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„Beauty as a Shortcut? An Investigation of Unconscious Thought Processes and the Role of Beauty in Post-Decision Satisfaction"

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Abstract

Our research project is based on two pillars that each have been investigated before: beauty and decision-making. We strove to replicate existing findings surrounding the Unconscious Thought Theory, developed by Dijksterhuis and Nordgren (2006), in the realm of empirical aesthetics. According to the Unconscious Thought Theory, decisions based on unconscious thought processes are superior to decisions based on conscious evaluation or without thinking at all. We expect beauty to be the reason for this superiority: We hypothesized that unconscious thought leads to better decisions in terms of post-choice satisfaction, because they unconsciously weigh in the important decision criterion beauty appropriately. Our research project was adapted from Dijksterhuis and van Olden (2006) and consisted of two experiments using different stimulus sets. This paper focuses on the first of the two experiments we conducted, using art postcards as stimuli. Based on the data of 106 participants taking part in the study, we could not replicate existing evidence that unconscious thought leads to better decisions. Similarly, we did not find any evidence that beauty plays a significant role in unconscious thought processes compared to conscious thought process or immediate decisions. Nevertheless, our data indicates that beauty is an important criterion in every thought process and decision.

Keywords: Beauty, Decision Making, Unconscious Thought Theory

Beauty as a Shortcut? An Investigation of Unconscious Thought Processes and the Role of Beauty in Post-decision Satisfaction

The focus of the present study ranges between two topics that both have been researched for a long time: beauty and decision-making. While beauty and its role and purpose are still subject to debate in different fields of research, decision-making theories build an essential part of economic psychology (Wiswede, 2012) and have found its way into bestselling popular science literature (i.e. Krogerus & Tschäppeler, 2017). It is our goal to contribute to both of those areas of research by bringing the topics together and empirically assess a possible interplay of the two. More concretely, we try to a) understand a possible function or role of beauty in the field decision-making and b) contribute to the research surrounding the Unconscious Thought Theory (Dijksterhuis & Nordgren, 2006) by replicating existing evidence (Bos, Dijksterhuis, & van Baaren, 2011; Dijksterhuis, Bos, Nordgren, & Baaren, 2006; Dijksterhuis & Meurs, 2006; Dijksterhuis & van Olden, 2006) and adding to this body of literature. Our research project consists of two studies that are closely related. The concept of both studies is similar as well as procedure and study execution. The main difference is that we use different stimuli sets (art postcards and ballpoint pens) in order to get broader insights into the expected effects. This paper focuses on idea, execution and analysis of one of the two studies, in which we use art postcards as stimuli. Both our studies hypothesize that decisions based on unconscious thought processes are superior over decisions based on conscious evaluation or spontaneous decisions. We hypothesize that beauty unconsciously serves as a shortcut to making better, meaning more satisfying, decisions.

Beauty

Beauty has fascinated mankind at all times. It has been described as inspiring, influencing, important and it has been associated with truth and goodness as the third of the ancient Greek's core values (Chatterjee, 2013). Plato equalizes absolute beauty with the Good, which for him is absolute truth and ultimate reality (Domanski, 2012). Later, beauty plays an important role in Immanuel Kant's philosophical system (Lüthe, 1984). He dedicates himself to aesthetic ideas as the teaching of judgements of beauty, but also to questions around art production; the latter being a matter of genius (Lüthe, 1984). Today, beauty as defined by Kant, can be understood as *disinterested pleasure* (German: interesseloses Wohlgefallen, Thielsch & Hassenzahl, 2008).

Also, psychology has focused on different aspects of beauty, trying to understand its nature. In this context, beauty has been subject to empirical research in different sub-fields of psychology. Especially the association between beauty and goodness has been investigated, for example showing that we tend to ascribe positive personality traits to attractive people (Dion, Berscheid, & Walster, 1972) or that beautiful things are believed to be more usable (Tractinsky, Katz, & Ikar, 2000). Consumer research focuses on understanding the liking of products (Buechel & Townsend, 2018), others focus on questions around human beauty (Wald, 2015), the universality of beauty (Conway & Rehding, 2013), its connection to pleasure (Chatterjee, 2013), context effects (Gerger, Leder, & Kremer, 2014) or influences on moral judgements (Rabb et al., 2016), just to mention some.

