.

On the other hand, the great majority of encounters were outside, which does give support to such arguments as that by Baillie (1747/1967; see Ashfield & De Bolla, 1996) that this would be an important factor. Most accounts, even including visual art, also involved the physical immediacy of the participant and stimulus, with only one or two cases of music being watched on TV. This supports the idea that sublime encounters may often require the presence of an individual's body, in order to either evoke a sense of real presence or perhaps because of the importance of proprioceptive or other sense experiences (see e.g., Schiller, 1793/1993). This would, of course raise important questions for laboratory study.

That people-related events were the second most common sublime category also can be connected to previous research. Gordon et al. (2016) have noted the ability of social interactions to lead to awe, and Menninghaus et al. (2015) have connected this to moving experiences (note, however, that these works found a higher incidence with people than with nature). However, again, it is notable that this category had such a high incidence in the results, and certainly contradicts theorists (e.g. Konečni, 2011) who argue against people as a seed for sublime occurrence.

It is also of note that in the study, as well as in other surveys of aesthetic experiences (e.g. Menninghaus et al., 2015), music and art were rarely seen as elicitors of the sublime. In the data, art and music combined accounted for under 15% of reported encounters. It may be that these triggers do not possess the aspects—size, being outside, evoking overwhelming reactions—that can be more easily triggered via nature etc. At the same time, contrary to certain theorists (Addison, 1773/1718; perhaps Burke, 1759/1958), this shows art can be connected to sublime experience, even if not as often. It is also important to note here and in the above discussions, that participants were asked to report one (their most profound) experience. They may very well have had others covering a range of trigger classes.

Finally, although the sublime accounts were largely based on visual features, with the exception of music (8.3% of cases), they did often contain other sense modalities. About half of participants explicitly noted sounds (highlighting a droning quality, or even total silence). This itself raises an interesting question regarding the role of such a context in relating to the sublime experience. A quarter also mentioned specific smells. Interestingly, this thus calls into question the argument that other modalities such as touch, smell, or taste could not bring about the sublime (Baillie, 1747/1967; see Ashfield & De Bolla, 1996).

### 7.4.3. Different Triggers but a Consistent Pattern of Felt Emotional/Cognitive Experience

Despite the breadth of answers to what evoked the sublime, examining the reported emotional or cognitive experience, there was high consistency and suggested one major sublime type. A network model of correlations between reported emotions and subsequent reduction to six dimensions/13 core items via Exploratory Graph Analysis (EGA), showed that 90% of participants could be fit into one shared pattern. This involved an experience with high reported pleasure (i.e. feeling of amusement, sensuality, mindfulness, sublime, and sense of beauty), tension (surprise and powerful force), bodily arousal, and self-awareness as well as transformation or insight (i.e. denoted by feeling of profundity and realization). This was in tandem with low reported negative emotions.

A general sense of pleasure and positive aesthetic experiences form an integral part of the first community. Here, the sublime appears to be associated with other notable aesthetic experiences, including wonder (Fingerhut & Prinz, 2018), awe (Keltner & Haidt, 2003), thrill (Konečni, 2011), and being moved (Menninghaus et al., 2015). All of these emotions have also been mentioned as components of, for example, Konečni's (2011) "aesthetic trinity" theory. Notable also is the senses of beauty, which in fact showed some of the highest magnitudes, again across all trigger types. The relationship between sublimity and beauty may go against various eighteenth century thinkers (Burke, 1759/1958; Kant, 1790/1986; see also Lyotard, 1994). However, the positive association between sublimity and beauty replicates recent empirical works (Ishizu & Zeki, 2014; Hur et al., 2018), as well as psychological theories that view sublimity ultimately as a kind of beauty (e.g. Konečni, 2011). Against Kant's view that sensual pleasures cannot be beautiful, a feeling of sensuality was also associated with this community (see also Brielmann & Pelli, 2017).

Sublime responses were also accompanied by emotions that relate to surprise and a powerful force. This community, which includes experiences of tension, confusion, anxiety, shock, etc., fits into what one may call a 'Burkean sublime'. For Burke (1759/1958), the sublime represented an experience riddled with tension or fear, yet of a kind that attracted people's attention, and through the human imagination, were suggested to be a form of delight and in fact one of "the most powerful of all passions." (Part I. Section VI). That these emotions are grouped separated from the last community of general negative emotions (including anger, being offended, guilt, grief, disgust, and emptiness) only underscores Burke's validity.

At the same time, the findings also suggest the presence of cognitive aspects connected to tension resolution, or even learning, insight, and transformation. This had been argued for by several authors (e.g., Ashley-Cooper, 1709/2001; Kant, 1790/1986; Schopenhauer, 1819/1995; Kuiken, Campbell, & Sopčák, 2012; Longinus, Keltner & Haidt, 2003; Konečni, 2011; Schiller, 1793/1993), but often as only one sublime variety—for example connected to interpersonal or conceptual, mathematical triggers. However, the insightful aspect tends to play a role across all accounts. A parallel might be found for this in the suggestions (e.g., Pelowski et al., 2017) that



transformation and insight is a key component of many moving and powerful aesthetic encounters.

Hand-in-hand with transformation/insight was self-awareness. This too had been a point of contention, with some suggestions that sublime might be related more to a selfless loss of surroundings or “flow”-type experience (Emery, 1973; Brennan, 1987; Mortensen, 1998). Conversely, self-awareness is often argued to be a key step towards transformation (Pelowski et al., 2017), opening the door to reflection and cognitive reorganization. That the element of tension exists as a separate dimension to that of pleasure and self-awareness/transformation also may imply an important dual-process that, for example, Kant (1764/2011) observed in sublime episodes. In explaining his dynamically sublime, Kant argued that the mind, first baffled by the enormity of a sublime conception, is transformed, before it is delighted by its own recognition of invincibility. The process of tension transforming into pleasure also appears in Burke (1759/1958), when he claims that the very nature of sublimity’s delight springs from reliefs from anxiety. In this study, the three components necessary in such dual process—a pre-transformation state of unease, transformation, and a post-transformation state of pleasure—emerged as distinct dimensions of the sublime.

#### **7.4.4. A Second Sublime Class: Why did some Report a more Visceral/Fearful Experience?**

Finally, it must be noted that although the singular item fear itself was not associated with sublimity for most people, fear did appear to play at least some role in defining a second, albeit statistically robust, sublime class. Occurring in only 9% of cases, this was notable for much higher negative and relatively lower positive emotions. A check of the written reports also suggested that this occurred in rare cases where individuals did actually come up against some danger or often violence—discussions of abuse, fights, war, dangerous animals. Interestingly, this sublimity type had relatively lower magnitude of reported sublime itself.

The finding of two distinct sublime classes in itself supports previous empirical studies (e.g., Gordon et al., 2016; Hur et al., 2018) showing the possibility to evoke both a threat/fear-based and positivity-based sublimity. This raises the question of how these might qualitatively differ in other aspects as well as what kinds of interactions were being had by past writers to push fear and negative emotions to the forefront, and why this was not often reported by the participants. One interpretation could be that Class 2 should be treated as noise, with a small subset of participants (only 22) reporting something other than a ‘sublime’ account. It may also be that the nature of a self-report method—asking participants to recall an event perhaps several years after the fact—could lead to especially negative emotions being obscured. For example, Gordon et al. (2016) suggested that participants better recalled positive sublime cases versus those containing threat. It is also possible that the sublime accounts involved a sequential process, as might be suggested from the *discrepancy, self-awareness, insight, positive emotion*

factors. Once an interaction itself was resolved, one might be less likely to note negative emotions, even though they were felt in reports. This second case, in tandem with the main finding, raises a fascinating avenue for future research.

#### **7.4.5. Caveats, Limitations, and Questions for Future Research**

This study also of course comes with many caveats. The present study assessed a sample of mostly young students. It would be interesting to try this with an even larger range, or in different cultures and languages. The self-report method, although providing a powerful qualitative and quantitative view, can also obscure or foreground certain factors and should certainly be followed up in other domains. Limiting evaluations of the sublime to those who have previously felt sublimity may also introduce its own bias. This may, on the other hand, also allow a more accurate picture of actual intensely felt sublime experiences. As noted above, the task of asking individuals to recall an event from the past and to make a detailed report of the experience also itself raises issues. That said, the evidence does support the arguments that: (1) even novice participants can often recount sublime occurrences; (2) these can involve a large number of triggers; and (3) in almost all cases and regardless of the underlying stimulus, these involve responses that (at least 90% of the time) describe a consistent cognitive and affective pattern which may provide an important new window into shared peak human experiences.

## **Chapter 8. Studies 11 and 12: Fear, Sublimity, and their Physiological Correlates**<sup>50</sup>

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<sup>50</sup> The research in this chapter was conducted as part of the Global Engagement Funds award, and was accompanied by a month-long visiting research at the University of Vienna's Department of Basic Psychological Research and Research Methods. The collaboration resulted in the publication, Hur, Gerger, Leder, and McManus (2018). The chapter is revised in line with that paper.

## 8.1. Introduction

In the current study, a prevalent theme in theories of the sublime is explored, namely the relationship of the sublime and fear. Although it was common among philosophers to consider fear as an integral makeup of sublime experiences (e.g. Burke, 1759/2008), recent empirical research portray diverging opinions regarding the involvement of fear in the sublime. While the sublime has on the one hand been assumed as an aesthetic experience of heightened positivity (e.g. Ishizu & Zeki, 2014; Konečni, 2011), some have on the other hand understood the sublime as an experience of fear-driven delight (e.g. Eskine, Kacinek, & Prinz, 2012; Ortlieb, Fischer, & Carbon, 2016). Yet these studies present methodological and conceptual issues, and a more systematic investigation into the relationship between sublimity and fear is still missing. In light of such context, the study aimed to evaluate the nature of sublimity's relation with fear, by means of combining behavioral and physiological measures.

### 8.1.1. Fear and the Sublime

Among aesthetician-philosophers of the eighteenth century, it was commonplace to discuss aesthetic experiences through the dichotomy of the sublime and beautiful. This plausible assumption is rooted on the idea that while aesthetic delight can derive from pure pleasure (beauty), it is also possible that one feels great delight in things that are unpleasant (sublimity).

The Irishman Edmund Burke's hugely influential work, *A Philosophical Inquiry into the Origins of Our Ideas of the Sublime and Beautiful* made a strong case of this dichotomy, and especially on the importance of the involvement of fear in the sublime, the latter a "sort of delightful horror" (p. 73). Burke explains in his characteristically unsparing tone (Burke, 1759/2008):

Whatever is fitted in any sort to excite the ideas of pain and danger, that is to say, whatever is in any sort terrible, or is conversant about terrible objects, or operates in a manner analogous to terror, is a source of the sublime. (p. 39)

Throughout much of the text, Burke sees fear as an integral trigger of the sublime, and it is through the startling effects of thing strong negative emotion that the sublime becomes "the strongest emotion which the mind is capable of feeling" (Burke, 1759/2008, p.39).

It must be noted, however, that that fear can coexist with delight can be found beyond philosophical contexts. Synonyms of sublimity that represent an amalgamation of fear, veneration, and delight exist globally. This includes *kua* among the !Kung San people of South-western Africa (Shostak, 1983), 敬畏 in Japan, Korea and China, and *Ehrfurcht*, in German speaking countries. As such, the phenomenon of fear being closely associated with sublimity appears hardly a mere relic of eighteenth century Western thinking.

### 8.1.2. A Psychological Perspective of the Sublime and its Relationship with Fear<sup>51</sup>

Given the memorable and profound nature of the sublime complemented by its rich historical underpinning, the gaining interest of psychological research on this matter is unsurprising. However, there have always been diverging viewpoints on whether sublimity is related to fear or not.

In Konečni's (2011) theoretical framework, the sublime (i.e. *sublime-in-context*) represents a profound and universal aesthetic experience of great intensity, and is associated with objects of vast physical dimensions, rarity, beauty, and novelty. While Konečni projects a wide range of psycho-physiological consequence of encountering these sublime objects such as a sense of being moved and thrills/chills, his conjecture construes the sublime as a source of deep positivity and agency of meaning-giving. While fear is mentioned in light of Burke's text, fear is ultimately distanced from a true sublime experience.

Unfortunately, Konečni failed to replicate such conceptualization in his subsequent empirical work (Konečni, et al., 2007). Neither mood, i.e. happy-sad, nor thrill was associated with the viewing of photographs of sublime objects, e.g. Cheops Pyramid, compared to when viewing non-sublime objects, e.g. The U.N. building & Mona Lisa.

Keltner and Haidt (2003), too, discuss Burke's theory of the sublime in light of their own notion of awe – although the writers never mention the term sublime, their source of theorization, by discussing Burke's text, is clearly a matter of the sublime. The authors construe the aesthetic emotions of the sublime as variants of social emotions. For example, the sense of reverence evoked by grand nature, is argued to be rooted from the everyday experience of reverence toward awe-inducing personalities. Crucially, Keltner and Haidt, much like Konečni, ultimately reject the idea that fear is central to sublime experiences.

Supporting the theoretical assumptions set by Konečni, Kelter, and Haidt is the empirical work of Ishizu and Zeki (2014). When participants were asked to rate a wide range of National Geographic photographs on sublimity (not at all sublime – very sublime), beauty (ugly –beautiful), pleasure (fearful –pleasant), and scale (small –grand), sublimity correlated strongly with beauty and scale, but weakly, albeit statistically significantly, to pleasure. Importantly, when fMRI activity was analyzed in light of sublimity ratings, judgements of sublimity were associated with the activation of the posterior hippocampus, an area associated with variants of positive emotions, such as romance (Zeki & Romaya, 2010). However, sublimity ratings did not have any noticeable effect on areas of the brain often related to immediate threat and fear, such as the amygdala and the insula (Mattavelli, et al., 2013). Areas that are often associated with negative emotionality such as perceived pain, such as the anterior

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<sup>51</sup> The relationship between fear and sublimity in psychological studies has been mentioned throughout the thesis. In the following section, a more detailed account of the relationship is given.

cingulate/medial prefrontal cortex (Etkin, Egner, & Kalisch, 2011), were de-activated with increased sublimity ratings.

At the other end of the spectrum are works that imply fear's importance in sublime experiences. It was in Eskine and colleague's (2012) paper where the priming of fear, not arousal or happiness induced heightened sublimity ratings of abstract artworks, suggesting that fear and sublimity may share a common mechanism. A similar claim can be made of the work by Ortlieb and colleagues (2016), who demonstrated that threat and liking can have strong positive associations despite that being modulated by individual differences. These findings link well with the *Distancing-Embracing model*, which argues that unpleasantness is essential to strong aesthetic experiences (Menninghaus, Wagner, Hanich, Wassiliwizky, Jacobsen, & Koelsch, 2017). Certainly, such viewpoint gives a nod to Bullough's classic essay on *psychical distance*, where Bullough develops a similar logic of thought (Bullough, 1912).

Some recent works have also pointed out that sublimity can exist in both fearful and non-fearful forms. Referring to Burke's conceptualization of the sublime, Piff and colleagues (2015; Study 4) reported that 3-mins video clips of threat-based/nature and positive/non-nature had similar ratings of sublimity despite being rated differently in terms of fear. This was replicated in a work by Gordon and colleagues using 2-minutes video clips (2016; Study 5).

### **8.1.3. Limitations of Past Research**

Despite the increasing number of research, a dispersion of conclusions allows little space for concrete insight in deciphering the relationship between sublimity and fear. The discrepancy can be addressed to a number of methodological issues. While most empirical works derive statistical generalisations based on human responses to certain stimuli, the choice and content of stimuli, especially in terms of which stimulus represents the sublime and which not, still remains in the domain of the researchers's own subjective choice (e.g. Konečni, et al., 2007; Gordon et al., 2016). Given that the sublime still remains in psychology an umbrella terminology to denote a general state of mixed or exalted emotions (Hur & McManus, 2017), a researcher's own idea of the sublime might differ considerably from those of another. Also problematic are conclusions sought over a single stimulus per conditions (e.g. Eskine et al., 2012; Gordon et al., 2016). This methodological shortcoming was covered in Chapter 1c.

### **8.1.4. Present Study**

In addressing the relationship between sublimity and fear, two theoretically informed studies that were and based on mixed methodologies were carried out. In Study 10, participants were asked to bring in a set of photographs of their own choices, before an independent group of participants rated all those photographs in their felt degrees of emotions including sublimity and fear. In line with Burke's characterization of the sublime, all photographs were limited to objects in nature.

Using a large subset of these rated images, Study 12 involved the use of physiological measures, namely, facial electromyography (fEMG) and skin conductance response (SCR), to further assess the emotional states people experience during experiences of sublimity and fear. Both fEMG and SCR have been previously used to uncover emotional processes underlying aesthetic experiences (Gerger, Leder, & Kremer, 2014; Gerger, Leder, Tinio, & Schacht, 2011; Gerger, Pelowski, & Leder, 2017; Gordon et al., 2016). Furthermore, both measures are associated with the experience of fear or fear-related states such as arousal (Bradley, Codispoti, Cuthbert, & Lang, 2001; Cacioppo, Petty, Losch, & Kim, 1986; Dimberg, 1986; Ekman & Friesen, 1975; Ekman, Friesen, & Ancoli, 1980; Lang, Greenwald, Bradley, & Hamm, 1993; Moody, McIntosh, Mann, & Weisser, 2007; Scherer & Ellgring, 2007). In particular, Gordon and colleagues (2016) had reported skin conductance not to be associated with sublimity. By adopting such multi-leveled measurements based on a wide range of participant-generated stimuli, the current study aimed to present a relationship between sublimity and fear that is generalizable over a wide range of stimuli and measures.

## 8.2. Study 11

According to several aesthetic theories, scenes of nature that evoke fear can be important emotional components of sublime experiences (e.g. Burke, 1759/2008). Thus, Study 11 served the purpose to generating a pool of nature-based photographs that could relate to the emotional nature of the sublime, all the while controlling for potential researcher-based bias in stimuli selection. One cohort of participants (Cohort A) were first asked to bring in a number of photographs of their own choice that suit a certain set of criteria. Afterward, a separate group of participants (Cohort B) rated these photographs in a lab setting.

### 8.2.1. Methodology

**8.2.1.1. Participants.** For Cohort A, participants from London, UK (17 participants, 9 female, mean age = 24.65 years,  $SD = 3.83$ ) and Vienna, Austria (17 participants, 10 female, mean age = 25.76 years,  $SD = 5.89$ ) were recruited in return for being entered into a raffle to win an Amazon voucher worth 10 GBP. For Cohort B, two groups of participants, one from London, UK (21 participants, 20 female, mean age = 20.67,  $SD = 2.78$ ) and one from Vienna, Austria (21 participants, 16 female, mean age = 20.67,  $SD = 2.01$ ) were recruited in return for course credit.

**8.2.1.2. Materials and procedure.** Participants of Cohort A were asked to bring in photographs of nature, six of which the participants believed elicited fear and another six, happiness. Stimulus selection was restricted to fearful and happy photographs, as it was the purpose to create a set of images that ranged in its degree of fearful. The sublime or beautiful were not mentioned at any point in this task, given the concern that participants's suspicion of the purpose of the task may influence their image selection.

Of those six images within each emotional category, half of them were asked to be close angle shots and the other half, wide angle shots; this was done in order to diversify content. All photographs had to be without traces of humans or human-associated artifacts (e.g. cars, houses, etc.), be chosen without collaboration with others, and be at least  $800 \times 600$  pixels in size. To maximize the diversity of content, the instructions regarding the emotional associations were kept vague and general. When the images were selected, they were sent in to the researchers via email.

Based on the compiled 192 images, a separate group of participants (Cohort B) rated the pool of images for their felt degree of sublimity, beauty, fear, happiness, arousal, and dominance.

Each session took place at a standard experimental cubicle at the University of Vienna and University College London, and was run via E-prime 2.0 software (Psychology Software Tools, Pittsburgh, PA). In both locations the image sizes were kept constant, and all images did not exceed the size of  $2160 \times 1080$  pixels. The images were shown on 19 inch monitors.

Rating measures were acquired via a cursor on the screen (controlled by a mouse), and participants rated each target photograph for its degree of the aforementioned six categories of judgements. Similar to previous studies, participants were provided with a set of standard definitions of the six judgements.