But despite the growing body of literature concerned with beauty, we still seem to know very little about it. Is beauty a feature of an object or does it lie in the eye of the beholder (Chatterjee, 2013; Kawabata & Zeki, 2004; Makkai, 2009)? Does it "simply" indicate other positive features of objects, people or landscapes (Dion et al., 1972; Hassenzahl, 2012; Tractinsky et al., 2000)? And although there is no consensus about beauty's nature (Conway & Rehding, 2013) and no unambiguous scale to measure it (Hassenzahl, 2012), we believe to understand some underlying core principles that seem to universally exist. Ramachandran and Hirstein (1999), for example, define "eight laws of artistic experience" (p.33), including the "peak shift principle" or "perceptual grouping" (p. 33). Others point out principles like typicality or familiarity as well as symmetry (Chatterjee, 2013; Hassenzahl, 2012; Ramachandran & Hirstein, 1999) or the golden ratio that essentially influence our judgement about beauty, although the latter two do not seem to be universal (Conway & Rehding, 2013; Leder et al., 2019). Similarly, effects like mere exposure or the Halo effect influence our beauty judgements (Dion et al., 1972; Hassenzahl, 2012; Thielsch & Hassenzahl, 2008; Tractinsky et al., 2000). Besides effects like the aforementioned, literature also shows that beauty judgements are fast and automatic processes (Hassenzahl, 2012; Kahnemann, 2012) leading to autonomous judgements even made independently from the judgement of other people (McGonigal, 2006). In the realm of decision-making, a possible function of beauty could be that it indicates good or right decisions.

Other questions around beauty have been asked in different fields of research and they appear to be much more difficult to answer: Do we possess some kind of beauty instinct

(Conway & Rehding, 2013) and if yes, then why? Chatterjee (2013) argues that there could be an evolutionary explanation, that a certain sense of beauty was adaptive in the evolutionary process. This aligns with the thought that beauty is no object characteristic, but a subjective process within our minds (Makkai, 2009), contrasting Plato and his idea that beauty is an object characteristic existing independently from the observer (Kawabata & Zeki, 2004). Neuropsychology continuously tries to understand brain processes involved in beauty experiences, and so far identified the orbitofrontal cortex (OFC) as one relevant area processing beauty experiences as well as goodness judgements (Tsukiura & Cabeza, 2011). Since activity in the OFC had been linked to reward before (Tsukiura & Cabeza, 2011), its activity while experiencing beauty can be easily interpreted: experiencing beauty is rewarding for us. More studies look into the role of OFC activity when experiencing beauty in attractive faces (Ishai, 2007), different types of beautiful objects (Zhang et al., 2017) or beauty judgements compared to other types of judgements, i.e. moral ones (Rabb et al., 2016; Wang et al., 2015).

Hassenzahl (2012) takes one big step forward and proposes to change of our main question altogether: rather than focussing on finding truth about beauty, he makes it a question of position, pointing out the ambivalent nature of beauty. This proposal seems reasonable, especially against the argument that our questions about beauty have been one-sided, focussing on what we find beautiful without asking how beauty influences us (Chatterjee, 2013). In other words, we do not know, whether beauty is subjective or objective (Zhang et al., 2017), it is clearly not logical (Chatterjee, 2013) and we still not know, "why [there is] such a thing a beauty" (Chatterjee, 2013, p.64) at all. It is one of the goals of this study to contribute to those questions and gain more insights into a possible function of beauty.

What is beautiful is good

Our study is based on the concept of beauty, truth and goodness, or rather the idea of *beautiful is good*, that has been investigated before (Dion et al., 1972; Eagly, Ashmore, Makhijani, & Longo, 1991; Lemay Jr., Clark, & Greenberg, 2010). Our starting point is a stream of research in the field of Human-Computer Interaction (HCI), namely the idea that "beautiful is usable" (Tractinsky et al., 2000, p.127) and therefore good. Tractinsky et al. (2000) investigated the association between the perceived aesthetics of an automated teller machine (ATM) and its perceived usability. It was the goal of the researchers to contribute empirical evidence to the so-

far tensional relationship between form and function (Tractinsky et al., 2000). They let the participants rate usability, aesthetics and the amount of given information of differently designed ATM layouts, before letting them test the ATMs in different tasks in order to rate their usability. Tractinsky et al. (2000) found a strong effect of aesthetics on usability and concluded that this effect is comparable to what has been found in social psychology before. In that field, the perceived attractiveness of a person had been linked to other desirable personality attributes, i.e. attractive people are believed to lead better lives, are perceived as more competent partners, more successful, etc. (Dion et al., 1972). As a possible explanation of the "beautiful is usable" equation, Tractinsky et al. (2000) propose associative stereotyping or the Halo-effect. But although they find strong evidence for a "beautiful is usable" relationship, they point out that the underlying process of that relationship remains unclear (Tractinsky et al., 2000).

Later, Hassenzahl (2004) dedicates himself to the field of HCI and, in parts critically, comments on the interplay of usability and object attributes. In his study, he fails to find a relationship between beauty and usability and, moreover, questions the measurement of usability in Tractinsky et al.'s (2000) study altogether (Hassenzahl, 2004). According to him, beauty and goodness relate, as long as and because both of them are operationalized as subjective valuations (Hassenzahl, 2004). Tractinsky (2004) takes the opportunity to comment on his previous work and, interestingly, points out that the original goal of their study was to disprove the "beautiful is usable" equation, which did not work (Tractinsky et al., 2000). Moreover he points out that the "beautiful is usable" equation (Tractinsky et al., 2000) "certainly overgeneralizes the study's findings" (Tractinsky, 2004, p. 352). He sees Hassenzahl's (2004) work as an important next step in order to uncover the processes that underlie the relationship of beauty and usability.

Taken together, it has been shown that systems that look more beautiful are estimated to be more usable as well (Tractinsky et al., 2000), although it remains unclear, if they objectively are (Hassenzahl, 2004). It is our goal to take the current knowledge from HCI research and transfer it to a broader field outside of HCI. So, based on the aforementioned findings, indicating a connection between beauty and goodness, we investigate the role of beauty in decision making. It is our goal to find a similar connection between beauty (as decision criterion) and goodness (as in a good decision). Specifically, we are interested in the role of beauty in decisions based on unconscious thought (Dijksterhuis & Nordgren, 2006).

The Unconscious Thought Theory

The idea of unconscious decision-making goes back on Ap Dijksterhuis' empirical studies (Bos, Dijksterhuis, & van Baaren, 2011; Dijksterhuis, 2004; Dijksterhuis & Meurs, 2006; Dijksterhuis, Smith, & Baaren, 2005) and his development of the Unconscious Thought Theory (Dijksterhuis & Nordgren, 2006). The theory states that unconscious thought processes lead to better decisions compared to conscious thought processes or decisions without thinking at all (Dijksterhuis & Nordgren, 2006). Empirical studies testing the theory always investigate decision quality after different modes of thought: conscious thought, unconscious thought and no thought at all (immediate decision). In those studies, decision quality is either operationalized as an objectively better decision (based on different features that are given about the items of choice; i.e. when participants chose between cars, see Bos et al., 2011) or as long-term satisfaction, especially when a decision is not easily defined as better or worse (i.e. when participants select the "best" poster, see Dijksterhuis & van Olden, 2006). Findings based on both of these ways of operationalization repeatedly show that decisions based on unconscious thought processes are superior to decisions based on conscious evaluation or immediate gut decisions (Dijksterhuis, 2004; Dijksterhuis & Meurs, 2006; Dijksterhuis & Nordgren, 2006; Dijksterhuis et al., 2005; Dijksterhuis & van Olden, 2006).