The ratings were paired together into three sets of in an *evaluative space grid* (Larsen, Norris, McGraw, Hawley, & Cacioppo, 2009). Two scales of rating were simultaneously represented on a single response grid, with one scale located on the x-axis and the other category located on the y-axis. Each axis of the grid was based on a 5-point rating scale, and was anchored with 'low' and 'high' at the edge of each scale. Previous research by Larsen and colleagues (2009) demonstrated that this method is suitable not only in measuring mixed emotion, but also in achieving efficiency, as compared to the use of two separate unipolar scales. Sublimity (on x-axis)-beauty (on y-axis) dimension was always rated first, followed by fear (x-axis)-happiness (y-axis), and arousal (x-axis)-dominance (y-axis) ratings. As was done in the original work by Larsen and colleagues (2009), it was ensured participants understood the workings of the response grid. The order of the last two grids were counterbalanced across participants. The presentation order of the 192 images were randomized for each participant. The study was run in English in London, and German in Vienna. A sample rating screen is portrayed in Figure 60.



**"Due to copyright restrictions the electronic version does not contain some images. They are, however, available in the printed version in the UCL Library"**

Figure 60. Sample rating screen (Study 10).

## 8.2.2. Results

The photographs brought in from the participants in Cohort A were filtered for overlapping content and stylistic appropriateness, resulting in a set of 192 images (i.e. 79 fearful & 113 happy; 87 close up & 105 wide shot). Participants from Cohort B rated those images in the aforementioned emotional dimensions. Presented below are analyses of the rating data.

**8.2.2.1. Ratings analyses.** The raw responses from both the London and Vienna groups were averaged by stimulus. Correlation analyses between the ratings of the two cohorts over stimulus revealed overall good levels of consistency ( $ps < .001$ ): beauty ( $r = 0.74$ ), sublimity ( $r = 0.76$ ), fear ( $r = 0.84$ ), happiness ( $r = 0.79$ ), arousal ( $r = 0.46$ ), and dominance ( $r = -0.22$ ). The dominance scale was excluded from further analyses given the negative correlation between the two cohorts. The ratings of the two cohorts were averaged together per image.

Furthermore, the relationship between emotional category allocated for the self-brought image (Cohort A) and the newly rated levels of fear and happiness (Cohort B) were analyzed. A 2-sample  $t$ -test assuming unequal variance revealed that images brought in as fearful ( $M = 2.91$ ) were rated as more fearful as compared to pre-selected happy images ( $M = 1.48$ ,  $t(109.13) = 16.34$ ,  $p < .001$ ,  $d = 2.51$ ). Likewise, images brought in as happy ( $M = 3.47$ ) were rated as more happy as compared to images pre-selected as fearful ( $M = 2.28$ ,  $t(141.01) = 13.71$ ,  $p < .001$ ,  $d = 2.07$ ).

Sublimity ratings were correlated with all of the other scales over the 192 images (see Table 52). Results revealed sublimity to be significantly correlated with beauty ( $r = 0.36$ ,  $p < .001$ ), fear ( $r = 0.38$ ,  $p < .001$ ) and arousal ( $r = 0.70$ ,  $p < .001$ ). However, sublimity was not

significantly correlated with happiness ( $r = 0.02, p > .05$ ). The unique emotional associations of sublime feelings independent of beauty was further calculated, via partial correlations. After controlling for beauty, sublimity was correlated negatively with happiness ( $r(69) = -0.68, p < .001$ ), and positively with fear ( $r(69) = 0.78, p < .001$ ) and arousal ( $r(69) = 0.70, p < .001$ ). When beauty was correlated with these variables after controlling for sublimity, beauty correlated positively with happiness ( $r(69) = 0.94, p < .001$ ), and negatively with fear ( $r(69) = -0.84, p < .001$ ) and arousal ( $r(69) = -0.17, p < .05$ ).

Table 52. Correlation table: Five ratings (Study 10).

	Beauty	Sublimity	Fear	Happiness	Arousal
Beauty (M=3.52, SD=0.75)					
Sublimity (M=2.91, SD=0.72)	0.36***				
Fear (M=2.07, SD=0.89)	-0.59***	0.38***			
Happiness (M=2.98, SD=0.81)	0.88***	0.02	-0.83***		
Arousal (M=2.86, SD=0.45)	0.14	0.70***	0.58***	-0.11	

Note.  $n = 192$  images, \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

**8.2.2.2. Stimulus selection for Study 11.** A subset of images from Study 11 were selected to be used in Study 12, where the images were associated with fEMG and SCR activations. Using the obtained average ratings of Study 1, the stimuli were categorized into four groups consisting of high and low levels of sublimity and fear, namely ‘high sublimity & high fear’ (HSHF), ‘high sublimity & low fear’ (HSLF), ‘low sublimity & high fear’ (LSHF), and ‘low sublimity & low fear’ (LSLF). This was achieved using a median split of each scale. From the median split, 18 images were selected, and it was ensured there was a diverse spread of image content throughout the four rough categories (Table 53 and Figure 61). Note that the categories were assumed as proxies of stimuli inducing high vs. low levels of sublimity and fear, not as fixed variables (see Study 12 analysis).

Table 53. Image content of image selection for Study 11.

Category	Sublimity rating	Fear rating	Example content
HSHF	M=3.71, SD=0.23	M=3.14, SD =0.63	Cliff, volcano, lightning, storm, bear, shark, sea, clouds, forest fire, craggy mountain, etc.
HSLF	M=3.51, SD =0.31	M=1.48, SD =0.18	Night sky, sun, beach, lake, landscape, bright forest, etc.
LSHF	M=2.38, SD =0.35	M=2.84, SD =0.55	Spider, snake, fighting animals, animal carcass, cave, dark forest, etc.
LSLF	M=1.93, SD =0.26	M=1.15, SD =0.09	Fruit, small animal (rabbit, dog, kitten, monkey, bird, etc.), flower, butterfly, etc.

*Note.* HSHF = High Sublimity High Fear, HSLF = High Sublimity Low Fear, LSHF = Low Sublimity High Fear, LSLF = Low Sublimity Low Fear

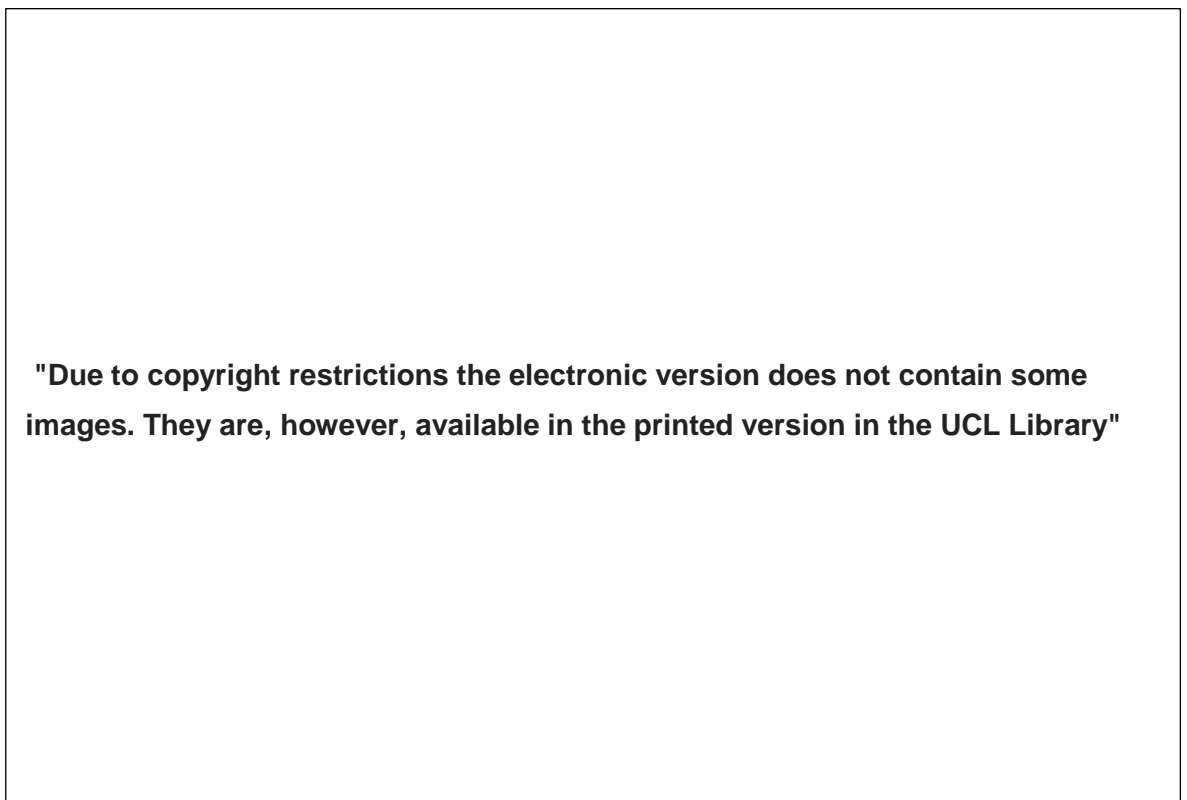


Figure 61. Sample images used for Study 11.

*Note.* Upper left = Low Sublimity High Fear. Upper right = High Sublimity High Fear. Lower right = High Sublimity Low Fear. Lower left = Low Sublimity Low Fear.

### 8.2.3. Discussion

In Study 11 the relationship between sublimity and five other aesthetic-related scales were explored. Items considered high in sublime were also seen as high in beauty, fear, and arousal. Happiness, on the other hand, was not associated with sublimity. These results indeed confirm philosophical outlooks that associate sublimity with fear, such as presented by Edmund Burke (1759/2008).

How do these correlations between ratings translate into corresponding physiological responses? In Study 12, two physiological measures that are commonly associated with a wide range of emotional experiences, namely facial electromyography (fEMG) and skin conductance response (SCR) were included in addition to rating procedures.

## 8.3. Study 12

### 8.3.1. Methodology

**8.3.1.1. Participants.** Forty-one participants (mean age = 21.54,  $SD = 3.29$ ; 7 male, 34 females) were recruited through the University of Vienna online participant recruit system, and were compensated for course credit. Before the start of the experimental session, participants signed a consent form through which they were informed that the study would involve filming as well as physiological measures of certain areas of the face.

**8.3.1.2. Materials and procedure.** Each session took place at a standard experimental cubicle at the University of Vienna, and was run via E-prime 2.0 software (Psychology Software Tools, Pittsburgh, PA). For the presentation of images, participants sat 1 m away from an LCD monitor (Nec MultiSyncLCD 3090 WQXi, 33'', 2400 × 1200 pixels).

For the fEMG measurement, participants were prepared following the guidelines suggested by Fridlund and Cacioppo (1986). First, participants were asked to clean their faces with water. Then, areas of the participants's faces corresponding to the emotions of theoretical interests were cleansed (by the researchers) using alcohol patches. Specifically of interest were activations at the *corrugator supercilii* (frowning), *zygomaticus major* (smiling), and *medial frontalis* (inner brow raise) regions, representing negative valence, positive valence, and fear respectively (Cacioppo, Petty, Losch, & Kim, 1986; Ekman & Friesen, 1975; Ekman, Friesen, & Ancoli, 1980; Lang, Greenwald, Bradley, & Hamm, 1993; Moody, McIntosh, Mann, & Weisser, 2007; Scherer & Ellgring, 2007). An abrasive paste was administered (Nu Prep, Weaver, USA) in order to decrease impedances below 10 k $\Omega$ . For each region, a pair of electrodes (Ag/AgCl of 4 mm diameters) filled with electrolyte (Signa Gel, USA) were attached. An electrode on the right mastoid was attached as a ground.

For the SCR measurement, a pair of electrolyte (Grass Skin Conductance Paste, USA) applied electrodes were applied onto the middle phalanx of the ring and middle fingers of the left hand of each participant. Past studies have demonstrated heightened SCR responses to be

related to arousal (Bradley et al., 2001; Dimberg, 1986; Lang et al., 1993). Given that fear is highly arousing (e.g. Scherer, 2005), and given philosophical projections of sublime being highly arousing and fearful (e.g. Burke, 1759/2008), SCR activity was thought to be correlated to sublime experiences. Before attaching the electrodes participants were asked to rinse their hands with water (no soap used). Both fEMG and SCR electrodes were connected to an amplifier (TMS International Portilab 20 channel, www.tmsi.com, Netherlands), and were sampled at 2048 Hz.

The rating procedure was similar to Study 10, but with some differences. Each trial started with a fixation cross for 2 seconds. Participants were instructed to attend the fixation cross once it appeared on the screen. Then a stimulus followed for six seconds after which participants rated the stimulus for their degree of elicited emotions. For the ratings the stimulus was reduced in size and presented on the left half of the screen whereas the scales appeared on the right half. After participants rated each stimulus on  $5 \times 5$  grids, first on the dimension of beauty and sublime and on the dimensions of fear and happiness. Arousal was rated on a unipolar five point scale (1 low, 5 high). Dominance was dropped, given the high inter-individual heterogeneity in the ratings in Study 10. An inter-stimulus interval of six seconds followed the last rating.

The selected 72 images from Study 11 were presented in random order to each participant. After the rating task, the researchers removed the apparatus used for physiological measures. All participants were debriefed. A session took around 75 minutes to complete. All written information presented to the participants was in German. All sessions were filmed via a Logitech HD c130 webcam. Figure 62 are photographs of the study setting.

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Figure 62. Photographs of study setting (Study 11).

**8.3.1.3. fEMG analysis.** Following van Boxtel (2001), EMG data were put through a 20 Hz high pass filter to reduce noise resulting from blink and slow drifts. A 500 Hz low pass and 50Hz notch filters were additionally implemented, the latter to reduce powerline artifacts. Afterward, the data were rectified and smoothed with a 125ms moving average filter. A baseline correction was carried out, by subtracting the average activation of 1000 ms before stimulus presentation from activations occurring during the 6000ms stimulus presentation (e.g. Gerger & Leder, 2015; Gerger et al., 2014). Each trial was inspected for movement artifacts (e.g. chewing,

not looking at the screen, etc.) by reviewing the video and physiological data side by side (Gerger et al., 2014). Trials with artifacts were excluded.

**8.3.1.4. SCR analysis.** SCR data were downsampled to 32Hz, and submitted to a Butterworth low pass filter (1Hz, 4<sup>th</sup> order), before being subjected to the Continuous Decomposition Analysis (CDA) via LedaLab Toolbox (Benedek & Kaernbach, 2010). This procedure allows for a continuous measurement of independent tonic and event-related phasic activities, optimized for individuals's unique sudomotor-response characteristics.

### 8.3.2. Results

**8.3.2.1. Behavioral results- comparisons of ratings with Study 10.** To examine if the ratings of Study 12 are consistent to those of Study 11, the five behavioral ratings of Study 12 were averaged over the 72 images, before the same was done over the same 72 images from the Study 11 data. When the mean ratings scores were correlated between the two studies over each scale, there were high correlations in all five rating scales. This implies that the images were rated consistently in both studies, i.e. sublimity ( $r(72) = 0.92, p < .001$ ), beauty ( $r(72) = 0.91, p < .001$ ), happiness ( $r(72) = 0.93, p < .001$ ), fear ( $r(72) = 0.96, p < .001$ ), and arousal ( $r(72) = 0.86, p < .001$ ).

Also consistent with the outcomes of Study 11, ratings of sublimity were positively correlated with ratings of beauty ( $r(72) = 0.31, p < .01$ ), fear ( $r(72) = 0.51, p < .001$ ), and arousal ( $r(72) = 0.70, p < .001$ ) and not significantly correlated with happiness ( $r(72) = 0.04, p > .05$ ; the full correlation is available in Table 54). To see if these correlations statistically differed to those obtained in Study 10, the five coefficients were compared to those of Study 10, based on Fisher's Z-transformation. Further supporting the notion that the ratings over the 72 images are consistent in both studies, the correlations between sublimity and the other variables did not reveal significant differences between the two studies (beauty,  $Z = 0.40, p > .05$ ; fear,  $Z = 1.16, p > .05$ ; happiness,  $Z = 0.14, p > .05$ ; arousal,  $Z = 0.00, p > .05$ ).

Finally, to determine the unique emotional correlates of sublime feelings independent of beauty, sublimity was correlated with the other rating variables after controlling for beauty, via partial correlation. It was revealed that sublimity was correlated negatively with happiness ( $r(69) = -0.60, p < .001$ ), and positively with fear ( $r(69) = 0.83, p < .001$ ) and arousal ( $r(69) = 0.77, p < .001$ ). When beauty was correlated with these variables after controlling for sublimity, beauty correlated positively with happiness ( $r(69) = 0.94, p < .001$ ), and negatively with fear ( $r(69) = -0.86, p < .001$ ) and arousal ( $r(69) = -0.35, p < .01$ ). These partial correlations replicate those of Study 10.

Table 54. Correlation table: Five ratings (Study 12).

	Beauty	Sublimity	Fear	Happiness	Arousal
Beauty (M=3.22, SD=0.85)					
Sublimity (M=2.99, SD =0.95)	0.31**				
Fear (M=2.07, SD =1.00)	-0.53***	0.51***			
Happiness (M=2.72, SD =0.92)	0.91***	0.04	-0.72***		
Arousal (M=2.97, SD =0.71)	-0.10	0.70***	0.77***	-0.22	

Note.  $n = 72$  images, \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

### 8.3.2.2. Physiological data results.

**8.3.2.2.1. Data preparation.** In the analysis of the physiological data, the dichotomized categorization (low vs. high) of aggregated data were not retained, as it overlooks the continuous nature of sublimity/fear ratings and the subtleties of individual differences. The latter point is crucial in highlighting the fact that the data are in fact nested, e.g. ratings are nested within participants. To address this issue, a series of linear mixed-effects models (also hierarchical models) were developed, via the *lmer()* function within the *lme4* package (version 1.1-15; Bates, Mächler, Bolker, & Walker, 2017) in *R* (version 3.4.1, R Core Team, 2017). By adopting this methodology, both items and participants were considered as random effects within a single model. Specifically, the analyses were subjected to random slope models, such that the models accounted for variations that occur between participants and items for each independent variable, i.e. fear and sublimity ratings (Judd, Westfall, & Kenny, 2017). Four models were run in total, in predicting the three facial muscles and SCR.

Significance levels were obtained using the *lmerTest* package (version 2.0-36; Kuznetsova, Brockhoff, & Christensen, 2017), and  $p$ -values were estimated based on  $t$ -tests using the Satterthwaite approximation for denominator degrees of freedom. Effect sizes in the form of  $r$  were computed to compare the behavioural and physiological data. Effect sizes were computed using the Satterthwaite-adjusted degrees of freedom and  $t$  values from the *lmer()* output, using equations suggested by Rosnow & Rosenthal (2003). Averaged activations over 6 seconds post stimulus exposure were taken as dependent measures.

**8.3.2.2.2. Corrugator supercilii.** For the *corrugator supercilii* (frowning), the analysis revealed significant fixed effects of ratings of fear,  $\beta = 0.37$ ,  $p < .01$ ,  $r = 0.51$ , and sublimity,  $\beta = -0.27$ ,  $p < .01$ ,  $r = 0.43$ . Thus increased levels of fear predicted frowning. At the same time higher sublimity coincided with reduced levels of corrugator activation. There was no



significant interaction between sublimity and fear in predicting frowning,  $\beta = -0.07, p > .05, r = 0.18$ . Table 55 presents the summary statistics for all models, including those of the *corrugator supercilii*.

**8.3.2.2.3. Zygomaticus major.** Activations of the *zygomaticus major* (smiling) was predicted negatively by fear ratings,  $\beta = -0.14, p = 0.01, r = 0.31$ , such that higher levels of fear were a precursor to decreased smiling. Both ratings of sublimity,  $\beta = 0.02, p > .05, r = 0.05$ , and the interaction between sublimity and fear,  $\beta = 0.05, p > .05, r = 0.16$ , did not predict activation changes of this muscle.

**8.3.2.2.4. Medial frontalis.** For the *medial frontalis* (inner brow raise), there was a significant effect of fear,  $\beta = 0.06, p < .05, r = 0.38$ . That is, an increasing level of fear led to an increased medialis frontalis activation. No effects were found for sublimity,  $\beta = -0.01, p > .05, r = 0.12$ , nor an interaction between sublimity and fear,  $\beta = 0.004, p > .05, r = 0.14$ .

**8.3.2.2.5. SCR.** One participant was further excluded due to electrode attachment issues. As a result, data from 39 participants were analyzed. In predicting the average phasic driver within the response window (Benedek & Kaernbach 2010), no main effects were present for fear,  $\beta = 0.78, p > .05, r = 0.07$ , and sublimity,  $\beta = 2.08, p > .05, r = 0.14$ . Equally, no interaction between fear and sublimity was detected,  $\beta = -1.89, p > .05, r = 0.19$ .

Table 55. Summary statistics for fEMG and SCR data (Study 11).

	<i>Corrugator supercilii</i>					<i>Zygomaticus major</i>				
	<i>df</i>	<i>t</i>	$\beta$	<i>r</i>	<i>p</i>	<i>df</i>	<i>t</i>	$\beta$	<i>r</i>	<i>p</i>
Intercept	51.99	0.07	-0.01	0.01	0.95	55.45	3.20	0.34	0.39	< .001
Fear	24.13	2.90	0.37	0.51	<b>0.01</b>	62.86	2.58	-0.14	0.31	<b>0.01</b>
Sublimity	35.98	2.86	-0.27	0.43	<b>0.01</b>	140.9 6	0.53	0.02	0.05	0.26
Fear × Sublimity	23.06	0.88	-0.07	0.18	0.39	49.19	1.13	0.05	0.16	0.60

	<i>Medial frontalis</i>					SCR				
	<i>df</i>	<i>t</i>	$\beta$	<i>r</i>	<i>p</i>	<i>df</i>	<i>t</i>	$\beta$	<i>r</i>	<i>p</i>
Intercept	41.14	0.93	-0.03	0.14	0.36	39.60	2.88	-7.60	0.42	<b>0.01</b>
Fear	30.82	2.29	0.06	0.38	<b>0.03</b>	41.41	0.48	0.78	0.07	0.63
Sublimity	28.17	0.64	-0.01	0.12	0.64	34.96	0.85	2.08	0.14	0.40
Fear × Sublimity	32.23	0.82	0.00	0.14	0.82	56.78	1.44	-1.89	0.19	0.15

Note. Degrees of freedom (df) use Scatterwaite approximations.

### 8.3.3. Discussion

Study 12 extended Study 11's findings by additionally incorporating physiological measures. There was a high level of consistency in the ratings between the two studies. Despite the positive correlation between sublimity and fear in the rating data, there was no evidence of fear indicated in the physiological data. In fact, sublimity was associated with a relaxation of the *corrugator supercilii*, a muscle that is often associated with negative emotional experiences.

## 8.4. Discussion and Chapter Summary

Since the translation of *Peri Hypsous* in 1743, philosophical discussions have often moulded the sublime as a kind of delight borne out of shock and terror, a view epitomized in Burke's *Philosophical Enquiry* (1759/2008). Nevertheless, psychological explorations into the sublime

have often remained generic, with various methodological issues. In two studies, the relationship between sublimity and fear was explored, using both behavioural and physiological measures and a wide range of participant-generated stimuli.

#### **8.4.1. Behavioural Data Concerning the Sublime and Fear**

Given the historical association between fear and sublimity (e.g. Burke, 1759/2008), the positive correlation between sublimity and fear was a real possibility. Such prediction was indeed verified via positive correlations between ratings of sublimity and fear in both studies, replicating empirical works that presented sublimity as an experience based on fear (e.g. Ortlieb et al., 2016). Thus objects that are often sublime are also likely to be fearful, confirming Burke's view that the source of the sublime is "whatever is fitted in any sort to excite the ideas of pain and danger...or operates in a manner analogous to terror" (p. 39).

Still, the positive link between experiences of sublimity and fear contradict many theories in the field of empirical aesthetics, as sublimity is often seen as emotionally positive, rather than fear-related (e.g. Keltner & Haidt, 2003). A common explanation is that despite the connotation of fear in the history of sublime theories, the actual experience of sublimity, as a peak aesthetic experience, is predominantly joyful. A direct comparison is possible with the empirical work of Ishizu and Zeki (2014), who reported that sublimity was positively and negatively associated with pleasure and fear respectively in photograph rating behavior. Certainly, there are important aspects that the present study shares with those of Ishizu & Zeki (2014), such as the rating of multiple photographs; most empirical works in the field rely on single stimuli (e.g. Gordon et al., 2016), and this can compromise statistical power (e.g. Judd et al., 2017). Yet a head-to-head methodological comparison between the two studies reveals a crucial difference. Where the earlier work (Ishizu & Zeki, 2014) measured fear as being opposite to pleasure (i.e. happiness) via a semantic differential, the present study allowed participants to rate fear and happiness as independent scales. For the present study, participants were hence able to also rate stimuli as either being both high in fear and happiness or both low in those emotions. In such methodological adjustment, it was made possible to acknowledge the possibility of mixed emotions in aesthetic experiences (e.g. Menninghaus et al., 2017), and thereby measure assess emotional subtleties in understanding the sublime.

In closer inspection of the raw data, the rating data revealed a non-straightforward relationship between sublimity, fear, and happiness. Since sublimity correlated positively with fear but not with happiness, it was verified that fear and happiness are indeed not opposites. The results further indicated that although sublime feelings are likely to be fear-inducing, there can be sublime feelings that are either happy or non-happy.

These findings point to the philosophical viewpoint that sublimity represents an aesthetic experience based on fear, as opposed to the pleasure-based beauty. Confirming such viewpoint, sublimity and beauty showed very different emotional profiles. Although sublimity

and beauty showed a moderate degree of correlations in both studies, sets of partial correlations revealed that when beauty was controlled for, sublimity was linked with high levels of fear and arousal, and low levels of happiness. Beauty, on the other hand, was uniquely (i.e. after controlling for sublimity) linked with high levels of happiness, and low levels of fear and arousal. Even when raw correlations were observed, sublimity and beauty did not share any emotional characteristics. Such differing emotions of sublimity and beauty reflect the various sublimity-beauty contrasts if not dichotomies that Burke and other notable aestheticians often utilized.

In further support of the contrast between sublimity and beauty, in both the present study and the rest of the thesis, stimuli distinctly evoking sublimity but not beauty (e.g. volcanoes) and vice versa (e.g. flowers) were reported. Thus despite both theoretical and empirical works in psychology arguing for the inherent link between sublimity and beauty (e.g. Ishizu & Zeki, 2014; Konečni, 2011), the present study's results demonstrate a much more subtle and complex side to the experience of the sublime in relation to beauty. At least, it appears sublimity and beauty differ considerably in terms of their association with fear.

Sublimity's positive association with arousal is in line with Burke's notion of the sublime being an experience of heightened tension, or "the strongest emotion the mind is capable of feeling" (p. 39). Given sublimity's correlation with the fear – an emotion of high arousal (e.g. Scherer, 2005) – the positive correlation found between ratings of sublimity and arousal was not surprising. On the contrary, this does not align well with previous empirical studies. Eskine et al. (2012) implied that induced fear (a 17-second video clip), but not arousal (jumping jacks), triggered feelings of sublimity of an artwork. The outcomes further defy the findings of Konečni et al. (2007), who failed to verify the induction of reported thrills – a proxy for arousal – based on exposure to sublime photographs. Considering the disagreements, it is plausible that the current study have major methodological strengths compared to these former works. While the former works drew conclusions based on 2 to 4 researcher-selected images, the outcomes from the current work were based on a large number of participant-generated stimuli (192 images in Study 11 & 72 images in Study 12). Furthermore, given that the same patterns of results were replicated in both Studies 11 and 12, one can assume that the positive correlation between ratings of sublimity and arousal provide useful insight into the literature.

#### **8.4.2. Physiological Activations Predicted by Sublimity and Fear**

An important aspect of the current work was to measure physiological reactions from photographs that evoke feelings of sublimity and fear. Given that fEMG and SCR are often used to measure subtle emotional experiences including positive/negative emotional valence and arousal (e.g. Cacioppo et al., 1986), it was of interest in how these physiological activations would reflect ratings of emotions toward photographs. Fascinatingly, Burke (1759/2008) makes specific predictions concerning facial expressions related to experiences of the sublime, when

he observes that anyone undergoing a sublime experience has “his eye-brows are violently contracted, his forehead is wrinkled...” (p. 129). Here, Burke had thought that whatever is sublime is also associated with fear and pain, and he thus argued that bodily responses to fear must also be present in responses to sublimity.

To start with, that photographs rated as fear inducing were associated with positive activations at the *corrugator supercilli* (frowning) and *medial frontalis* (inner brow raise), and with negative activations at the *zygomaticus major* (smiling), sits well with the empirical literature (e.g. Scherer & Ellgring, 2007) as well as with Burke’s prediction. It was expected that a similar form of fEMG activation pattern would exist for sublime photos, given sublimity’s positive association with fear. Yet sublimity was not associated with any physiological responses associated with fear and negative emotionality. On the contrary, photographs rated as sublime were associated with a decreased activation at the *corrugator supercilli* (frowning).

There are two ways to interpret the link between sublimity and the deactivation of the *corrugator supercilli* (frowning). Deactivations of the *corrugator supercilli* have on the one hand been associated with the experience of positive valence compared to emotional baseline (e.g. Bradley et al., 2001), indicating that sublime experiences indicate positive affect. Such characterization of sublimity has its proponents (e.g. Keltner & Haidt, 2003), although report of physiological response to sublimity have been rare. This view, however may ultimately fall short, since sublime photographs in the present study failed to activate an area of the face most distinctly related to positive valence, namely the *zygomaticus major* (smiling; e.g. Scherer & Ellgring, 2007). The generalization of the sublime as a positive experience *per se* thus meets reservations.

A different interpretation of the deactivation of the *corrugator supercilli* is that the sublime represents an experience marked by a decrease of negative emotionality. This interpretation is satisfying for a number of reasons. Theoretically, the ultimate aesthetic value underlying sublimity has often been seen as a derivative of a relief from negativity. When Burke discussed the unique qualities of sublime encounters, he assumed a distinction between pleasure and delight, the sources of beauty and sublimity respectively. In doing this, he characterized delight as “the sensation which accompanies the removal of pain or danger” (p. 36). Kant’s notion of the *dynamically sublime* (1790/1951), too, outlines how the mind is elevated by reducing the threatening aspects of sublime sources, and idea that forms for the core of what Keltner and Haidt’s (2003) would call *accommodation*. These views are in line with the fMRI study of Ishizu and Zeki (2014), who reported the deactivation of brain regions related to negative emotionality upon the perception of sublime photographs. In this light, feelings of the sublime is a negative delight shaped by the elimination of negative emotionality.

Note, however, that the decrease of negativity is limited to the deactivation at the *corrugator supercilli*, as a similar effect was not found at the *frontalis medialis* (inner brow raise), the latter which has been linked with experiences of fear (e.g. Scherer & Ellgring, 2007).

One possibility of this result is that the deactivation of negative emotionality through sublimity is confined to the decreased experience of general negative emotions instead of fear specifically. In support of this notion, Ishizu and Zeki (2014) also failed to find deactivations of brain areas known to be linked specifically with fear, such as the amygdala (Mattavelli, et al., 2013). It is also possible that because the *frontalis medialis* area has been associated with other experiences such as novelty (e.g. Scherer & Ellgring, 2007), which in itself is valence-free, the outcome of decreased negative emotionality through exposure to sublimity may have been relatively downplayed. Based on the evidence so far, it is difficult to determine which of these two options was at play, however.

#### **8.4.3. The discrepancy Between Behavioural and Physiological Data**

The discrepancy between the rating and fEMG data paint a complex picture of the sublime. Although the rating data support the philosophical notion that sublimity represents a fear-related aesthetic experience, there has been no fEMG evidence indicating that sublimity actually evokes fear and negative emotionality.

Yet closer inspection of the data reveals that the discrepancy between rating and physiological data are pronounced in other ways too. One such area is the difference in effect size between the two types of measures. In Study 11, the magnitude of correlation coefficient between fear and happiness ratings,  $r = 0.72$ , significantly differs from the effect size  $r$  of the relationship between fear rating and *zygomaticus major* (smiling; positive valence),  $r = 0.31$  ( $Z = 0.14$ ,  $p = .01$ ). A similar observation can be made regarding the arousal data. Where both sublimity and fear ratings correlated positively with arousal, report of sublimity and fear both failed to be significantly associated with SCR activation, despite SCR's close association with arousal (e.g. Bradley et al., 2001).

One can construe the general reduction of effect size in physiological data compared to rating data as a consequence stemming from limitations of rating as a method of capturing truly felt emotions and of the stimuli pool. Although some stimuli were rated relatively highly in evoking specific emotions compared to others, the actual emotional impact of those stimuli, represented through physiological activations, may not have been sufficiently strong. This may have been caused by the use of a distant 2D screen, where the sense of presence coming from the nature-related photographs may have been compromised. Furthermore, despite efforts to create ecologically valid stimuli, the selected items may have inherently been short of emotional impact as desired. In turn, sublimity's link with physiological indicators of emotional negativity, fear, and arousal, though weakly present, may have been annulled. Still, sublimity's lack of association with fear-related physiological responses is not an issue of effect size, as physiological activations linked to sublimity go in opposite directions to those of fear (this pattern of outcome is maintained even when sublimity is used as a sole predictor of the physiological reactions). How can something be seen as fearful, even though it fails to trigger

physiological responses of fear? There are two conceptual ways to think about the paradox, although neither is entirely satisfactory in its own right.

The first option is “false appraisal”. Ontologically, it is probable that physiological reactions precede explicit appraisals such as ratings (Palmer, Schloss, & Sammartino, 2013). A likely scenario, thus, is that although an individual felt something positive toward a sublime photograph, the intensity and perhaps novelty of the experience would have rendered the individual to falsely interpret the texture of experience as fear. Given Study 11’s design where participants viewed each stimulus for 6 seconds – during which physiological responses were measured – before they appraised the stimulus, this interpretation seems chronologically fitting too.

However, the “false appraisal” view is limited by the crucial fact that the claim cannot be empirically demonstrated. In the present study, all generalizations of physiological measures per item were made on the bases of ratings per item. This means that from an analytical perspective, it is impossible to derive any generalization of how physiological activations cause rating behavior. Ideally, there would be a set of stimuli with them guaranteeing elicitation of specific emotions at early stages of perception, and analyzed how those stimuli would have caused alterations of specific aesthetic and emotional ratings later. Unfortunately, this was not within the scope of the current work.

The other interpretational possibility, then, is “distancing.” Bullough (1912), in his notion of *psychical distance*, explains that the existential safety upon viewing a displeasing object is possible as soon as the viewer allows the object of aesthetic contemplation, “to stand outside the context of [the viewer’s] personal needs and end – in short, by looking at [the object] ‘objectively’” (p. 89). Taking this logic to the study, although participants acknowledged the threat and excitement associated with a sublime stimulus (e.g. erupting volcano), the participant also knew that he/she is located in a safe context of an experimental laboratory. If stimuli evoking danger are in no reach of actual harm, this may in turn reduce the amount of actually felt threat (deactivation of *corrugator supercilli*).

The advantage of this theory is its large following that continues to this day (e.g. Menninghaus et al., 2017; Pelowski et al., 2017), and the fact that the idea commonly underlies general theories of how unpleasant things can be enjoyed (e.g. Bullough, 1912). Yet two crucial problems emerge. On the one hand, the logic of the argument would suggest that anything unpleasant presented in psychological experiments should be translated into an aesthetic, somewhat pleasing (we can be assured those who regularly watch horror films, which are content-wise inherently shocking if not displeasing, would do so in exchange for some kind of delight), or less displeasing phenomenon. Clearly, this outcome does not account for the results regarding the link between fear ratings and their positive correlations with fear-related physiological measures, nor does it support the consistent reports from lab studies that found a link between displeasing objects and increase of *corrugator supercilli* activations, for instance.

On the other hand, even if it were true that participants distanced themselves from fear upon viewing a photograph considered sublime, why would they return to reporting fear afterward? Here, the “false appraisal” hypothesis is reprised.

In sum, both “false appraisal” and “distancing”, while they give important insights into the dissociation between rating and physiological responses, fall short in giving satisfactory conclusions. Recent psychological models of aesthetic processing, too, are insufficient in providing acute explanations, since most models assume congruence between physiological, emotional, and evaluative outcomes, at least within short timeframes of stimulus processing (e.g. Menninghaus et al., 2017; Pelowski et al., 2017). What is certain is that the aesthetic emotion of the thesis, namely sublimity, despite its link with fear, acts differently to fear in terms of bodily reactions. Evidently, such a view of the sublime would fit into Scherer’s (2005) distinction between *utilitarian* and *aesthetic* emotions, the latter which is “not shaped by the appraisal of the work’s ability to satisfy my bodily needs, further my current goals or plans, or correspond to my social values... [but instead] by the appreciation of the intrinsic qualities of the beauty of nature, or the qualities of a work of art or an artistic performance.” (p. 706). Reactions of pure fear, which immediately activate physiological responses linked with fear, in contrast, would fit the mould of *utilitarian* emotions, which are linked with adaptive functions such as fight/flight tendencies and motivational enhancements.

One can assume that the reported fear associated with sublimity, if it can be called fear that is, is likely an aesthetic fear. In fact, despite Burke’s (1759/2008) militant observation of fear-riddled sublimity, he, too, conceded of the possibility of the unique qualities of fear in sublimity, as he argued that the elements of threat and pain in sublimity must be experienced “at certain distances, and with certain modifications” (p. 40). That certain modification, as can be tentatively suggested, roots from what is likely a mix of “false appraisal” and “distancing.”

Ultimately, it doesn’t seem to be the case that researchers were incorrect in their view of sublimity being emotionally positive, because that view would reflect the physiological data. Yet the picture of sublimity as a fear-driven aesthetic occasion, as was argued by the likes of Burke (1759/2008) is also no pure fantasy, given the study’s rating data. At this point, it is curious if the emotional taxonomy of the sublime may depend on how and where one assesses the sublime as an experience. Should one concentrate on the purely verbal and evaluative elements of sublimity, it would not be surprising that one finds a positive association between sublimity and fear. Conversely, considering the visceral experiences of sublime encounters would encourage taking an alternative stance against this controversial claim.

#### **8.4.4. Limitations and Future Directions**

The findings offer new insight into the relationship between sublimity and fear. Nevertheless, the sublime remains a complex phenomenon, and warrants methodological expansion in future studies. Firstly, discrepancies between what people verbally report and what people actually



experience were detected, the latter represented through the fEMG data, only measured three areas of the face were measured. However, in reality aesthetic emotions are likely accommodated by a network of physiological and bodily reactions, some of them possibly more sensitive to the sublime than the areas presently measured. Recent studies, for example, by Suckfüll (2010), used a wide range of bodily and facial reactions – such as observing reactions in according to the Facial Action Coding System (Ekman, Friesen, & Hager, 2002) – to understand emotional processing of aesthetic stimuli. For a fuller understanding of the sublime and its emotional implications, a wider range of measurements, especially on how the sublime develops across different areas of the body will provide useful insights. Secondly, while the stimuli used in the current work concerned nature, this was in large due to keeping with theories from notable texts of philosophy. Philosophers in the past often used nature in their descriptions of the sublime and beautiful (e.g. Burke, 1759/2008). However, as various sources show, the sublime can also be found in other forms, such as in architecture, human face perception, landscape design, music and painting (Monk, 1935), and even in mass media. As put by Palmer and colleagues (2013), “virtually everyone has some aesthetic response to virtually everything they see” (p.80). Future works on the sublime should thus attempt to address how the sublime can play a role in the everyday, and strive to find commonalities of the sublime among various media.

**Chapter 9. Studies 13, 14, and 15: Sublimity and Fear via Subjective Judgements**

## 9.1. Introduction

At the centre of Edmund Burke's *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful* (1759/2008) sits the notion that sublimity is associated with fear. Beauty, on the other hand, is associated with pleasure. Yet this viewpoint, for its substantial influence in subsequent sublime theories (see Chapter 1), saw little light empirically. Hence it was one of the primary concerns of the present thesis to explore the sublimity-fear link.

In the aggregated data analysis of Study 8, photographs evoking more sublimity than beauty were reported to be more unpleasant, arousing, controlling, and fearful, as well as being more awe-inspiring. In Study 10, where the emotional nature of sublimity was explored via a large online study, sublimity was reported to be related to the activation of fear and fear-related evaluations as confusion, anxiety, and tension, and was distinct from general negative evaluations as disgust and boredom. Lastly, that subjective sublimity is correlated with subjective fear in photograph ratings was reported in Studies 11 and 12. These findings promote the Burkean view of fear-related sublimity.