The procedure in studies investigating the Unconscious Thought Theory is always very similar: Participants are assigned to one of three conditions: conscious thought, unconscious thought and immediate decision condition. Conscious thought "refers to the cognitive and/or affective task-relevant processes one is consciously aware of" (Dijksterhuis, 2004, p. 586), unconscious thought to the ones outside of conscious awareness (Dijksterhuis, 2004). The immediate decision condition (no thought) serves as control condition. Participants then follow their different instructions and choose the best alternative out of multiple ones. Based on this procedure, multiple studies show that unconscious thought leads to better decisions than conscious thought or no thought (Dijksterhuis, 2004; Dijksterhuis & Meurs, 2006; Dijksterhuis & Nordgren, 2006; Dijksterhuis et al., 2005; Dijksterhuis & van Olden, 2006). The decision itself can be a selection of the best option out of multiple, this can refer to apartments, roommates (Dijksterhuis, 2004), cars (Bos, Dijksterhuis, & Baaren, 2008) or posters (Dijksterhuis & van Olden, 2006), for example. Or it is operationalized in a more complex way,

i.e. as the prediction of soccer matches by experts or non-experts (Dijksterhuis, Bos, Van der Leij, & van Baaren, 2009) or forming personality impressions (Bos et al., 2008).

In their Unconscious Thought Theory, Dijksterhuis and Nordgren (2006) give a possible explanation as to why unconscious thought processes lead to better decisions, in form of higher long-term satisfaction. They argue that unconscious decisions profit from the almost unlimited capacity of the unconscious part of our brain (Dijksterhuis, 2004). While immediate decisions are made without thinking about them at all, conscious decision making processes are limited by the limited items that can be consciously hold in our brains at the same time (Dijksterhuis, 2004; Miller, 1956). So according to the Unconscious Thought Theory, the unconscious thought process leads to a superior decision, because it allows to better weigh in all relevant decision criteria. And since there is almost no limit in capacity, all relevant criteria are being taken into account (Dijksterhuis, 2004).

Another relevant criterion that Bos et al. (2008) later focuses on, is the goal dependency of unconscious thought. They specifically point out that unconscious thought processes are goal dependent, meaning that they only happen when there is the explicit goal to further process information, even if conscious thinking is occupied with something else (Bargh, 2011; Bos et al., 2008). So it is extremely important to keep this goal dependency in mind when designing a replication study. As specifically pointed out by Bargh (2011), this is one of the few assumed underlying mechanisms of unconscious thought and often forgotten when trying to replicate.

While the studies mentioned above used different stimuli and more or less artificial decision scenarios, they all tend to find the superiority of unconscious decision processes both over immediate and conscious decision-making processes. Nevertheless it is still controversial, if the effect unequivocally exists and how it works. There has been a growing body of literature since the Unconscious Thought Theory has been developed. Multiple labs tried to replicate the existing findings and not all of them were successful. In his meta-analysis, Acker (2008) finds only little evidence for the superiority of unconscious thought, mirroring what also other studies find as well (Thorsteinson & Withrow, 2009). Some replication attempts not only fail to find evidence for the superiority of unconscious thought, there is also evidence for the superiority of conscious ones (Acker, 2008; Huizenga, Wetzels, van Ravenzwaaij, & Wagenmakers, 2012; Newell, Wong, Cheung, & Rakow, 2009; Rey, Goldstein, & Perruchet, 2009; Waroquier, Marchiori, Klein, & Cleeremans, 2009). They conclude that decision-making is yet to be fully

understood. Moreover the Unconscious Thought Theory needs to take into account work that has been done in the field of decision making and judgement in the field of cognitive psychology (González-Vallejo, Lassiter, Bellezza, & Lindberg, 2008). So although the superiority of unconscious thought has been shown in multiple studies so far, there is also some doubt as to how it works and what underlying processes influence it. Especially, replications of studies investigating the quality of decisions as post-choice satisfaction, a rather subjective measure of quality, have not been attempted. The existing replication attempts rather focused on studies that objectively measure better decisions. It is our goal to focus on replicating the supposed effect based on a subjective measure of decision quality, close to Dijksterhuis & van Olden (2006), and to contribute to a better understanding of the effect in this realm.