The present chapter provides an extension of this narrative, based on three aggregated datasets. Study 13, using datasets from Studies 3, 4, 5, 6, 7, and 9, involves analysing ratings of a large set of International Affective Picture System (IAPS; Lang et al., 1997) photographs. Sublimity and beauty ratings are correlated with various emotional values given to the set of emotionally standardised images. Study 14 is based on word association data from Studies 3 and 4. Here, sublimity and beauty is associated with various emotional and aesthetic concepts. Study 15 concerns word generation datasets. Taking data from Studies 5, 6, 7, 9, and 12, the study explores what words participants come up with when thinking of sublimity and beauty.

As in all past studies in the thesis, at no point was the link between fear and sublimity suggested. Should the sublimity-fear link be true in the domain of subjective evaluations, one could thus expect the association to emerge through these multiple methodologies involving various task types.

Beyond exploring the exclusive relationship between sublimity and fear, the chapter concludes with a list of suggested word choices for a potential semantic differential scale. The new scale attempts to capture the subjective sublimity-beauty space without the use of 'sublimity' and 'beauty'. While the scale is yet to be psychometrically verified, the analyses of the present chapter no doubt provide an important groundwork for capturing sublimity and beauty, via rigorously produced philosophy-informed testing.

## 9.2. Study 13

### 9.2.1. Methodology

The International Affective Picture System (IAPS; Lang, et al., 1997) is an emotionally standardised set of photograph stimuli. Each photograph is provided with an evaluation on the

three emotional dimensions of valence (i.e. unhappy vs. happy), arousal (i.e. relaxed vs. excited), and dominance (i.e. dominated vs. in control). The three dimensions of emotional states are also known as the PAD model (Mehrabian & Russell, 1974). Lang et al. (1997) provide PAD ratings for each stimulus in their IAPS manual.

IAPS photographs were used throughout much of the thesis, and were rated for their elicitations of sublimity and beauty. These photographs appeared in Studies 3, 4, 5, 6, 7, and 9. This amounted to 90 unique IAPS photographs being tested over 237 participants and 7797 trials. In Studies 3 and 4, IAPS photographs were selected on the basis of diversifying PAD ratings (based on the PAD ratings provided in the IAPS manual). In the case of Study 7, IAPS images were selected on the basis of content diversification without looking at their PAD ratings.

## **9.2.2. Results**

**9.2.2.1. Data preparation.** The data preparation of IAPS ratings was done in a similar fashion to the aggregated data analysis of Study 8. Ratings of sublimity and beauty were aggregated by the 90 unique IAPS images, thus creating ‘average sublimity’ and ‘average beauty’ variables for each image. From these two variables, two variables were created, namely ‘average sublimity + average beauty’ (i.e. S+B) and ‘average sublimity – average beauty’ (i.e. S-B) variables. These two new variables represent the degree to which an experience is both sublime and beautiful, and perhaps just generally “attractive” (S+B), and the degree to which experience is more sublime than beautiful (S-B). The assumption for this interpretation of the newly formed variables is that there is a positive correlation between sublimity and beauty ratings. This assumption, as was in the case for most image rating data in the thesis, was met,  $r(90) = 0.55, p < .001$ .

Valence, arousal, and dominance values for each of the 90 images were taken from the IAPS manual (Lang, et al., 1997). Also considered were the discrete emotional ratings for some of the IAPS images, provided by Mikels and colleagues (2005). These discrete emotional categories were anger, disgust, fear, sadness (all above  $n = 17$ ), amusement, awe, contentment, excitement (all above  $n = 32$ ).

**9.2.2.2. The emotional character of the sublime and beautiful through emotional image ratings.** A number of correlation analyses were run (all available in Table 56). The sublimity and beauty variables were correlated with the PAD variables. On average, sublimity ratings are associated with high pleasure and high excitement, whereas beauty ratings are associated with high pleasure and high dominance. When an image evoked both sublimity and beauty, these images often elicited positive pleasure and the viewers felt more in control. Where sublimity was more elicited than beauty, these images tended to be lower in pleasure, higher in excitement, and make the viewers feel more controlled.

Subjective sublimity was positively linked with subjective fear, awe, and excitement, which can be seen as a manipulation check that ratings of sublimity did indeed relate to awe and to two measures of arousal ('arousal' from the PAD and 'excitement' as a discrete emotion). It is noteworthy that sublimity seems associated only with fear, instead of negative emotions *per se*, such as anger, disgust, or sadness. Subjective beauty, on the other hand, was only related to the experience of contentment.

The degree to which an image evokes both sublimity and beauty (i.e. S+B) was associated with elicitations of awe and contentment. Lastly, replicating the implications of the results from Study 8 (Table 34) but this time with greater observation numbers, the more an image elicited sublimity than beauty (i.e. S-B), the more an image evoked fear, awe, and excitement, but less of contentment.

### **9.2.3. Discussion**

Using data from 6 different studies, Study 13 explored participants's sublimity and beauty ratings of emotionally standardised images. In settings where participants were not guided with specific emotional characteristics of images, the most interesting set of results derived from the S-B, namely the degree to which sublimity and beauty were differentiated by raters. Images that were characterised with low pleasure, high arousal, a sense of dominating the viewers (i.e. low dominance), high fear, high awe, and low contentment were rated as being more sublime than beautiful. This outcome resonates with Burke's (1759/2008) idea of fear-driven sublimity, and replicates similar analyses done before in Study 8. The difference between Study 8 and the present study, however, is that the present study involved a greater number of participants and stimuli. The present study thus provides greater statistical power.

In what other ways is it possible to measure the phenomenology of the sublimity and beauty distinction? As an alternative methodology, if participants are directly given a list of concepts to link with sublimity and beauty, would a similar pattern of sublimity and beauty distinction emerge? This questions were explored in Study 14.

Table 56. Correlation table: Aesthetic ratings and emotional variables (Study 13).

	Valence ( <i>n</i> = 190)	Arousal ( <i>n</i> = 190)	Dominance ( <i>n</i> = 190)					
Sublimity	<b>0.26*</b>	<b>0.39**</b>	-0.14					
Beauty	<b>0.82***</b>	-0.13	<b>0.57***</b>					
S+B	<b>0.63***</b>	0.13	<b>0.27**</b>					
S-B	<b>-0.65***</b>	<b>0.54***</b>	<b>-0.78***</b>					

	Anger ( <i>n</i> = 17)	Disgust ( <i>n</i> = 17)	Fear ( <i>n</i> = 17)	Sadness ( <i>n</i> = 17)	Amusement ( <i>n</i> = 32)	Awe ( <i>n</i> = 32)	Contentment ( <i>n</i> = 32)	Excitement ( <i>n</i> = 32)
Sublimity	0.01	-0.1	<b>0.53*</b>	0.24	-0.29	<b>0.79***</b>	-0.01	<b>0.52**</b>
Beauty	<b>-0.50*</b>	<b>-0.63**</b>	-0.19	-0.01	-0.15	<b>0.31**</b>	<b>0.75***</b>	-0.04
S+B	-0.23	-0.37	0.29	0.17	-0.27	<b>0.69***</b>	<b>0.40*</b>	0.32
S-B	0.36	0.34	<b>0.69**</b>	0.27	-0.16	<b>0.52**</b>	<b>-0.62**</b>	<b>0.55**</b>

Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ . Significant correlates are marked in bold.

## 9.3. Study 14

### 9.3.1. Methodology

To approximate the emotional and aesthetic characteristics of the sublime and beautiful more directly, a word association task was administered at the end of Studies 3 and 4. As a result, 59 participants<sup>52</sup> gave numeric ratings to a set of 112 words or phrases, for their perceived associations with sublimity and beauty respectively.

The list consisted of 50 words/phrases that appear commonly in original philosophical texts in describing (or describing against) sublimity or beauty. The words were mainly extracted from Ashfield and de Bolla (1996), and Hipple (1957). Also included were the 3 PAD dimensions (Mehrabian & Russell, 1974), aesthetic emotion terms developed in the Empirical Visual Aesthetics Lab at the University of Vienna (Pelowski et al., 2019), and awe-related words/phrases appearing in Bonner & Friedman (2011). The item list is available in Figure 12 from Study 3.

### 9.3.2. Results

**9.3.2.1. Basic data description.** Sublimity and beauty ratings for the word association were aggregated by the 112 words/phrases. There was a positive correlation between sublimity and beauty,  $r(112) = 0.72$ ,  $p < .001$ , indicating that items conceived as sublime, are also likely to be conceived as beautiful. The general shape of the sublimity-beauty rating space is visualised in Figure 63.

To further describe the data, ‘average sublimity + average beauty’ (i.e. S+B) and ‘average sublimity – average beauty’ (i.e. S–B) scores were calculated for each item. Using z values of these two scales, 5-7 items at each of the extreme ends of the two scales were extracted.

- High ‘S + B’ scores (sublime and beautiful): *awe-inspiring, beautiful, elevating, fascinated, majestic, marvellous, and nature*
- Low ‘S + B’ scores (not sublime and not beautiful): *bored, disgusted, dread, irritated, low (vs. high), and offended*
- High ‘S – B’ scores (sublime and not beautiful): *afraid, fearful, immense, imposing, intense (emotion-wise), power, and shocked*
- Low ‘S – B’ scores (not sublime and beautiful): *beautiful, charmed, elegant, loving, pleasant (vs. unpleasant), smooth, and softened*

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<sup>52</sup> Studies 3 and 4 tested a total of 88 participants. The reasons that Study 14 considers only 59 participants is because the word association task was not fully administered to all participants in Study 4, due to a mistake by the researcher.

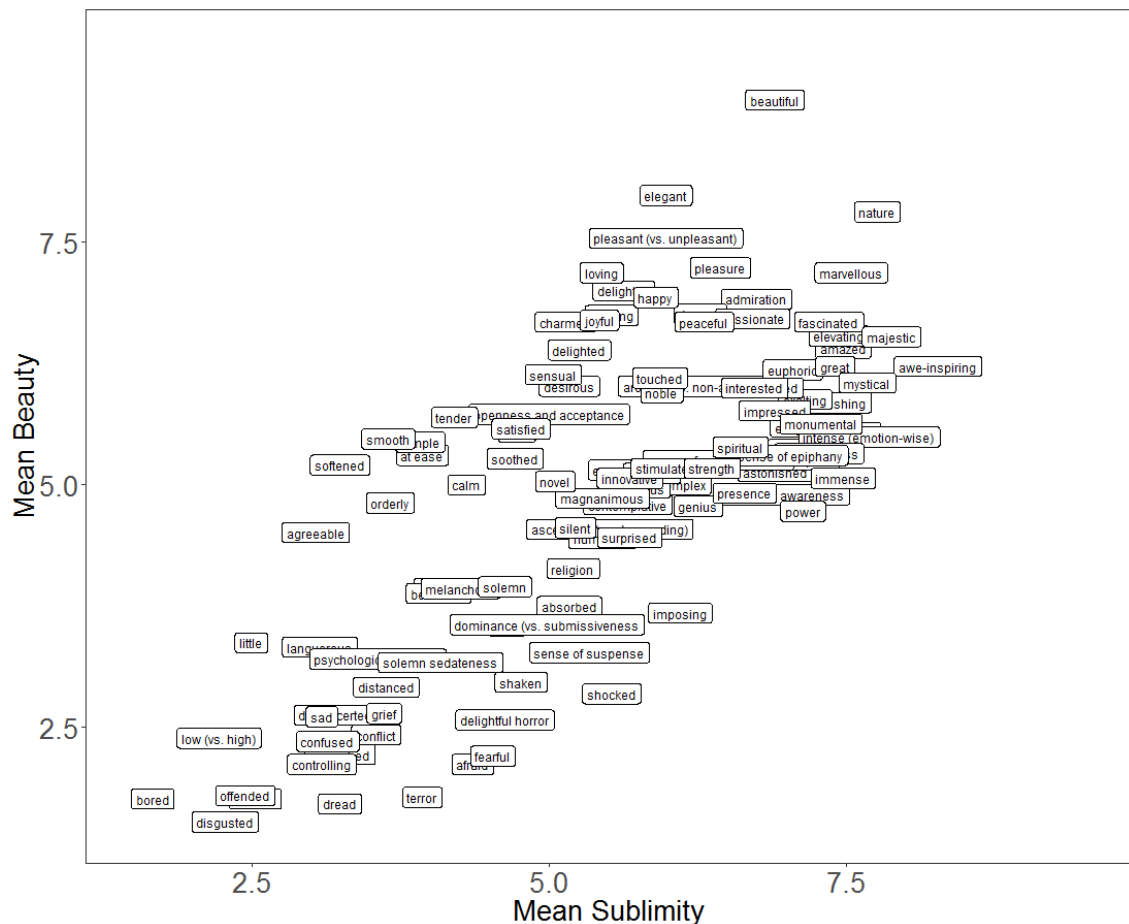


Figure 63. Word association task visualisation (Study 14).

### 9.3.2.2. The emotional character of sublimity and beauty in word association

**studies.** What are the emotional correlates of words/phrases associated with sublimity and/or beauty, and what distinguishes the sublime from the beautiful? Each word/phrase was given emotional valuations. The valuations adopted Recchia and Louwerse's (2015) corpus study, where 23,495 English words were computationally estimated of their valence, arousal, and dominance levels. Recchia and Louwerse's method relies on frequency-normalised co-occurrences patterns of semantic and orthographic neighbouring words (and on few other factors such as word length and contextual diversity), and produces PAD estimates for words. These pleasure, arousal, and dominance ratings have been found to be consistent with human ratings.

The list of 112 words/phrases from the word association data were thus fitted to the database of estimated emotional norms provided by Recchia and Louwerse. By doing this, each item had its own pleasure, arousal, and dominance levels. While most items did not require alteration, some words/phrases not available in the database were exchanged for words of semantic or orthographic similarities. For example, phrases as 'openness and acceptance' became the single term 'openness', 'absorbed' became 'preoccupied' (semantic similarity), and



‘desirous’ became ‘desired’ (orthographic similarity). Directly quoted compound phrases from philosophical texts, as ‘solemn sedateness’ and ‘delightful horror’ were left out, due to difficulties of interpretation. In the end, 104 items were considered in the final analysis.

With the word association dataset replete with valence, arousal, and dominance values, a set of correlation measures were computed (Table 57). The direction and significance levels were identical to those of the previous IAPS rating results, save for the positive relationship between sublimity and dominance.

Note that the analysis does not include fear, a discrete emotion. However, fear is often seen as the most representative emotion of low valence, high arousal, and low dominance (Gebhard, 2005; Hoffmann et al., 2012). Given that the degree to which a word is more sublime than beautiful (i.e. S-B) relates positively to the degree a word is lower in valence, higher in arousal, and lower in dominance, one can thus infer that fear may be what sets apart sublimity from beauty. Looking back to the results of Study 13, it is not surprising that S-B was positively correlated with fear, as well as to low valence, high arousal, and low dominance.

Table 57. Pearson correlation between aesthetic mean ratings and PAD variables for word association (Study 14).

	Valence	Arousal	Dominance
S	<b>0.45***</b>	<b>0.20*</b>	<b>0.32**</b>
B	<b>0.80***</b>	0.01	<b>0.69***</b>
S+B	<b>0.68***</b>	0.11	<b>0.56***</b>
S-B	<b>-0.51***</b>	<b>0.25*</b>	<b>-0.53***</b>

*Note.* ‘S’ = average sublimity ratings. ‘B’ = average beauty ratings. ‘S+B’ = ‘average sublimity + average beauty’ ratings. ‘S-B’ = ‘average sublimity - average beauty’ ratings.  $n = 104$  words. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ . The numbers in bold represent a significant difference at  $p < .05$ .

### 9.3.3. Discussion

Unlike in Study 13 where standardised emotional characteristics of items were correlated to their sublimity and beauty ratings, in Study 14, participants were directly asked to associate sublimity and beauty with a number of emotional and aesthetic words/phrases. When the rated words/phrases were translated into emotional values of pleasure, arousal, and dominance, the overall picture of Study 14 was remarkably similar to Study 13. In both Studies 13 and 14, sublimity relative to beauty was low in valence, high in arousal, and low in dominance in both studies. It can be interpreted that given fear’s characteristics of low valence, high arousal, and low dominance, what differentiates sublimity from beauty may be associated with the involvement of fear. This once again supports Burke’s (1759/2008) claim that fear is integral in sublime experiences.

Still, one of the limitations of a word association task is that people are forced to rate items they otherwise would not have thought of. It is even possible that some participants did not understand some of the words they had to rate. Therefore, to create a more natural process in

extracting characteristics of sublimity and beauty from participants, and especially focusing on the distinction between the two, Study 15 involved the process of asking participants to freely generate words in relation to sublimity and beauty.

## 9.4. Study 15

### 9.4.1. Methodology

The evaluation of the perceived characters of the sublime and beautiful was also done without a list of suggested words/phrases, in the form of asking participants to generate their own words. As part of the debrief in Studies 5, 6, 7, 9, and 12, a total of 190 participants were asked to write on a blank sheet of paper, words that immediately come to mind when thinking of the sublime and beautiful. Each participant was asked to give 7-10 responses for sublimity and beauty each, and were told that the generated words/phrases can be anything from emotions, events, places, objects, people, to ideas. This amounted to 1421 and 1366 words/phrases generated for sublimity and beauty, respectively.

### 9.4.2. Results

The word generation data were analysed in two steps. The first step involves the analysis of minimally corrected raw data, followed by a PAD comparison between words generated for sublimity and those generated for beauty. The assignment of PAD values for words was based on the Recchia and Louwerse (2015) database, as was done in Study 14. The second step involves the pooling of items into concise forms and themes. The themes themselves are used as the basis of a thematic analysis and test of independence between the themes and judgement type, i.e. sublimity vs. beauty.

**9.4.2.1. Raw data analysis.** Given that the responses were to be assigned valence, arousal, and dominance values via the Recchia and Louwerse (2015), raw responses were corrected for spelling mistakes and items with more than one word were reduced to single-word responses. Some words were altered to fit the database's available words, based on semantic or orthogonal similarities. Alternation was minimal, and the majority of the correction involved the transferring of British English to American English, and the correcting of plural words to singular words. Some responses were given in German (Study 12), to which online German-to-English dictionaries were used, under the consultation of an individual with good German knowledge. Last but not least, all words directly related to beauty or sublimity, such as 'beautiful', 'beauty', 'sublime', were deleted. Semantically similar words (e.g. sea vs. ocean), words of differing tenses (e.g. admiration vs. admired), and words of semantic inclusivity (e.g. cold vs. weather), were left untouched to preserve naturalness of the data.

Table 58 presents a table of words that were generated by at least 5% of the participants. From the entire dataset, only 'nature' was commonly emergent in both lists. When

valence, arousal, and dominance values for all raw data were assigned through the Recchia and Louwse (2015) database, words generated for sublimity, compared to words generated for beauty, were lower in valence,  $t(2627.40) = 19.95, p < .001$ , higher in arousal,  $t(2731.40) = 15.68, p < .001$ , and lower in dominance,  $t(2438.50) = 21.93, p < .001$ . These results reflect previous emotional comparisons between sublimity and beauty.

Table 58. The most common words generated for sublimity and beauty (Study 15).

Sublimity	Beauty
Nature (23.16%)	<b>Pretty (39.95%)</b>
<b>Powerful (22.63%)</b>	Nature (22.11%)
<b>Grand (15.26%)</b>	<b>Attractive (21.05%)</b>
Mountains (14.21%)	Colorful (23.68%)
Breath-taking (13.68%)	<b>Cute (16.84%)</b>
<b>Power (12.63%)</b>	<b>Aesthetic (15.79%)</b>
<b>Astonishing (12.11%)</b>	Love (15.26%)
<b>Awe (12.11%)</b>	<b>Flowers (15.26%)</b>
Overwhelming (10.00%)	<b>Happy (12.63%)</b>
<b>Impressive (8.95%)</b>	<b>Colors (12.63%)</b>
<b>Fear (8.42%)</b>	Animals (11.05%)
<b>Ocean (8.42%)</b>	<b>Joy (8.95%)</b>
Emotional (7.89%)	<b>Happiness (7.89%)</b>
<b>Vast (7.89%)</b>	<b>Smile (7.89%)</b>
<b>Great (7.37%)</b>	<b>Pleasing (6.842%)</b>
<b>Shock (7.37%)</b>	Natural (6.32%)
<b>Inspiring (6.84%)</b>	<b>People (6.32%)</b>
<b>Majestic (6.84%)</b>	<b>Pleasant (6.32%)</b>
<b>Shocking (6.84%)</b>	Scenery (5.79%)
<b>Volcano (6.84%)</b>	<b>Calm (5.79%)</b>
Amazing (6.32%)	<b>Nice (5.26%)</b>
Landscape (6.32%)	<b>Sweet (5.26%)</b>
<b>Extreme (5.79%)</b>	Art (4.74%)
Sea (5.79%)	Music (4.74%)
<b>Cosmos (5.26%)</b>	Sunset (4.74%)
<b>Imposing (5.26%)</b>	Symmetry (4.74%)
<b>Large (4.74%)</b>	<b>Gorgeous (4.74%)</b>
<b>Strong (4.74%)</b>	<b>Eyes (4.74%)</b>
<b>Waterfall (4.74%)</b>	<b>Peaceful (4.74%)</b>

*Note.* Words in bold are words that are present less than or equal to 1% of responders in the other category.

**9.4.2.2. Pooled data analysis.** To account for words of similar or inclusive semantics, or of sharing the same stem (but differing in tense), items were pooled into more concise terms. For example, all ‘ocean’ responses were replaced with ‘sea’ (semantic similarity), items such as ‘lightning’ were replaced with ‘storm’ (semantic inclusivity), and all ‘wondrous’ responses were replaced with ‘wonder’ (tense alteration). Further pooling was made, since Recchia and Louwerse (2015) had also considered multiple forms of the same word, e.g. singular vs. plural forms or British vs. American English.

Afterward, the data were further reduced until all items were fit into themes, e.g. words as ‘uncertain’ and ‘lost’ were grouped under the theme of ‘confusion.’ The unification of terminology between responses was also considered; for example, ‘delight’ and ‘joy’, essentially the same theme, was notated as ‘joy’ in both sublimity and beauty responses. In their final forms, sublime words were reduced to 118 themes and beauty words to 116 themes. Put together, both responses produced 176 unique themes, meaning there was 32.95% overlap. Table 59 presents a table of themes, based on themes that were reported by at least 10% of the respondents. Of these, ‘nature’, ‘animals’, and ‘scenery/landscape’ were observed in both judgement types in at least 10% of the respondents.

Table 59. The most common concepts generated for sublimity and beauty (Study 15).

Sublimity	Beauty
Powerful (51.57%)	Joy (51.58%)
<b>Vast (38.42%)</b>	<b>Pretty (44.21%)</b>
Breath-taking (30.00%)	Colourful (31.58%)
Nature (27.37%)	Nature (29.47%)
Mountains (27.37%)	Calm (27.89%)
<b>Shocking (24.21%)</b>	Love (27.37%)
<b>Grandeur (21.89%)</b>	<b>Pleasant (23.68%)</b>
<b>Awe (17.89%)</b>	<b>Attractive (23.16%)</b>
Sea (17.89%)	<b>Flowers (21.58%)</b>
Spiritual (16.32%)	Animals (20.00%)
<b>Fear (14.74%)</b>	<b>Cute (18.42%)</b>
Animals (14.21%)	<b>Aesthetic (15.79%)</b>
<b>Astonishing (14.21%)</b>	Scenery/Landscape (13.16%)
Celestial/space (13.16%)	Symmetry/Balance (12.11%)
<b>Danger (12.63%)</b>	
<b>Storm (12.63%)</b>	
Scenery/Landscape (12.11%)	
Emotional (11.58%)	
Special (11.58%)	
Meaningful (10.53%)	
Overwhelming (10.53%)	
Inspiring (10.00%)	

*Note.* The words in bold are words that are present less than or equal to 1% of responders in the other category.

For a better overview of the themes, the themes were subjected to further reduction. First, themes with single frequency of observations were eliminated (< 5% of sublimity and beauty total observations, respectively). The themes were then reduced to 20 concept categories (Table 60). Note that even within the same concept categories, there are some notable differences. For instance, where both sublimity and beauty had themes of positive emotions, many themes for beauty are associated with human descriptions (e.g. attractive, charming, cute, etc.).

To test the independence of the themes and the judgement type, a frequency table of Table 60 was tested for a chi-squared test. The test reveals that the spread of themes are not equal between sublimity and beauty,  $\chi^2(19) = 974.32, p < .001$ . As can be inferred from the previous PAD analysis, sublimity themes were more charged with negative emotionality, intensity, quantity, power, and a sense of the supernatural. On the other hand, beauty themes were often related to calmness, colours, humans, symmetry, and femininity.

Table 60. Frequency table of themes (Study 15).

Concept category	Sublimity ( <i>n</i> = 1363)	Beauty ( <i>n</i> = 1296)
Positive evaluation	Admiration, appreciation, arresting, astonishing, breath-taking, impressive, joy, magnificent, majestic, Marvellous, perfect, phenomenal, relief, satisfaction, supreme ( <i>n</i> = 167)	Admiration, appreciation, attractive, breath-taking, charming, cute, freshness, fun, glamorous, glorious, Grace, handsome, harmless, heartfelt, impressive, innocence, joy, perfect, pleasant, satisfaction, sweet, warm, Aesthetic, pretty ( <i>n</i> = 472)
Negative evaluation	Aggression, anger, anxiety, confusion, despair, discouraging, fear, horrific, struggle, ugly, Diminished, loneliness ( <i>n</i> = 71)	Envy/jealousy, diminished ( <i>n</i> = 5)
Awe	Awe ( <i>n</i> = 34)	( <i>n</i> = 0)
Intensity	Aroused, energy, intense, shocking, emotional, overwhelming, vivid ( <i>n</i> = 123)	Aroused, emotional, energy, focused, intense, overwhelming, surprise, tears, vivid ( <i>n</i> = 35)
Calm	Calm, comfort, soft ( <i>n</i> = 16)	Calm, comfort, flowing, soft ( <i>n</i> = 75)
Nature	Cave, celestial, cliff, earth, fire, forest, mountains, nature, scenery/landscape, sea, sky, storm, sun, water ( <i>n</i> = 269)	Autumn, celestial, earth, flowers, forest, mountains, nature, rainbow, scenery/landscape, sea, sky, snow, sun, water, weather, winter ( <i>n</i> = 208)
Danger	Danger, death, disaster, explosion ( <i>n</i> = 66)	( <i>n</i> = 0)
Quantity/size	Grandeur, numerous, size, spacious, vast, infinite ( <i>n</i> = 138)	Vast ( <i>n</i> = 2)
Supernatural	Incredible, indescribable, heaven, magical, mysterious, spiritual, supernatural, uncontrollable, wonder ( <i>n</i> = 101)	Magical, spiritual, wonder ( <i>n</i> = 13)
Art	Art, building/architecture, literature, music/instruments ( <i>n</i> = 22)	Art, fashion, literature, music/instruments ( <i>n</i> = 34)
Animals	Animals, carnivorous ( <i>n</i> = 29)	Animals, butterflies ( <i>n</i> = 40)
Colours	Bright, colourful ( <i>n</i> = 9)	Bright, colourful, contrast, green, light, pink ( <i>n</i> = 98)
Human	Humans ( <i>n</i> = 2)	Baby, cosmetics, face, humans ( <i>n</i> = 51)
Love	Friendship, love ( <i>n</i> = 6)	Cuddle, family, friendship, kindness, love ( <i>n</i> = 85)
Symmetry	Harmony, Symmetry ( <i>n</i> = 7)	Harmony, symmetry ( <i>n</i> = 35)
Femininity	( <i>n</i> = 0)	Feminine ( <i>n</i> = 16)
Special		Special, striking ( <i>n</i> = 14)

Concept category	Sublimity ( <i>n</i> = 1363)	Beauty ( <i>n</i> = 1296)
	Crazy, extreme, memorable, special, striking ( <i>n</i> = 47)	
Powerful	Imposing, powerful ( <i>n</i> = 108)	Powerful ( <i>n</i> = 3)
Thought-provoking	Creation, deep, evolution, historical, inspiring, intriguing, life, meaningful, transient ( <i>n</i> = 81)	Creation, inspiring, intriguing, historical, life, meaningful, memories, transient ( <i>n</i> = 24)
Others	Achievements, appearance, city, food, immobile, open, phenomenon, politics, raw, darkness, courage, cold, atmospheric ( <i>n</i> = 67)	Clear, complexity, confidence, content, detail, food, freedom, healthy, holiday, model, object, open, sensual, simple, sophistication, sports, subjective, familiar ( <i>n</i> = 86)

*Note.* The number within each column represents the frequency of observation for each concept category. The ‘Awe’ concept category only included the theme ‘awe’, the latter which also consisted only of the specific input of ‘awe.’ Awe was made into this specific category, due to its unique link with sublimity.

What does the distribution of themes mean emotionally? The frequency of observation for the 176 themes themselves were used as data to be correlated (Spearman) with assigned PAD values (Table 61). The results show that the more often a theme is generated as being both sublime and beautiful, the more likely the theme is high in valence and dominance. The more often a theme is generated as being more sublime than beautiful, the more likely the theme is low in valence, high in arousal, and low in dominance. These two findings replicate the results from the rest of the chapter.

Table 61. Spearman correlations between aesthetic variables mean ratings and PAD variables for the word generation themes (Study 15).

	Valence	Arousal	Dominance
S	<b>-0.15*</b>	<b>0.23**</b>	<b>-0.22**</b>
B	<b>0.45***</b>	<b>-0.24**</b>	<b>0.44***</b>
S+B	<b>0.22**</b>	0.06	<b>0.16*</b>
S-B	<b>-0.33***</b>	<b>0.29**</b>	<b>-0.38***</b>

*Note.* Data unit is frequency of appearance. ‘S’ = average sublimity ratings. ‘B’ = average beauty ratings. ‘S+B’ = ‘average sublimity + average beauty’ ratings. ‘S-B’ = ‘average sublimity - average beauty’ ratings. *n* = 176 words. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ . The numbers in bold represent a significant difference at  $p < .05$ .

### 9.4.3. Discussion

Study 15 formed the final study in a series of studies looking into the emotional characteristics of sublimity. In Study 15, participants were asked to generate words on their own that they think are associated with sublimity and beauty. When this was done, the kinds of words participants generated for sublimity were similar to eighteenth century descriptions of the sublime, e.g. vastness, power, danger, etc. Beauty had a contrasting profile, with themes as femininity, colours, and calmness appearing often. When the emotional characters of these two theme

groups were compared, Study 15, just like Studies 13 and 14, had S-B correlating with low valence, high arousal, and low dominance. Thus in three methodologies, the degree to which sublimity is distinguished from beauty seems related to fear (in the previous chapter, it was established that fear is an emotion of low valence, high arousal, and low dominance), even when participants did not directly rate fear (as participants did in Studies 11 and 12).

### **9.5. Developing a Semantic Differential Scale**

The present chapter included two studies – word association and word generation – that accrued words and concepts characterising sublimity and/or beauty. Using these available data, a set of words to represent the sublimity-beauty space without the use of the words sublimity and beauty is suggested.

Throughout the chapter, emotional characteristics of the sublime and beautiful were unveiled, many of them consistent between studies. Save for the word generation data from the present study where participants were forced to draw contrasts between sublimity and beauty, sublimity and beauty were positively correlated.

The positive relationship between sublimity and beauty results in a number of issues, one of which is that in the conceptualisation of sublimity and beauty as being independent experiences, as per most British thinkers from the eighteenth century, is not met. There arise ambiguities, since the response toward elicited sublimity also inherits elements of beauty, and *vice versa*, when sublimity was initially portrayed as something different from beauty. The measure of sublimity itself is thus never the pure sublimity intended to be measured. Although it is reasonable for the data to suggest that two seemingly different things are similar, and there are rarely issues with analysing such data, the mismatch between concept and behaviour is nevertheless a theoretical itch.

In the context where sublimity risks being beauty and beauty being sublimity, one natural solution is to force conceptual opposition between sublimity and beauty entirely, as Burke (1759/2008) has done. Yet such assumption was never met throughout the thesis's empirical data, given the correlation between sublimity and beauty (see also Ishizu & Zeki, 2014). Furthermore, forcing the separation may yield consequences only relevant to Burke's theories, losing an empirical work's ecological validity. Another solution is to eliminate either sublimity or beauty. Yet as underscored in the Introduction of the thesis, to do so is to forgo philosophical theories from the past – past theories have often elucidated the characters of the sublime and beautiful simultaneously. More importantly, the task of capturing of pure sublimity becomes even more troublesome. If to ask for sublimity alone, does this measure sublimity and beauty, beauty, or even things like wonder or liking? This is a classic case of construct validity violation, where there is mismatch between what was meant to be measured, and what is measured.



Alternatively, to theorise on the onset of sublimity being an experience related to beauty may enable the embracing of the observed sublimity and beauty correlation. A solution to capture the sublimity-beauty space in the most theoretically congruous way would be to rotate the measurement axes to explain most of the data's variances. This is akin to a principal component analysis. The first principal component axis would explain most of the data, and the second principal component axis would maximally explain the data's variance that is orthogonal to the first principal component. Given the positive correlation between sublimity and beauty, the S+B and S-B scales are seen as a proxy to the first and second principal components, respectively. The conceptualisation of S+B and S-B as axis rotation is visualised in Figure 64.

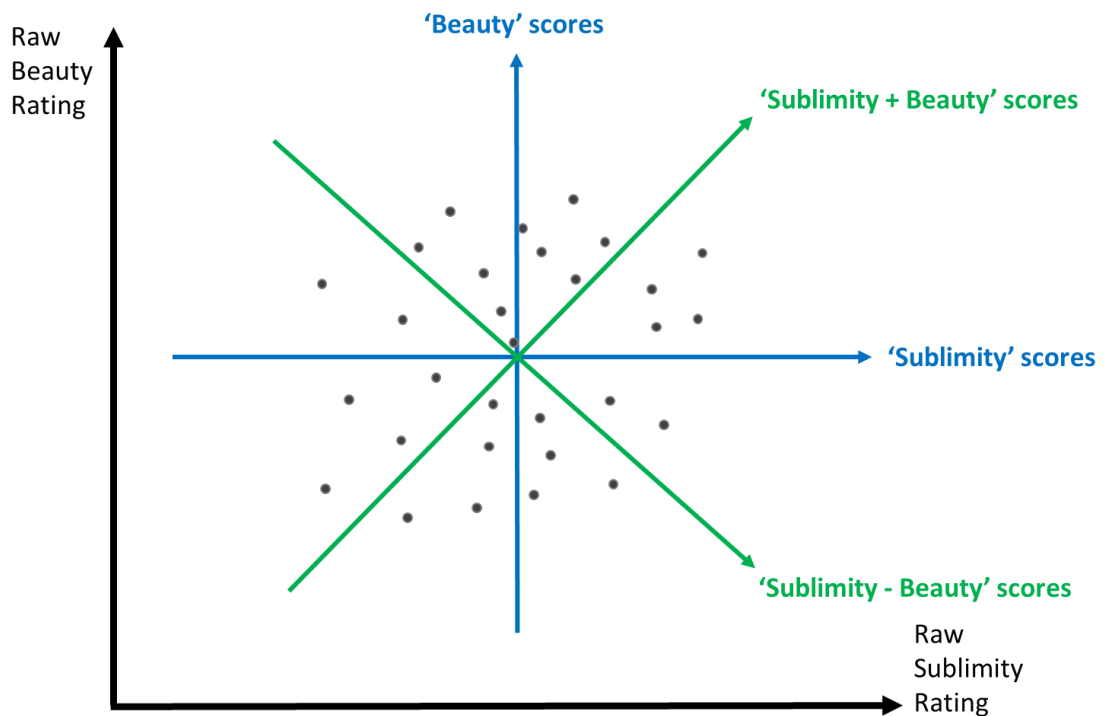


Figure 64. Visualisation of axis rotation.

*Note.* The S+B and S-B axes are perpendicular to each other, just as how the sublimity and beauty axes are perpendicular to each other.

Validations of the S+B and S-B as independent scales to each other, thus being perpendicular to each other in their directions have been already made throughout the theses. The correlations between the two scales have been non-significant in the datasets from Study 8,  $r = -0.05$ ,  $p > .05$ , and from the present chapter, Study 13,  $r = -0.15$ ,  $p > .05$ , and Study 14,  $r = -0.08$ ,  $p > .05$ , datasets.

Psychological inferences made using these scales have also been reliable, with emotional characteristics of both axes directions being replicated in multiple settings. In the present chapter, the S+B dimension have always been associated with high valence and high dominance. In the case of the S-B dimension, its equivalent terms were used throughout the thesis; Study 8 used regression coefficients of judgement types (sublimity vs. beauty), and

Studies 11 and 12 used partial correlations where correlations between sublimity and other emotional variables were made accounting for beauty. These methods resulted in the singular outcome that what is more sublime than beautiful relates to low valence, high arousal, low dominance, and fear. In fact, the contrasting between sublimity and beauty closely resembles Burke’s sublimity, in both conceptual and statistical results, at least more cleanly than when measuring sublimity on its own.

In other words, not only does the consideration of these newly formed axes most parsimoniously capture the data, it also forms an important bridge between the Burkean theoretical representations and empirical measures of sublimity. And after all, Burke and his fellow thinkers rarely theorised of sublimity alone, as they had mostly created a conceptual mould of sublimity that acts against beauty. The new axes may hence capture Burke’s – or more largely eighteenth century Britain’s – sublimity and beauty better than any other psychometric measures available in empirical psychology.

The following are suggested labels to be used for a potential semantic differential scale of the two dimensions (Table 62). The labels are made available from the word association and generation datasets of the present chapter. While no psychometric verifications have been made, the labels are followed by two sample questionnaires, demonstrating how the words can be used in its final form.

Table 62. Suggestion of word choices to represent the ‘sublimity + beauty’ and ‘sublimity – beauty’ dimensions (Study 15).

	S + B	S – B
Low	Anger, boredom, irritation, offense, disgust	Calm, love, joy, happiness, pleasure, attraction, charm
High	Elevation, fascination, marvel, astonishment	Power, shock, intensity, grandeur, strength

[Sample Questionnaire 1]

To what degree do you identify with the following experiences? Please select one choice from each scale, from 1 (identify most with the left-hand side experience) to 9 (identify most with the right-hand side experience):

“I experienced...”

Anger	1	2	3	4	5	6	7	8	9	Marvel
Intensity	1	2	3	4	5	6	7	8	9	Calm
Fascination	1	2	3	4	5	6	7	8	9	Shock
Joy	1	2	3	4	5	6	7	8	9	Disgust
Charm	1	2	3	4	5	6	7	8	9	Grandeur
Elevation	1	2	3	4	5	6	7	8	9	Irritation
Power	1	2	3	4	5	6	7	8	9	Love
Boredom	1	2	3	4	5	6	7	8	9	Astonishment

[Sample Questionnaire 2]

From the following five group of words, please select one group to which you identify your experiences most.

“I experienced...”

<b>Choice A</b> “...calm, love, joy, happiness, pleasure, attraction, and/or charm”		<b>Choice B</b> “... elevation, fascination, marvel, and/or astonishment”
	<b>Choice E</b> “...none of these experiences”	
<b>Choice C</b> “...anger, boredom, irritation, offense, and/or disgust”		<b>Choice D</b> “...power, shock, intensity, grandeur, and/or strength”

### 9.6. Discussion and Chapter Summary

In Studies 8, 10, 11, and 12, subjective sublimity was associated with fear and fear-related emotions, such as confusion and tension. These results align with Burke’s (1789/2008) notion of the sublime, since Burke saw the source of the sublime as fear and terror. Beauty, on the other hand, was seen to be rooted in pleasure.

The narrative of the fear-laden characterisations of the sublime was further explored in the present chapter, using emotional image rating, word association, and word generation datasets, each involving 237, 59, and 190 participants. While images eliciting fear were often rated as being sublime, sublimity was also positively correlated with the pleasure levels, i.e. valence, of those items (IAPS rating & word association).