We believe that the supposed superiority of unconscious decision-making could indeed rest upon the better weighing between all relevant decision criteria, as proposed by Dijksterhuis (2004). We further think that the combination of our current knowledge about beauty and our knowledge about unconscious thought processes could give us more insights. We expect that beauty is one of the relevant decision criteria making a decision satisfying in the long run. It is wrongly weighted in conscious thought processes, whereas its importance is unconsciously present. One possible explanation could be that we do not want to admit that beauty has such a big influence on our decisions, that it is thought to be a superficial criterion. To sum up, we believe that beauty is *the* relevant, though unconscious, decision criterion that leads to more post-decision satisfaction, ergo a better decision. In other words: beauty is a shortcut to better decisions.

Hypotheses

The main goal of our study is to investigate the role of beauty as an unconscious decision criterion and its influence on post-decision satisfaction. Our main hypothesis (H1) is that participants, who think unconsciously about their decision, make the better decision, meaning they are more satisfied in the long run, compared to participants, who think consciously about their decision or who make an immediate decision without thinking at all. We hypothesize that this effect is due to beauty playing a bigger role in the decision-making process for the unconscious thought group compared to the conscious thought and no thought group. We rely on Dijksterhuis and van Olden (2006) and control for art interest. In Hypothesis 1, it is our main

goal to replicate existing findings surrounding the Unconscious Thought Theory (Dijksterhuis & Nordgren, 2006) in the realm of aesthetic experiences. In their study, Dijksterhuis and van Olden (2006) already enter this realm using art posters as stimuli. And also before that, art posters have been used to compare decision types regarding their long-term satisfaction (Wilson & Schooler, 1991). Both of these exemplary studies include knowledge as a possibly confounding variable. We plan to follow these examples, not only because we plan to stay as close to the existing procedure as possible, but also because knowledge is an important variable to consider in aesthetic research. It has been clearly shown that art experts show different reactions to artworks, which indicate different underlying processes between art experts and non-experts (Brieber, Nadal, Leder, & Rosenberg, 2014; Leder, Belke, Oeberst, & Augustin, 2004). According to the model of aesthetic appreciation and aesthetic judgement, especially the explicit classification stage, which is the second of five stages of aesthetic experiences, is influenced by expertise (Leder et al., 2004). While naïve or non-expert viewers categorize artworks based on their content i.e., experts rather use art-specific concepts, like style or epoch, for categorization (Augustin & Leder, 2006; Leder et al., 2004). And also regarding liking ratings, some differences between experts and non-experts have been shown to exist. Naïve viewers like, what makes them feel good (Augustin & Leder, 2006), while experts tend to also appreciate "ugly" artworks. Leder, Gerger, Dressler, and Schabmann (2012) showed that the difference between emotional and cognitive appraisal of artworks decreases with increasing expertise. So, expertise plays an important role in the realm aesthetic experiences and cannot be ignored when doing research in that field. Therefore we deliberately follow the examples of Dijksterhuis and van Olden (2006) and Wilson and Schooler (1991) and include this important variable.

Our second hypothesis (H2) is that there is no difference between groups (unconscious, conscious and no thought) regarding their decision outcome. This means that the decisions are not different depending on the thought processes, the difference we try to detect lies in the long-term satisfaction with the decision. In other words, the three decision making processes we investigate do not lead to different decisions, but to similar ones that are perceived more or less satisfying. Here again, we follow the example of Dijksterhuis and van Olden (2006).

Our third hypothesis (H3) is that participants, who think unconsciously about their decision, more strongly decide based on beauty as decision criterion, than participants in the other two conditions. Here we focus on beauty as decision criterion and try to contribute to the

existing body of literature by investigating a possible function of beauty and trying to understand underlying processes within unconscious thought.

Method

We conducted two experiments using different sets of stimuli, but the exact same method. We hoped this would help us to find effects valid for different types of decisions. This very paper focuses on procedure, analysis and discussion of the experiment using one of these stimuli sets, namely art postcards. The methods we used follow the example of several studies that have empirically investigated different modes of thoughts and their role in decision making (Wilson et al., 1993; Wilson & Schooler, 1991), especially surrounding the Unconscious Thought Theory (Bos et al., 2011; Dijksterhuis, 2004; Dijksterhuis & Meurs, 2006; Dijksterhuis & Nordgren, 2006; Dijksterhuis & van Olden, 2006). In addition to their procedure, we focused on the role of beauty as decision criterion and therefore made some adaptions, so our procedure reflects this. We preregistered our study (aspredicted, 2018; see Appendix B for details).

Sample

Participants were university students recruited from five different psychology classes at the University of Vienna. Based on a power analysis we conducted in G*Power (Faul, Erdfeller, Lang, & Buchner, 2007), we strove for 160 participants (details see Appendix C). As defined in our preregistration, we planned to exclude participants who would not finish all three blocks of the study. But due to the unexpectedly high dropout rate after Block 1 (64%), we decided to include participants who finished Block 2 and Block 3 in the analysis of H1 and H2 after all. We made that decision before starting data analysis. After excluding 2 participants, whose answers in Block 1 indicated that there weren't following the instructions (by giving the same answer for every criterion and every item), we ended up with a total of 106 participants (74.5% female, 25.5% male), whose mean age was 22.4 years (ranging from 18 to 46 years). A total of 78 participants (61 female, 17 male) finished all three blocks of the study (31 in the conscious thought condition, 14 in the unconscious thought condition, 33 in the no thought condition), 28 participants (18 female, 10 male) only finished Block 2 and 3 (9 in the conscious thought condition, 6 in the unconscious thought condition, 13 in the no thought condition).

Stimuli

Close to Wilson et al. (1993) and Dijksterhuis (2004) using posters as stimuli, we used A5 formatted glossy art postcards for our first experiment. Searching the Prometheus Image Archive (Prometheus, 2018), we decided to use artworks from varying artists and in different styles. We further created a variety by using artworks in different sets of colours. In order to avoid familiarity, we decided to use less popular artworks (details see Appendix D). In the second experiment we conducted, we used a set of five different ballpoint pens from different brands that were similar in appearance and price. As stated above, this second experiment is not discussed in detail in this paper.

Measures

In all of our hypotheses, our independent variable (IV) was group. There were three groups, namely the no thought group (NT), the conscious thought group (CT) and the unconscious thought group (UT). In each group, we introduced a different thought process. We were interested in understanding the differences between decisions based on conscious and unconscious thought processes, so CT and UT can be defined as our experimental groups, while NT is the control group.

For our main hypothesis (H1), we were interested in the *better decision*, which we operationalized using the three dependent variables „use of item", „finding beautiful" and „reported satisfaction" in Experimental Block 3. We measured „use of item" on a dichotomous scale (yes / no), on which participants indicated if they kept their art postcard. We also gathered additional information about what participant's exactly did with their item (i.e. *I hung up the art postcard*, German original: *Ich habe die Kunstpostkarte aufgehängt*) for possible exploratory analyses. In our preregistration, we defined that we measure „finding beautiful" and „reported satisfaction" on a 7-point Likert scale, but instead, we used a 5-point Likert scale. We measured art interest as a covariate on the above using 5 items (on a 7-point Likert scale) from the Vienna art interest and art knowledge questionnaire (VAIAK, reliability $\omega = .94$) developed at the University of Vienna (Specker et al., 2018). The art interest score of the participants is the mean rating of the participants over those 5 items.

For our second hypothesis, we compared the selected postcards between experimental groups in experimental Block 2. The DV here was simply the „number of the selected item“. There were 5 postcards to choose from, so this number ranges from 1 to 5.

Our third hypothesis focused on the role of beauty as decision criterion. We operationalized the DV „strength of beauty“ on a 5-point Likert scale that we used in Experimental Block 1 and 2. In order to mask the true goal of the study, we did not only collect information about the DV in Block 1 and 2, but also about several other decision criteria that we adapted based on Jamal and Goode (2011; details see Appendix E). In total we asked participants to rate 10 criteria (quality, design, workmanship, durability, comfort, beauty, variety, information provided, artist / producer, German original: Qualität, Design, Verarbeitung, Langlebigkeit, Komfort, Schönheit, Vielfältigkeit, bereitgestellte Zusatzinformation, Künstler / Hersteller) on a 5-point Likert scale ranging from *not important at all* (German original: *gar nicht wichtig*) to *very important* (German original: *sehr wichtig*).

We used an anagram task as a filler task in both the unconscious thought and the no thought group. The sole purpose of it was to streamline the duration of the questionnaire in Block 2 between groups. We developed 18 anagrams to solve, but don’t analyse any data from the anagram task.