Sublimity that incorporated elements of beauty, in the forms of S+B (the degree sublimity is elicited more than beauty) and S-B (the degree sublimity is elicited together with beautiful) scores, however, revealed more consistent and stronger outcomes. Throughout the three studies in the present chapter, and also replicating Studies 8, 11, and 12 results, sublimity

being elicited more than beauty was characterised as being unpleasant, exciting, controlling, and fearful. Again replicated in all three datasets, the more sublimity was elicited together with beauty, the more pleasant and under control the experience felt.

The word generation analysis revealed contrasting emotional and semantic connotations of the sublime and beautiful. Where objects, events, and emotions claimed to be associated with sublimity had elements of danger and vastness, those observed to be associated with beauty were more friendly and human-oriented, for example. Using the distinction between the sublime and beautiful, the chapter concluded with a suggested semantic differential measure.

### **9.6.1. Uniqueness of Fear**

While fear has been commonly grouped with sublime experiences throughout time, recent empirical works on the sublime have tested this claim either by relying on general negative emotions or by looking at fear only (Ishizu & Zeki, 2014; Hur et al., 2018). The present results, together with those from Studies 8, 11, and 12, demonstrate that sublimity relates specifically to fear, instead of it being linked with other negative emotions as anger, disgust, or sadness, or general emotions of negative valences. The character of the sublime thus differs from aesthetic emotions that incorporate melancholy/sadness or disgust (e.g. Menninghaus et al., 2017; Vuoskoski & Eerola, 2017).

How can fear be delightful? It may be that people see fear – an emotion of low valence, high arousal, and low dominance (Gebhard, 2005; Hoffmann et al., 2012) – as a proxy to a highly arousing experience. After all, actual fear is rarely experienced in sublimity, and highly arousing experiences in themselves can be thrilling (Menninghaus et al., 2017). Still, the Hur et al. publication has also found little connection between actual arousal and sublimity, and so have others, who have tested subjective awe (Gordon et al., 2016). It may be possible that subjective fear, a unique network of thrill, mystery, and danger, can be delightful once guaranteed of actual physical safety. How physical safety is registered before functioning as a distancing mechanism for delight has been theorised before (Bullough, 1912), although the exact working are still questionable.

### **9.6.2. Sublimity as Opposed to Beauty, as Opposed to Sublimity Alone**

Subjective sublimity and beauty were often correlated throughout the thesis including in the present chapter, and when used on their own, were inconsistently correlated with emotional measures. For instance, where sublimity was positively valenced in the IAPS rating and word association tasks, the relationship was reversed in the word generation task. On the other hand, ‘sublimity + beauty’ and ‘sublimity – beauty’ scores were consistently non-correlated to each other, and their emotional correlates were consistent among the datasets. While consistency is hardly the only tool at hand, these results suggest that sublimity may best be conceptualised when considered together with beauty.

That is, people are good at making categorical distinction between sublimity and beauty. A photograph of an erupting volcano (a stimulus considered highly sublime but not beautiful) would never be seen as being more beautiful than sublime. People are also good in things that are both sublime and beauty, this evaluation representing a “general beautiful” (e.g. sunsets), as opposed to things that are “generally ugly” (e.g. garbage bag). On the other hand, people’s judgements of pure sublimity may be weaker and less stable, mainly because sublimity relates to correlates with beauty by measure, or in the case of Konečni (2012), by nature. As such, judgements of just sublimity is never about just sublimity.

If true that the two dimensions of ‘sublimity + beauty’ and ‘sublimity – beauty’ are psychologically independent, the two dimensions may also represent independent measures. Accordingly, a potential for a semantic differential scale of two dimensions is possible. Word choices are crucial given the subtlety of aesthetics and the subtlety of psychometrics, and samples of these were provided in the last part of the results section. While not psychometrically verified of yet, these developments no doubt provide an important few steps into the measures of the sublime and beautiful.

### **9.6.3. Limitations**

All word association and generation tasks were done as part of debriefing in the various image rating tasks throughout the thesis. It may be criticised that that the prior tasks might have influenced the word generation or word association. Note, however, that at no points were the participants instructed of which items are or are not sublime and/or beautiful. It was down to the participants to decide what was sublime, and what was beautiful of a wide range of images, and to reflect on this verbally afterward. Despite the possibility of being primed from the stimulus, if certain imageries or emotions were consistently evoked between participants as being associated with the sublime and/or beautiful more than other associates, the data are meaningful. This is what was analysed.

It is noteworthy that as in all past studies of the thesis, at no point was the link between sublimity and fear mentioned, nor the interacting role of beauty. Despite the wide-ranging types and number of tasks, an important connection between sublimity and fear was found. To date, the present set of studies remains one the most extensive of its kind in explicating the emotional nature of the sublime (and beautiful).

## **Chapter 10. Conclusion**

## 10.1. Summary of the Thesis

This thesis provided a set of empirical results on the psychologies of the sublime and beautiful, rooting ideas in past philosophical and historical explorations of the subject, with Edmund Burke's (1759/2008) *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful* forming a pivotal overall influence. A set of empirical explorations elaborated on some psychometric, physical, and emotional aspects of sublimity and beauty, involving 768 participants, 571 photographic stimuli, 36 musical stimuli, and numerous verbal responses by participants. Thus, one of the thesis's noticeable contributions lies on the work being a systematic analysis on the phenomenology of sublimity and beauty in tandem with considerable statistical power and generalisability.

Prior to presenting the studies, a general introduction reviewed why there is a need of a scientific study of the sublime and beautiful beyond a simple focus on pleasure and beauty (Chapter 1a). A detailed elaboration into the etymological, philosophical, and psychological histories of sublimity further provided grounds as to the uniqueness and universality of sublimity as a psychological phenomenon (Chapter 1b). This was followed by a critique of existing empirical works (Chapter 1c). It was here that the importance of Edmund Burke, the need for the simultaneous consideration of sublimity and beauty as a pair of dependent variables, and the importance of suitable design-wise and analytical methodologies were underscored.

The two pilot studies examined the within-participants and between-participants consistencies of sublimity and beauty judgements (Chapter 1d), a topic that was later extended to a larger number of participants (Chapter 2). Having established that sublimity and beauty are reliable judgements, the studies then assessed whether sublimity and beauty are affected differentially from a stimulus' size, height (Chapter 3), and colour (Chapter 4). These explorations revealed that image size affects sublimity more than beauty, that object colour affects beauty more than sublimity, and that image height affects both sublimity and beauty.. Given the theoretical importance of size in the literature of the sublime, the size effect was further sub-divided into visual angle, viewing distance, and actual image size. These manipulations were considered simultaneously with manipulations of brightness and contrast (Chapter 5). The studies showed that visual angle is the most crucial mechanism for exploring size effects, a finding that was also present in an aggregated data analysis. On the other hand, brightness and contrast were not effective in influencing sublimity and beauty judgements.

Because music is one of the most discussed and most commonly experienced art forms, the determinants of sublimity and beauty in music and in audio-visual cross-modal stimuli were explored (Chapter 6). While mode type (i.e. atonality vs. minor key vs. major key) affected both sublimity beauty, the major key was linked with beauty much more than sublimity. The sublimity of audio-visual stimuli was affected by the sublimity of the music clips and photographs, although the effect of image sublimity was significantly larger than that of music



sublimity. Similarly, the beauty of audio-visual stimuli was affected only by the beauty of the music clips and images, with the beauty of the images similarly being more important than that of the music clips.

To ask more generally what sublimity means to people, an online survey was launched in which participants described a sublime encounter. Sublimity seemed to be elicited by a wide range of objects and events, but was surprisingly similar between participants in the emotions it evoked (Chapter 7). While there was pleasure, arousal, and a sense of transformation, this was also accompanied by a sense of tension and shock, supporting a Burkean view of sublimity. In a separate study, the role of fear in sublimity was explored more directly, participants readily associated subjective sublimity with subjective fear in image rating tasks (Chapter 8). However, subjective sublimity did not elicit fear-associated physiological reactions assessed using facial electromyography and skin conductance measures. Overall, there was robust evidence that in image rating, word association, and word generation tasks, sublimity, especially when compared against beauty, was related to fear (Chapter 9).

The 15 empirical studies, then, answered the seven aims presented at the end of Chapter 1a. The seven aims are reproduced in Table 63, attached with a short summary of findings.

Table 63. Summary of thesis

Aims	Studies	Summary
What are the general descriptions of sublime experiences?	10, 14, & 15	A wide range of emotions and events are associated with sublime experiences, and almost all include a sense of power and profundity.
How consistent are judgements of sublimity both within and between participants?	1, 2, 3, 4, 5, 6, 7, 9, 11, & 12	There are generally high levels of both within- and between-participants rating consistencies.
What physical properties of objects such as size, height, colour, brightness, and contrast, influence experiences of the sublime?	5, 6, 7, & 8	Sublimity generally increases with increased object size and height, but the size effect is most selective for sublimity. The size effect is driven by visual angles, not by viewing distance or actual object size.
What emotions underpin sublime experiences? Specifically, what is the role of fear?	8, 10, 11, 12, 13, 14, & 15	Sublimity in itself can evoke a wide range of emotions. When compared against beauty, sublimity is usually related with fear.
Are there physiological correlates of sublime experiences?	12	Sublimity ratings are associated with less frowning.
How do visual and auditory modalities interact to produce sublime experiences?	9	The sublimity of an audio-visual stimulus is predicted by the sublimity of both the image and the music. The former's effect is significantly larger than the latter's effect.
How do sublimity and beauty differ?	2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, & 15	While sublimity and beauty ratings are often correlated, sublimity seems to be more linked with size and fear. There are also distinct images that rate high on sublimity but not beauty, and that rate high on beauty but not sublimity.

## 10.2 Key Themes in the Thesis

In Table 63, certain themes re-emerged throughout the thesis more often than others. These themes were test-retest reliability (or within-participants consistency), between-participants agreement (or between-participants consistency), sublimity-beauty correlation, size effect, and fear. The nature of the numerous reappearances of these themes lies in the fact that they were of special importance in understanding the workings of the sublime, and they were examined in multiple occasions using different methodologies. These studies showed that sublimity and beauty, beyond their surface complexity, have patterns that are reproducible and consistent across studies. A summary of how the key variables are represented in the thesis is presented in Table 64 and Table 65.

In the two tables below as well as in the rest of this section, four related papers are present as sources of comparisons. These are Edmund Burke (1759/2008), for Burke's substantial contribution on theories of the sublime, and Ishizu and Zeki (2014), for their paper being one of the few works to consider both sublimity and beauty in the context of rating photographs. Keltner and Haidt (2003) and Konečni (2005, 2011) are also considered, for their works are two of the most influential bodies of psychological theories on the sublime.

### 10.2.1. Test-retest Reliability and Between-Participants Agreement

Rating procedures are seen as one of the three main methodologies of empirical aesthetics as suggested by Gustav Fechner, and constitutes a variant of the *method of choice* (Mather, 2013).<sup>53</sup> In this thesis as well as in the broad literature of empirical aesthetics, ratings are commonly used. In this context, the test-retest reliability of ratings assesses whether participants making complex judgements of complex stimuli are at least consistent in their ratings. Consistent ratings mean that the ratings signify something psychologically stable and meaningful in the given task, and can indicate that participants have a basic understanding of the task. Surprisingly, testing the reliability of ratings is fairly novel in the psychology of sublimity. In studies in this thesis, high test-retest reliabilities were obtained. Although Burke had played down individual differences (as has Konečni, 2005), such that certain objects elicit sublimity universally, it was of interest to see that there were good levels of between-participants agreement in most studies.

### 10.2.2. Sublimity-Beauty Correlation

Unlike Burke's (1759/2008) assumption that sublimity and beauty represent opposite passions, recent theories (Konečni, 2005; 2011) assume that what is sublime is also beautiful. The positive correlation between sublimity and beauty was demonstrated recently by Ishizu and

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<sup>53</sup> The other two methods are *method of production* (participants are asked to produce something in accordance to their taste) and *method of use* (objects in the real world are examined, assuming that what most frequently exists is in line with what is most approved).

Zeki (2014), although Keltner and Haidt (2003) dismiss issues of beauty from their theoretical framework of awe. Throughout the thesis, sublimity and beauty were almost always present, and their correlations were reported where possible. The studies support the general view of sublimity's positive correlation with beauty.

### **10.2.3. Size, Sublimity, and Beauty**

Possibly one of the least controversial statements in the literature of the philosophy and psychology of sublimity is that sublimity relates to size. Size can relate to subjectively felt vastness, imagined vastness, or actual vastness of an object. Even so, matters get more controversial with the involvement of beauty. Burke (1759/2008) saw a double dissociation; largeness relates to sublimity but not to beauty, while smallness relates to beauty but not to sublimity. The results from the thesis do not support such claims, since size affected both sublimity and beauty positively. However, sublimity seemed more influenced by size than beauty. While Ishizu and Zeki (2014) similarly saw a correlation between beauty and size, most of the literature follows the paths of Konečni (2005, 2011) and Keltner and Haidt (2003), where the link between sublimity and size is made without much mention of the link between beauty and size.

There are three important implications of the relationships between size, sublimity, and beauty. Firstly, the results demonstrate that while sublimity and beauty are related experiences, they may also follow distinct visual mechanisms. This view adds complexity to Burke's simplification of sublimity opposing beauty. Secondly, because the effect of size was generalised over stimuli, the results emphasised the importance of form over content. The content-form interaction indicates that *how* something is presented may be as important as *what* is presented. Thirdly, the effect of size is primarily an effect of visual angle is most important (Study 8), raising the question of whether people often view paintings in galleries closer in order to increase the visual angle.

### **10.2.4. Fear and Sublimity**

The relationship between sublimity and fear remains a popular concept, with Burke (1759/2008) having supported the idea. Yet recent viewpoints are either sceptical of this view (Konečni, 2005, 2011, Keltner and Haidt, 2003) or have provided data that do not support it (Ishizu & Zeki, 2014).

The present thesis reports a middle ground. Where it has often been found in this thesis that fear relates to sublimity in subjective ratings, and particularly when beauty is taken into account, there is little evidence that people actually experience fear in subjective sublimity. In Study 12, where subjective sublimity ratings were positively correlated with subjective fear ratings, subjective sublimity was in fact associated with a decrease in frowning. The decrease in

frowning is often linked with the decrease of negative emotional experiences. In other words, the verbal and conscious report of fear do not reflect physiological responses related to fear.

This therefore raises the question of what it is that people experience when they report experiences of fear while viewing sublime events or objects. In a similar vein, what other everyday emotions reported in aesthetic experiences correspond to the actual emotion remains to be seen.

Table 64. Summary of thesis with key variables (Part 1).

	WP: Sub.	WP: Bty.	WP: Sub.+Bty.	WP: Sub.-Bty.	BP: Sub.	BP: Bty.	BP: Sub.+Bty.	BP: Sub.-Bty.	Corr: Sub.&Bty.
Study 1					Good				
Study 2	0.74	0.72			Good	Good			0.71
Study 3	0.84	0.88	0.89	0.60	Good	Good	Good	Good	0.89
Study 4	0.85	0.91	0.91	0.70	Not Good	Good	Good	Good	0.68
Study 5	0.83, 0.89	0.87, 0.88	0.89, 0.90	0.73, 0.82	0.88 <sup>a</sup> , 0.86 <sup>b</sup>	0.91 <sup>a</sup> , 0.85 <sup>b</sup>	0.89 <sup>a</sup> , 0.87 <sup>b</sup>	0.94 <sup>a</sup> , 0.81 <sup>b</sup>	0.53
Study 6	0.79	0.84	0.85	0.73	0.88 <sup>a</sup> , 0.70 <sup>b</sup>	0.97 <sup>a</sup> , 0.79 <sup>b</sup>	0.95 <sup>a</sup> , 0.75 <sup>b</sup>	0.95 <sup>a</sup> , 0.73 <sup>b</sup>	0.29
Study 7					0.94 <sup>a</sup> , 0.68 <sup>b</sup>	0.98 <sup>a</sup> , 0.77 <sup>b</sup>	0.99 <sup>a</sup> , 0.77 <sup>b</sup>	0.97 <sup>a</sup> , 0.63 <sup>b</sup>	0.47
Study 8									
Study 9					0.89 <sup>a</sup>	0.96 <sup>a</sup>	0.94 <sup>a</sup>	0.90 <sup>a</sup>	0.35, 0.31, 0.25
Study 10									
Study 11					0.76 <sup>a</sup>	0.74 <sup>a</sup>			0.36
Study 12 (rating)					0.92 <sup>a</sup>	0.91 <sup>a</sup>			0.31
Study 12 (physiology)									
Study 13									
Study 14									
Study 15									
Burke					+	+			-
Konečni					+				+
Keltner & Haidt					-				
Ishizu & Zeki									0.52

Note. "WP" = Within-Participants Consistency, "BP" = Between-Participants Consistency, "Corr" = Correlation, "Sub." = Sublimity, "Bty." = Beauty, "Sub.+Bty." = Sublimity Plus Beauty score or anything equivalent (e.g. both sublime and beautiful), "Sub.-Bty." = Sublimity Minus Beauty score or anything equivalent (e.g. more sublime than beautiful). All numbers represent Pearson correlation coefficients. All other represent theoretical opinions or general outcome. "+" = "positive relationship", "-" = negative relationship, "0" = no relationship, "" = No Mention. <sup>a</sup>Between-studies consistency. <sup>b</sup>"Mean Minus 1" score.

Table 65 Summary of thesis with key variables (Part 2).

	Fear: Sub.	Fear: Bty.	Fear: Sub.+Bty.	Fear: Sub.-Bty.	Size: Sub.	Size: Bty.	Size: Sub.+Bty.	Size: Sub.-Bty.
Study 1					+ <sup>a</sup>			
Study 2					+ <sup>a</sup>	+ <sup>a</sup>		
Study 3					+ <sup>a</sup>	+ <sup>a</sup>		
Study 4					0 <sup>a</sup>	0 <sup>a</sup>		
Study 5					+ <sup>b</sup>	+ <sup>b</sup>	+ <sup>b</sup>	+ <sup>b</sup>
Study 6					+ <sup>b</sup>	+ <sup>b</sup>	+ <sup>b</sup>	0 <sup>b</sup>
Study 7					+ <sup>b</sup>	+ <sup>b</sup>	+ <sup>b</sup>	+ <sup>b</sup>
Study 8	+	0	0	+	+ <sup>b</sup>	+ <sup>b</sup>	+ <sup>b</sup>	+ <sup>b</sup>
Study 9								
Study 10					+ <sup>a</sup>			
Study 11	+	-		+				
Study 12 (rating)	+	-		+				
Study 12 (physiology)	-							
Study 13	+	0	0	+				
Study 14	0	0	0	+				
Study 15	+	-	0	+	+	0		
Burke	+	-		+	+	-		+
Konečni	-				+			
Keltner & Haidt	-				+ <sup>c</sup>			
Ishizu & Zeki	-				+ <sup>c</sup>	+ <sup>c</sup>		

Note. "Fear" = Fear Effect, "Size" = Size Effect, "Sub." = Sublimity, "Bty." = Beauty, "Sub.+Bty." = Sublimity Plus Beauty score or anything equivalent (e.g. both sublime and beautiful), "Sub.-Bty." = Sublimity Minus Beauty score or anything equivalent (e.g. more sublime than beautiful).

All input represents either theoretical opinions or general outcome. "+" = "Positive Relationship", "-" = Negative Relationship, "0" = No Relationship, "" = No Mention.

<sup>a</sup> Size of stimuli determined by size of image content only. <sup>b</sup> Size of stimuli determined by physical manipulation of stimuli. <sup>c</sup> Size of stimuli determined by subjective rating only.

### 10.3. Re-evaluating Edmund Burke

Burke's importance throughout the thesis was made clear from the introductory chapter. The justification for selecting Burke as a guiding figure was threefold. Firstly, Burke's (1759/2008) *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful* marks one of the most popular philosophical theories on the sublime. Therefore, to discuss Burke in empirical terms allows an interpretational ease of the present thesis on the existing philosophical literature on the sublime. Secondly, Burke's system is highly compatible with empirical research. The compatibility stems from the fact that Burke formulated his theories from real life experiences, and deconstructed elements of the physical world, e.g. size, in relation to aesthetic-emotional outcomes, e.g. fear & joy. Especially because Burke is reluctant to attribute sublimity and beauty to specialised aesthetic faculties of the mind or to metaphysical concerns such as morality, all causal inferences can be identified through the common psychologies of emotion and perception. This allows Burke's theories to be transferred to scientific methodologies without grave difficulties. Thirdly, because different philosophers often disagree with each other, the selection of a single author (and in this case a single book) allows for theoretical consistency. Like many established empirical works, it was crucial to build an architecture of empirical data on a set of theories that is, at minimum, consistent.

In what ways or extents did the studies in the thesis prove Burke's arguments to be valid? The world, in all its subtle workings, is rarely based on clean distinctions; the thesis both supported and contradicted Burke's arguments, often leading to questions than answers.

One of Burke's core assumptions in his treatise was that the experiences and physical triggers of sublimity were opposed to those of beauty, to the degree that sublimity and beauty form a pair of non-correlated and opposite aesthetic experiences. Crucially, in studies throughout the thesis where ratings of both sublimity and beauty were asked for, it was always the case that sublimity and beauty ratings were positively correlated. In other words, experiences of sublimity were also often beautiful, and experiences of beauty were often sublime. Given the large number of participants and stimuli involved, with many studies varying in experimental designs or varying in the language in which the studies were carried out, the sublimity-beauty correlation is difficult to be disputed. Such contradiction to Burke's core assumption adds a layer of complexity to Burke's dashing youthful, and often black-and-white, paintings of sublimity and beauty.

It comes as no surprise that some stimuli-characteristics that affected sublimity also affected beauty. In the case of height, the positive effect of stimulus height on sublimity and beauty ratings were indistinguishable. Even for the effects of stimulus size, although size affected sublimity more than beauty, size still had a statistically significant positive influence on beauty.

At the same time, there were subtleties that make a total rejection of Burke's view difficult. Whenever sublimity and beauty were forced to be segregated, either by analysis (e.g.



analysis of ‘sublimity-beauty’ scores) or design (e.g. in Study 15, where participants were asked to generate separate word associations to sublimity and beauty, respectively), the characteristics that distinguished sublimity and beauty were in align to Burke’s conceptualisations. In these situations, stimuli that were associated with imageries of Burkean sublimity (e.g. volcanoes, storms), were rated – with agreeable within-participants and between-participants agreements – as being sublime more than beautiful. Likewise, objects that Burke portrayed as being beautiful (e.g. babies, flowers), were also consistently rated as being more beautiful than sublime.

Furthermore, where Burke argues that sublimity relates to fear and that beauty relates to pleasure, the thesis replicated in numerous occasions that fear was at the core of differentiating between subjectively rated sublimity and beauty (e.g. Studies 13, 14, & 15). The validity of these findings is that participants were oblivious to Burke’s aesthetic system. As such, Burke’s views are simultaneously not entirely irrelevant in the 21<sup>st</sup> century.

Unresolved in the thesis is the issue of the degrees to which subjectively reported fear in subjective sublime experiences relate to actual fear. That people do not experience fear in sublime situations, despite their report of subjective fear in sublime stimuli, has been demonstrated in Study 12’s physiological measures. Also, when the distinction between sublimity and beauty is not forced upon, fear was rarely reported in sublime experiences (Study 9; that said, participants still reported Burke-related adjectives in sublime experiences, such as anxiety and tension).

The evaluation-experience dissociation of ‘reported fear’ vs. ‘actual fear’ in sublime experiences critically undermines to Burke’s stance. In fact, this is a problem that Burke himself seems to struggle with. Where Burke’s system of aesthetic passions is derived from physiological activations, closer reading of Burke suggests that Burke himself seemed uncertain at times of the correspondence between subjective evaluations and physiological states. Psychologically, Burke sees sublimity as a passion of *delight*, a negative pleasure that arises from a relief from pain. As one becomes conscious of the lessening of pain and terror, one starts to see the delight in the escape. Nevertheless, Burke’s physiological explanations of sublimity is rooted on the idea that the body “must be shaken and worked on to a proper degree” (p. 134) to states of heightened physiological tension and fearful states.

Curiously, Burke does not subsequently explain how such heightened physiological tension is relieved in the form of *delight*. Instead, he commences soon afterward to attribute beauty to the physiological state of becoming relaxed from states of tension, which in itself can read similarly to the previously mentioned fearful *delight*. It is with such inconsistency that Burke’s fear-driven sublimity is difficult to be justified not only in real life, but also in theory. Where Burke claims that sublimity causes eye-brows to be “violently contracted” (p. 129) because of fear, results from Study 12 of the thesis reports the relaxation of eye-brows. In other words, where Burke argued for physiological arousal but psychological relief in explaining sublimity, Study 12 reported psychological arousal with physiological relaxation. These

inconsistencies demonstrate the need for some of Burke's ideas to be taken with a pinch of salt, or at least taken not in full face value.

Facing such subtleties, how to commit to a generalised re-evaluation of Burke? At least, the thesis has shown that to explain a multi-facet phenomenon as the sublime was never an easy task for Burke. Yet for Burke to have quasi-empirically and quite revolutionarily at that time outlined ways in which sublimity can be studied using everyday psychological faculties and everyday objects deserves applause. Reading the preface to the second edition of the *Philosophical Enquiry*, Burke (1759/2008) seems to be aware of both the advantages and limits of his thoughts:

We must make use of a cautious, I had almost said, a timorous method of proceeding. We must not attempt to fly, when we can scarcely pretend to creep. In considering any complex matter, we ought to examine every distinct ingredient in the composition, one by one; and reduce every thing to the utmost simplicity... We ought afterwards to re-examine the principles by the effect of the composition, as well as the composition by that of the principles. We ought to compare our subject with things of a similar nature, and even with things of a contrary nature; for discoveries may be, and often are made by the contrast, which would escape us on the single view. The greater number of these comparisons we make, the more general and the more certain our knowledge is like to prove, as built upon a more extensive and perfect induction... If an enquiry thus carefully conducted, should fail at last of discovering the truth, it may answer an end perhaps as useful, in discovering to us the weakness of our own understanding. If it does not make us knowing, it may make us modest. If it does not preserve us from error, it may at least from the spirit of error, and may make us cautious of pronouncing with positiveness or with haste, when so much labour may end in so much uncertainty (p. 4).

In Burke's systematic and data-driven outlook, it is possible to see Burke, the scientist. The thesis has examined and empirically tested some of Burke's theories, and ultimately leaves with many questions. Because Burke offers a rare kind of philosophy, a rich psychology of origins and ideas but which attempts at a sober empirical dissection of those ideas, Burke's *Philosophical Enquiry* can continue to be located as a theoretical guideline for future psychological studies on the sublime.

## 10.4. Limitations and Future Directions

### 10.4.1. More Burke: The Aesthetic Hexagon

Throughout the thesis, the *Aesthetic Hexagon* was used as a basic descriptive tool for the spread of stimuli content across the sublimity-beauty rating space (Figure 22, p. 103). Stimuli contents were categorised into six categories, representing experiences bearing descriptions of Boring/Disgusting, Tender/Adorable, Peaceful/Elegant, Marvellous/Astonishing, Powerful/Imposing, and Dreadful/Fearful. The shape itself reflected the mild positive correlation between ratings of sublimity and beauty; items were rarely rated as eliciting high sublimity and low beauty, and low sublimity and high beauty.

The hexagon played an important role in stimuli selection for image-rating studies. In Studies 5, 6, 7, and 9, participants saw equal numbers of stimuli from each hexagon category. In this method, greater generalisability of stimuli manipulation effects were enabled, given that the reported fixed effects were not circumscribed to specific subsets of stimuli within the sublimity-beauty rating space. To further enhance generalisability of fixed effects across participants, in Studies 6 and 7, each participant saw a randomly selected subset of images across all hexagon corners.

Sublimity and beauty ratings were continuously graded, because aesthetic judgements were not assumed to be categorical (for example, the difference between sublimity ratings of 1 and 4 may be meaningless in categorical terms if both ratings are within the same category of 'low sublimity.' However, those same ratings present meaningful differences on a continuous scale, just as much as the differences between ratings of 4 and 7, and 8 and 11. In other words, the continuous scale provides information about the extent to which something is psychologically meaningful). Therefore, the categorical hexagon was never intended to be used as a predicting or fixed factor. Consequentially, no statistical tests were run on the hexagon, and the construction of the hexagon itself was done roughly by hand. In few occasions, visual inspections informed that the hexagon appeared to roughly reappear across studies (e.g. Figure 31, p. 119, Figure 51, p. 162, & Figure 53, p. 180).

However, it has to be duly acknowledged such approach has its limitations. It can also be argued that it is an oversight of the present thesis that the potential of the hexagon was not fully explored. There are largely two routes the *Aesthetic Hexagon* can take in future studies. Firstly, if the hexagon is to be repeatedly used, a more robust statistical method may be needed to prove the presence of a hexagonal shape in ratings. Analytically, this can be approached via cluster analyses of ratings. A card sorting task of stimuli may also provide useful insights as to how people conceptualise images if forced to do so categorically. Secondly, once a rough number of clusters are statistically verified, the clusters may be tested for their stability over various rating tasks. Here, there may emerge 'typical' contents that fit each category with minimal between-participants differences and good within-participants reliability. Such

processes may ensure the presence of rudimentary forms of categorical perceptions in sublimity-beauty judgements.

In an advanced stage, the *Aesthetic Hexagon* must also address to what degree the hexagon can be generalised as being aesthetic, as its name suggests. Albeit backed by philosophical theories, a substantial assumption in the thesis was that sublimity and beauty are two key aesthetic dimensions. Even if some consistent patterns of sublimity and beauty relations have emerged in the thesis, there is no denying that there may be more aesthetic dimensions that operate orthogonal to sublimity and beauty (e.g. curiosity, arousal).

#### **10.4.2. Contextual Factors**

Scarcely addressed and developed in the thesis were contextual factors. The importance of context in general emotional experiences is substantially elaborated in previous publications. An elegant portrayal of this issue by Russell (2003, p. 145-146), already brought up in the thesis in page 52, is re-printed below in a fuller form:

Consider the concept of fear, and recall James's imagined encounter with a bear: Alice is calmly strolling through the woods. A wild bear steps into her path. She is startled, utters a quick yell, freezes, and then flees. Is analysis of this prototypical case of fear really informative about all other cases to which the English word fear applies? Is it the same emotion Alice experienced when she first saw the film *Aliens*, even though she knew that she was in no danger, did not flee the theater, enjoyed the experience, and would pay to see it again? How would that sameness be empirically established? In what sense is Alice's reaction to the bear the same emotion as her other fears? When afraid of falling, she freezes; when afraid of what she knows is a harmless spider, she squishes it; when afraid of missing her flight, she speeds toward the airport; when afraid of a decline in stock prices, she buys bonds; and when afraid that her child is ill, she telephones her doctor. What, other than the label fear, do various instances of fear share with each other that they do not share with what is not fear? Pinker (1997) concluded, "Fear is probably several emotions" (p. 386). All the events covered by the word fear must be explained, and the concept of fear must itself be taken into account. Still, fear might not be an emotional atom (Berridge, 1999; Rachman, 1984). There may be no one scientific model that applies to all cases of fear, and only to fear.

The experience of fear differs vastly between an actual encounter of a bear in a forest and a digital encounter of an imaginary species at a cinema. Aesthetic experiences entailing a number of, possibly multi-layered emotional states (e.g. Pelowski et al., 2017), the importance of contexts is paramount. Particular to the issue of sublimity, the contexts of temporal (e.g. previous exposure) and physical (e.g. physical environment) may be considered. If it may be the case that sublimity operates on arousal and surprise, as some philosophers have suggested, repeated exposure to sublime stimuli or sublime experiences may habituate subsequent sublime responses. Beauty responses, on the other hand, may display a more stable activation through multiple exposures. Likewise, it comes to attention that when the sea is portrayed as a typical sublime object in the philosophical literature, that sea is often a troubled one. Calm seas under a bright blue sky, may evoke sublimity that is rather different, if sublimity at all. These

considerations can be tested by behavioural experiment settings not too different to the ones set in the thesis.

What is especially important for studies exploring contextual factors is the identification of the scope of contexts. If contexts mean stimulus-related factors that moderate the measurement in question, the aforementioned temporal and physical contexts are crucial. However, if contexts imply factors that may moderate the very operationalisation of the measurement, the range and depth of contextual factors increase greatly. In this latter type of contexts, two may stand out, namely linguistic (e.g. linguistic associations influencing the meaning of a psychological construct and/or socio-cultural associations attached to such linguistic associations) and modality-based (e.g. the meaning of a psychological experience based on sensory modality types) contexts.

As an example of the importance of linguistic contexts, the direct translation of sublimity in German, *Erhaben*, unlike *sublime* in English, is hardly used in everyday contexts. Whatever may have caused this difference, the understanding of *Erhaben* and *sublime* may rouse different psychological textures. In terms of modality-based context, the way one expresses sublimity toward a piece of music may signify a different psychological state to when one expresses sublimity toward a person of romantic interest. Both of these cases, like the example passage by Russell (2003) mentioned above, illustrate how malleable the relationship between language and the experience that is signified by language can be.

Thus, at the core of the linguistic- and modality-based contexts is the idea that it is often difficult to precisely know that what people say is what the experience itself is. Therefore, it is crucial to understand what the verbal measure of sublimity measures. In order to minimise the variance deriving from such operationalisation issue, a manoeuvre undertaken in the present thesis was to introduce definitions of sublimity and beauty to participants before they rated photographs on those dimensions. By giving definitions, it was hoped that the measures measured what was intended to be measured.

This move may in a sense be seen as reductionist, since the definition-giving uses a simplified segment of a complex phenomenon. However, the risks of being reductionist was determined to be far less than the risks involved in studying an entire phenomenon without knowing what participants are being measured for. To work in a blind state of measurement could be, as written in section 1c.2.3. of the Introduction, a violation of construct validity. The thesis was also never intended to study *the* sublime, but rather, based on theoretically-driven outlook, to empirically approach a complex phenomenon with a focused set of largely-accepted philosophical ideas (section 1a.2.1.). The thesis, thus, reported some important consistencies based on known verbal measures with minimisation of the language-experience variances.

There are other ways to measure experiences of sublimity whilst keeping the complex associations coming with linguistic contexts at bay. One way would be to introduce non-verbal measures, such as EEG, fMRI, and eye-tracking, without the use of explicit verbal ratings, e.g.

n-back tasks. It may be fascinating to see whether certain non-verbal activations can be grouped together in a purely bottom-up, activation-driven analysis. That said, it is unlikely that a purely non-verbal task can be employed for more subtle analyses. For examples, these grouped activations will have to be eventually linked up with some meaningful psychological construct, the latter that will inevitably accompany some form of verbal report.

### **10.4.3. Individual Differences and the Universality of the Sublime**

The present thesis accounted for individual differences in two ways. Firstly, most of the experimental studies, via various between-participants and between-studies similarity measures, demonstrated that people's aesthetic responses are in some degrees largely similar to each another. Simultaneously, the thesis also acknowledged that there can be important personality moderators that may influence one's judgements of sublimity and beauty (Study 4). One particularly interesting finding was that while male participants appeared to report sublimity in violent images, female participants did not find those violent images sublime. Secondly, by using linear mixed modelling, many studies in the thesis focused on the generalisability of manipulations after taking into consideration of various individual differences variances (section 1c.4.1.).

However, more individual differences could have been explored. After all, while between-participants agreements were generally acceptable, this does not mean that people responded exactly the same to each other (Table 64). Even if subtle individual differences are not predicted by specific personality features, the very fact that participants (inevitably) differ is an important topic in aesthetics. Developing from such considerations, it may additionally be insightful to explore why group-level similarities (between-studies agreement) often outperform individual-level similarities (between-participants agreement).

Perhaps the most crucial point of discussions regarding individual differences derives from Study 10. Here, 59.7% of individuals from an online survey reported having sublime experiences at least once in their entire lives. To what degree can scientists work on a phenomenon that is found only in six out of ten people? A number of explanations can be considered.

It is possible, for instance, that a response bias independent of the measurement itself, may have been at play. Given the unusually long duration of the survey (around 45 minutes, with some participants taking up to an hour), and since participants were awarded equal credit regardless of their study duration, many of the 40.3% of participants who responded 'no' to sublime experiences could have responded so to cut their study short. Such participants could have had their study finished in as quickly as 15-20 minutes.

Still, what should perhaps be focused on in the outcome is that of the participants who reported sublime experiences, 90.8% of the participants were clustered together as having similar emotional profiles of their sublime experience. That an open ended questionnaire of a

high-level psychological construct should have such a higher level of between-subject consistency certainly supports for the strength of sublimity's potential universality.

Should the response by the 40.3% non-sublime responders have genuinely thought that they had never experienced sublimity, it may also be that some individuals failed to attribute an experience they have experienced. One does not fully have to acknowledge the evidence of one's, for example, empathic abilities to have made use of them (incidentally, the word 'empathy', signifying the ability to understand others's feelings, only entered the dictionaries in the early 20<sup>th</sup> century. It is unlikely that people did not experience empathy the invention of the word.). Especially, should sublime experienced indeed nurture and support evolutionary needs for social bonding and mental schema updating (e.g. Griskevicius et al., 2010), the experience of sublimity may be an important mechanism in the everyday.

For what these arguments are worth, it may be indeed the case that only 6 out of 10 people have ever experienced sublimity. However, it is nevertheless difficult to ignore the fact that a wide range of languages and cultures have terminologies that signify experiences of the sublime, from sub-Saharan African cultures (Shostak, 1983), to East Asian cultures, from the ancient Greek cultures to modern cosmopolitan societies. One hopes that the universal prevalence of sublimity in linguistic representation is not an accident, and not a word that has sprung out of non-experiential and purely intellectual abstractions.

#### **10.4.4. More Burke: Wealth of Ideas Still Untested**

The empirical explorations of the thesis mentioned a small selection of Burke's theoretical views. Because the *Philosophical Enquiry* will remain an outstanding work on empirical theories on the sublime, it still offers a wealth ideas for potential empirical studies. Below, three such ideas are presented.

**10.4.4.1. The sublimity of words and poetry.** It cannot be denied that one of the most overlooked but original passages of the *Philosophical Enquiry* appears in the last section, Part V. Until this point, Burke used real life examples, e.g. nature, in describing his system of sublimity and beauty. Burke begins Part V by comparing the sublimities and beauties of natural objects, paintings, and architecture, but claims that words can create the greatest of passions of them all. Burke justifies this innovation by suggesting that where natural objects, paintings, and architecture arouse affection through visual imageries or actual visual information, words affect the mind without the mediation of imageries. Instead, imaginatively written words have a strong impact on the mind because they can invigorate the imaginations of readers directly via powerful ideas. Burke makes a strong case for poetry especially. In poetry, the imaginations are most exalted when poets describe abstract things or events that are impossible in the real world (e.g. God, heaven, and hell) or when phrases exist that are impossibly to be visualised or sensed at all. When such abstract ideas come in succession to one another, the combination of these

words can ultimately give “a new life and force to [a] simple object” (p. 172). The following is an example given by Burke:

Three rays of “twisted showers, three of watery clouds, three of fire, and three of the “winged south wind; then mixed they in the work terrific lightnings, and “sound, and fear, and anger, with pursuing flames (p. 169).<sup>54</sup>

Therefore, future works can attempt to explore the sublimities and beauties of words, and compare their elicited degrees of sublimity to those elicited by photographs or poetry. As a variation of this idea, and still in keeping with Burke’s original thought on comparing different types of objects, it may be fascinating how different styles of expressions – while keeping the content constant – can lead to different aesthetic evaluations. For instance, the sublimities of mountains can be evaluated by portraying mountains in single words, prose, poetry, photographs, videos, and paintings. The findings would have important implications on the interaction between style and content.

**10.4.4.2. The beauties of grief.** A close reading of Burke also reveals that more can be done in the exploration of the emotional or cognitive mechanisms of beauty. As mentioned before, one of the key emotional mechanisms of sublimity is argued to be *delight*, a form of negative pleasure driving from relief from pain. With beauty, however, Burke is rather ambiguous. Where Burke is firm that beauty arises within the domain of pleasure and even positive pleasure, he also writes in Section V of Part I that the absence of pleasure is *grief*, and that just as the absence of pain is *delight*, “[t]he person who grieves, suffers his passion to grow upon him; he indulges it, he loves it...” (p. 37). In other words, where pleasure is beautiful, the loving of grief, a kind of sad joy, is also beautiful. It may be thus be reasonable that an empirical investigation may look into the relationship between pleasure, pain, the reduction of pleasure, and the reduction of pain, in creating two mixed emotions, i.e. fearful joy (*delight*) and sad joy (*grief*), and relate this to sublimity and beauty.

**10.4.4.3. Cognitive mechanisms of sublimity.** In Section XVIII of Part II, Burke mentions how suddenness creates a sense of sublimity, which also “has a grand effect” (p. 83). In explaining the phenomenon, Burke attributes attention as a key mechanisms, i.e. “The attention is roused by this; and the faculties driven forward, as it were, on their guard.” In uncovering mechanisms of sublimity beyond size and fear, it may thus be worthwhile for future research to explore attention-based cognitive mechanisms. It may especially be interesting to manipulate attention via cues (endogenous control) or without cues (exogenous control), and see how this would interact with the emotional (e.g. fearful vs. non-fearful) or physical (e.g. small

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<sup>54</sup> There are no closing quotes corresponding to each of the opening quotes in Burke’s original text.



vs. large) characteristics of stimuli. Should the shifting of attention be an important clue to sublime experiences, one can thus expect attention (or perceived change of attention) to mediate the links between size and sublimity, and fear and sublimity.

#### **10.4.5. Beyond Burke**

While Burke presents a number of stimulating ideas of how sublimity can be studied, the *Philosophical Enquiry* is an eighteenth century work by a teenager, Burke having written it before the age of nineteen. The world has changed since then, and there are themes Burke could have overlooked in exploring the complex workings of sublimity. It must also be acknowledged that while the thesis focused much on Burke's inquiry, this was done as a heuristic, in order to root the empirical enquiry in a consistent set of feasible theories. The merits of focusing on Burke notwithstanding, the scope of understanding the phenomenon of sublimity need not be limited to the views of Burke or any other assumptions imposed upon the presented empirical works.

**10.4.5.1. Expertise.** While the thesis recruited non-experts as participants, the recruiting of experts may inform crucial ideas underlying sublimity and beauty. It should be emphasised, for instance, that most eighteenth century theories on sublimity and beauty came from experts either in aesthetics or in the arts. Many of their ideas, perhaps owing to their professional insights, still hold true to this day. A study of how sublimity and beauty are conceived in the 21<sup>st</sup> century may thus be informative of changing trends, or at least may shine light on different shades of sublimity and beauty.

An increasing number of studies also report that art experts may process art or aesthetic processes differently from non-experts (Leder, Tinio, Brieber, et al., 2019; McManus et al., 2011; Palmer et al., 2013). For instance, while symmetry is highly preferred among non-experts, asymmetry is preferred among experts. This raises the question of whether sublimity and beauty may have different standards or dimensions across different expertise groups, and may further question the assumed universality of sublimity and beauty.

**10.4.5.2. The aesthetics of horror films.** In relating to the potential sex differences in the aesthetic appreciation of violence, the aesthetics of horror films may be an area of future research. While on paper, both Burke's sublimity, e.g. grand nature, and horror films share the coexistence of fear and joy, the qualities of the experiences the two types of event bring are substantially different. It may be the case that horror films are related to Gothic literature, a genre that was influenced by theories of sublimity (Monk, 1935), in which case horror films provide unbridled shock where sublimity may reconcile some of its fear by being relieved from fear, or even being associated with beauty. Yet horror films are perhaps more immersive and stimulating than Gothic literature, but perhaps also less stimulating of the imagination.

**10.4.5.3. Further explorations into the size effect.** Last but not least, while size was an important variable discussed in the thesis, there are more aspects of size to uncover. For example, when does an increase of size cease to be sublime? One might expect an inverted U-curve. While largeness of objects to a moderate degree may be appealing, objects that are too large may lose their appeal. Similarly, there are also objects in the real world that are not desired to be too large (e.g. ears). “Bigger is better”, thus, may have its limits.

Especially intriguing in studying the appeal of size may be to adopt Fechner’s *method of use* (Mather, 2013), in order to explore how size’s attraction is represented in the real world. One way to explore this would be to survey some of the world’s most visited museums, and explore the size of presentations of their most famous and popular works (and it is a safe bet that the two tend to be correlated). It would not be surprising were the most outstanding pieces also to be works that stand out physically, thereby capturing attention from long distances. It may even be the case that artists use large canvases when they wish to depict monumental participants or works of personal importance. It would be intuitive, for instance, that paintings of battlefield or heroisms are depicted monumentally, physically speaking, but that paintings that are large beyond a limit may be undesirable.

Size may further be studied with virtual reality (VR). In Troscianko et al. (2012), the increase of object size was associated with an increase of presence, or the experience of non-mediation. In conditions of high presence, participants are likely to feel the “realness” of an object or event. Beyond the obvious fact that VR would enable manipulation of stimuli size and contextual factors (e.g. sound & interaction) unachievable in standard experimental settings, an important advantage of using VR may thus be that VR would bring an extra layer of believability and presence into study settings. However, the use of VR would require extra care so that sublimity is triggered by stimuli, not by wonders of the technology itself.

#### **10.4.6. Improving the Psychometrics of Sublimity and Beauty**

Throughout the thesis, sublimity was measured on a Likert-like scale, ranging from “not sublime” to “very sublime.” Likewise, beauty was measured via a scale of “not beautiful” to “very beautiful.” While the measures produced consistent results, there is still vagueness in the meanings behind “not beautiful” and “not sublime.” The vagueness is most palpable in the distinction between something negative (to the scale) and neutral. For instance, when rating an object that is truly repulsive or an object that simply lacks in aesthetic appeal, participants are likely to rate both objects as “not beautiful.” Therefore, the currently used Likert-like scales are limited in further differentiating experiences, causing some participants perhaps be confused in the rating procedure.

One solution would be the introduction of the semantic differential (Osgood, Suci, & Tannenbaum, 1957). In semantic differential scales, participants are asked to rate on scales of

bipolar adjectives, or adjectives with references to their opposite meanings. Examples of such are: alive-dead, difficult-easy, delicate-rough, and kind-cruel (Osgood, May, & Miron, 1975). Notice that by the introduction of a reference point, it becomes easy to differentiate between different states of, for example, ‘difficult’, ‘easy’, and somewhere in between. The previously mentioned vagueness of the Likert-like scale is contained. There is also the additional advantage that the scales are easier to understand with the presence of reference points at each end of the scale.

A related practical problem is the difficulty of determining what the opposite adjectives of sublimity and beauty are. Osgood et al. (1975) refer to the opposite of ‘beautiful’ as ‘ugly.’ However, the validity of this claim is limited, since the authors did not consider sublimity together with beauty. As is the case with many other works testing beauty, it is uncertain if Osgood and colleagues’ ‘beauty’ represents ‘beauty and sublimity’ (i.e. general goodness/appeal) or ‘beauty as opposed to sublimity.’ For sublimity, it may be possible to refer to the common phrase, “from the sublime to the ridiculous”, and therefore, construct a semantic differential scale of sublime-ridiculous. However, these considerations, however methodologically judicious they may be, are yet to be tested.

The development of such semantic differential scales would enable further elaborations on the mechanisms of sublimity and beauty. Assuming the use of beautiful-ugly and sublime-ridiculous, a positive correlation between sublimity and beauty would also indicate a correlation between ugliness and ridiculousness, which is perhaps not implausible. Should there be no correlation between sublimity and beauty in the semantic differential scale, this could mean that sublimity and beauty are measured in a way that their overlap is minimised.

### **10.5. What is the Sublime?**

Throughout most studies in the thesis, participants were given a standard set of definitions of sublimity and beauty prior to tasks, to ensure that participants evaluate objects on dimensions that are in line with the thesis’ general aims and directions. Only in two studies (Studies 10 & 15) were participants given the chance to express their views on sublimity. While these two studies provided answers on minute details of what the sublime may emotionally and contextually entail, “what is the sublime?” still remains a difficult question. Part of the reason for the difficulty lies in the very nature of sublimity presenting contradictory states. In Longinus’ *On the Sublime* (Περὶ Ὕψους; Peri Hýpsous), one of the earliest taxonomies of sublimity, the very idea of sublimity is borne on the thought that great enthusiasm arises from disorder. Audiences are moved as speakers break out in uncontrolled passions. The audiences are shocked and overwhelmed, and the speech in itself may be unacceptable in terms of grammar, but audiences are still attracted to such powerful show of enthusiasm and authority.

In subsequent descriptions of the sublime throughout the centuries, the sublime is described as an event that induces one’s total immersion toward a task or event, yet which also

allows for a sense of connectedness with the surrounding. Similarly, one loses one-self, but simultaneously gains a heightened awareness of the self. The sublime both intensifies and arouses the mind, but also finds itself humbled in the serenity of a landscape's grandeur. One is often overwhelmed and intimidated by the powers of an external force, but one emerges also with a sense of powerfulness and conviction of one's invincibility.

In studying the sublime scientifically, similar contradictions appear. While participants report feeling fear, they also experience a reduction of negative emotions (Studies 11 & 12). Participants also report the experience of brightness in sublime encounters (Study 10), but actual brightness of stimuli does not affect sublimity in any way (Study 7 & 8). Moreover, even though sublimity is a highly pleasurable experience, also present in the same experience is a sense of discord and tension (Study 10). Throughout the thesis, sublimity is reported to be different from beauty, and when compared to beauty, almost always related to fear. Compared to beauty, sublimity also is influenced by different visual and musical factors. At the same time, what is sublime is often also beautiful.

These contradictions make sublimity difficult to generalise. There are a number of possibilities of how to reconcile such contradictions, all of them broadly theoretical. One possibility is that there are multiple types of sublimities that in actuality do not necessarily overlap with each other much, so that the elicitation of the specific sublimity is task-dependent. The sublimity of recollection (Study 10), for instance, is different from the sublimity of ratings of photographs (e.g. Study 11), and again, is different from the sublimity of rating music (Study 9), each of them having their own set of non-contradictory states. Another possibility is that sublimity represents a general state of invigoration, that all these opposing experiences suddenly emerge, possibly oscillating between one another in quick successions. If one is more awake, one simply feels more. A third possibility is that while experiences are rarely mixed, they change gradually and systematically over time. This is how an erupting volcano may initially be fearful, but may acquire a grandeur with time particularly with physical distance. A number of theories have been attempted to denote the paradox of strong aesthetic experiences (Menninghaus et al., 2017; Mukhopadhyay, 2014), but none are specifically concerned with sublimity and beauty.

Setting broad ontological examinations aside, instead of asking what the sublime is, a more imminent and possibly sensible manner in approaching the sublime may be to continuously produce concrete evidence that enlighten the various sides and aspects of the sublime. Just as no human experiences are straightforward, but that humans can (most of the times) still live in harmony despite not knowing the meanings of themselves, the embracing of complexity with a keen eye in identifying consistencies and shared attributes across many small moments may be most informative. This is what was achieved in this thesis.

## 10.6. Concluding Remarks

All research is personal, because strivings are personal. Strivings require patience because they entail a conflict between the hope to observe the world objectively and the drive of an instinctive demand. At the end of the thesis, and by producing this work, I am fortunate to have contributed something to the history of the sublime. What was presented is just a handful of pebbles among many findings waiting to be unearthed. Hence, I have titled the thesis as *An Empirical Aesthetics of the Sublime and Beautiful*, instead of *The Empirical Aesthetics of the Sublime and Beautiful*. I conclude in the manner I started, with Edmund Burke and his words, with sympathy, gratitude, and admiration.

To conclude; whatever progress may be made towards the discovery of truth in this matter, I do not repent the pains I have taken in it. The use of such enquiries may be very considerable. Whatever turns the soul inward on itself, tends to center its forces, and to fit it for greater and stronger flights of science (Edmund Burke, 1759/2008, p. 5).

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## Appendix

The appendix includes measures collected after image rating tasks.

### A. Basic demographics

At what age did you finish full-time education? <i>15 or below / 16-18 / 19-21 / 22 or above (e.g. post-graduate) / Still in full-time education</i>
How much have you studied science subjects? <i>Not at all / Until age 15 / 16-18 / University / Postgraduate</i>
How much have you studied arts or humanities subjects? <i>Not at all / Until age 15 / 16-18 / University / Postgraduate</i>
Have you studied Art (Painting, Sculpture or similar subjects)? <i>Not at all / Until age 15 / 16-18 / University / Postgraduate</i>
Have you studied Music? <i>Not at all / Until age 15 / 16-18 / University / Postgraduate</i>
If you have taken a degree or are studying for one, what subject is it in? _____
In which broad category of subject would you put that degree? <i>Medical science / Biological science / Physical science / Mathematics / Engineering / Architecture / Social studies / Business / Media studies / Languages / Humanities / Creative arts / Education</i>
Are you male or female? <i>Male / Female</i>
What is your year of birth? _____
What is your nationality (the country on your passport)? _____
In what country were you born? _____
In what country did you complete your secondary education? _____
What is your first language? _____ If <i>English</i> is not your first language, have you learned English? _____ If you have learned English, how old were you when you started to study English? _____

B. The Big 5 personality traits (Soto & John, 2016)

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who *likes to spend time with others*? Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement.

1 Disagree strongly	2 Disagree a little	3 Neutral; no opinion	4 Agree a little	5 Agree strongly
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*I am someone who...*

- |   |  |
|---|--|
| 1. ___ Is outgoing, sociable.                           | 31. ___ Is sometimes shy, introverted.                   |
| 2. ___ Is compassionate, has a soft heart.              | 32. ___ Is helpful and unselfish with others.            |
| 3. ___ Tends to be disorganized.                        | 33. ___ Keeps things neat and tidy.                      |
| 4. ___ Is relaxed, handles stress well.                 | 34. ___ Worries a lot.                                   |
| 5. ___ Has few artistic interests.                      | 35. ___ Values art and beauty.                           |
| 6. ___ Has an assertive personality.                    | 36. ___ Finds it hard to influence people.               |
| 7. ___ Is respectful, treats others with respect.       | 37. ___ Is sometimes rude to others.                     |
| 8. ___ Tends to be lazy.                                | 38. ___ Is efficient, gets things done.                  |
| 9. ___ Stays optimistic after experiencing a setback.   | 39. ___ Often feels sad.                                 |
| 10. ___ Is curious about many different things.         | 40. ___ Is complex, a deep thinker.                      |
| 11. ___ Rarely feels excited or eager.                  | 41. ___ Is full of energy.                               |
| 12. ___ Tends to find fault with others.                | 42. ___ Is suspicious of others' intentions.             |
| 13. ___ Is dependable, steady.                          | 43. ___ Is reliable, can always be counted on.           |
| 14. ___ Is moody, has up and down mood swings.          | 44. ___ Keeps their emotions under control.              |
| 15. ___ Is inventive, finds clever ways to do things.   | 45. ___ Has difficulty imagining things.                 |
| 16. ___ Tends to be quiet.                              | 46. ___ Is talkative.                                    |
| 17. ___ Feels little sympathy for others.               | 47. ___ Can be cold and uncaring.                        |
| 18. ___ Is systematic, likes to keep things in order.   | 48. ___ Leaves a mess, doesn't clean up.                 |
| 19. ___ Can be tense.                                   | 49. ___ Rarely feels anxious or afraid.                  |
| 20. ___ Is fascinated by art, music, or literature.     | 50. ___ Thinks poetry and plays are boring.              |
| 21. ___ Is dominant, acts as a leader.                  | 51. ___ Prefers to have others take charge.              |
| 22. ___ Starts arguments with others.                   | 52. ___ Is polite, courteous to others.                  |
| 23. ___ Has difficulty getting started on tasks.        | 53. ___ Is persistent, works until the task is finished. |
| 24. ___ Feels secure, comfortable with self.            | 54. ___ Tends to feel depressed, blue.                   |
| 25. ___ Avoids intellectual, philosophical discussions. | 55. ___ Has little interest in abstract ideas.           |
| 26. ___ Is less active than other people.               | 56. ___ Shows a lot of enthusiasm.                       |
| 27. ___ Has a forgiving nature.                         | 57. ___ Assumes the best about people.                   |
| 28. ___ Can be somewhat careless.                       | 58. ___ Sometimes behaves irresponsibly.                 |
| 29. ___ Is emotionally stable, not easily upset.        | 59. ___ Is temperamental, gets emotional easily.         |
| 30. ___ Has little creativity.                          | 60. ___ Is original, comes up with new ideas.            |

### C. Empathy (Davis, 1980)

Please indicate how well each of the following statements describes you:

	Describes me very badly	Describes me poorly	Describes me fairly well	Describes me very well
<i>i.</i> I daydream and fantasise with some regularity about things that might happen to me				
<i>ii.</i> I sometimes find it difficult to see things from another person's point of view				
<i>iii.</i> Sometimes I don't feel very sorry for other people when they are having problems				
<i>iv.</i> In emergency situations I feel apprehensive and ill-at-ease				
<i>v.</i> I try to look at everybody's side of a disagreement before I make a decision				
<i>vi.</i> Becoming extremely involved in a good book or movie is somewhat rare for me				
<i>vii.</i> Other people's misfortunes do not usually disturb me a great deal				
<i>viii.</i> Being in a tense, emotional situation scares me				
<i>ix.</i> I am usually pretty effective in dealing with emergencies				
<i>x.</i> I would describe myself as a pretty soft-hearted person				
<i>xi.</i> I really get involved with the feelings of the characters in a novel				
<i>xii.</i> Before criticising somebody I try to imagine how I would feel if I were in their place				

### D. Masculinity and Femininity (Spence and Helmreich, 1978)

The items below inquire about what kind of person you think you are. Each item consists of a pair of characteristics, with the letters A-E in between. For example:

Not at all Artistic    A.....B.....C.....D.....E    Very Artistic

Each pair describes contradictory characteristics--that is, you cannot be both at the same time, such as very artistic and not at all artistic.

The letters form a scale between the two extremes. You are to choose a letter which describes where you fall on the scale. For example, if you think you have no artistic ability, you would choose A. If you think you are pretty good, you might choose D. If you are only medium, you might choose C, and so forth.

	A	B	C	D	E	
1. Not at all aggressive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very aggressive
2. Not at all Independent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very independent
3. Not at all emotional	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very emotional
4. Very submissive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very dominant
5. Not at all excitable in a major crisis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very excitable in a major crisis
6. Very passive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very active
7. Not at all able to devote self completely to others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Able to devote self completely to others
8. Very rough	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very gentle
9. Not at all helpful to others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very helpful to others
10. Not at all competitive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very competitive
11. Very home oriented	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very worldly
12. Not at all kind	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very kind
13. Indifferent to others approval	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly needful of others approval
14. Feelings not easily hurt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Feelings easily hurt
15. Not at all aware of feelings of others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very aware of feelings of others
16. Can make decisions easily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Has difficulty making decisions
17. Gives up very easily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Never gives up easily
18. Never cries	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Cries very easily
19. Not at all self-confident	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very self-confident
20. Feels very inferior	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Feels superior
21. Not at all understanding of others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very understanding of others
22. Very cold in relations with others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very warm in relations with others
23. Very little time for security	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very strong need for security
24. Goes to pieces under pressure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Stands up well under pressure

E. Sublimity and beauty questionnaire

In the following section, we would like to ask you a number of questions regarding the aesthetic judgements you gave throughout today's experimental session.

*Firstly*, please indicate below, by circling a number, how confident you are at the moment regarding your conceptual understanding of the sublime and beautiful. For example, do you think you know what it means when someone tells you something is either sublime or beautiful, or when you think that something is either sublime or beautiful?

Sublime:

**1 (not at all) – 2 – 3 – 4 – 5 – 6 – 7 (completely)**

Beautiful:

**1 (not at all) – 2 – 3 – 4 – 5 – 6 – 7 (completely)**

*Secondly*, please write down 7-10 words (feel free to write more) that immediately come to mind when you think of the sublime and beautiful separately. The words can either refer to objects, emotions or ideas.

Sublime	Beautiful

*Lastly*, by selecting one of the three options below, please let us know whether you have previously studied about the sublime particularly in relation to the beautiful, based on philosophical works or from any form of professional knowledge source (e.g. textbook). You could have studied it either by yourself or by having attended a lecture (e.g. either online or non-online). In essence, we want to know whether you have had any prior knowledge of the unique distinction between the sublime and beautiful before the start of today's experimental session. If 'Yes' or 'Other' is selected, please specify the source.

**Yes ( \_\_\_\_\_ ) / No / Other: ( \_\_\_\_\_ )**