Procedure

In total, our study consisted of two experiments with three experimental blocks each, conducted in five different university courses and lectures. This is different to what we defined in our preregistration and due to the unexpectedly high dropout rate (64%) in the planned university lecture in Winter-term 2018/19. We decided to collect data in four additional university courses in Summer-term 2019. Each experimental block took part either at the beginning or at the end of each course. Block 1 and 2 were one week apart from each other. Block 3 followed five or six weeks later. Participants received verbal instructions by one of three experimenters in the beginning of each block. Those instructions were supported by presentation slides. Detailed instructions were given on the paper pencil questionnaires (see Appendix E for details) the participants filled out. Pictures of the postcards were presented using the projector and presentation slides.

Experimental Block 1. We started with verbal instructions. We introduced the experiment as part of a study about visual perception and the evaluation of art. We informed the participants that their participation was voluntary and distributed the informed consent form for signature. Students, who did not want to participate, took a break. Then we distributed random 5-digit participant codes and asked all participants to save their code in their phone to be able to use it for all three blocks of the experiment. After we gathered the signed informed consent forms, participants received a two-sided questionnaire. On this questionnaire, we asked them to rate five objects, namely gloves, postcards, wall calendars, ballpoint-pens and mobile protection cases (German original: Handschuhe, Postkarten, Wandkalender, Kugelschreiber, Handy-Schutzhülle) on 10 decision-making criteria on a 5-point Likert scale (ranging from 1 *not important at all*, German original: *gar nicht wichtig*, to 5 v*ery important*, German original: *sehr wichtig*). After we gathered the questionnaires we reminded participants to keep their codes saved in their phones for the upcoming two blocks. Experimental Block 1 took approximately 15 to 20 minutes in each of the courses.

Experimental Block 2 . Similar to Block 1, Experimental Block 2 started off with verbal instructions supported by presentation slides. Students, who had not participated in Block 1, received their random participant code and a consent form for signature. They were still able to participate, because the analysis of H2 and H3 only needed data from experimental Block 2 and 3. Here we spontaneously deviated from what we planned in our preregistration, because of the unexpectedly high dropout rate after Block 1. After these formalities were completed, we distributed the questionnaires. There were three types of questionnaires, one for the no thought condition, one for the conscious thought condition and one for the unconscious thought condition. In the largest university lecture, in which we conducted our experiment, we divided the lecture hall into three sections (left, middle and right) and pseudo-randomly distributed the different types of questionnaire section-wise. We did not expect that the left, middle or right position of the participants in the lecture hall would influence our variables of interest. We decided to do so instead of a fully randomized distribution, so the participants would not be irritated when they notice that their questionnaire is different to the ones of their neighbours sitting next to them. In the smaller lectures (with approximately 15 to 25 participants each), in which we conducted our study, we randomly selected one experimental group per lecture. We did not expect that this would influence our variables of interest. For all groups, the experiment

started off with some general instructions and the presentation of a presentation slide using the beamer, showing five art postcards for 45 seconds.

Table 1

[Procedure of Experimental Block 2]

No Thought Condition	**Conscious Thought Condition**	**Unconscious Thought Condition**
Verbal instructions about Experimental Block 2 and distribution of questionnaires		
Picture of 5 art postcards visible on a slide for 45 seconds (via projector)		
Immediate decision: Participants select the art postcard they like most.	Conscious Thought Process Initiation: "Please carefully evaluate each picture and decide which one you like most."	Unconscious thought process initiation: Participants are informed that they will be asked to select the postcard they like most later.
Anagram-task (300 sec.)		Anagram-task (300 sec.)
	Decision: Participants select the art postcard they like most.	Decision: Participants select the art postcard they like most.
Repetition of question from Experimental Block 1 questionnaire: What role did the different criteria play in the decision participants just made?		
Surprise: Participants get the postcard they like most as a gift.		

In the no thought condition, participants were then asked to immediately select the postcard they like most. After that, they had to solve as many anagrams as possible in 300 seconds. This condition served as control that would let us differentiate between an immediate decision without thinking and an unconscious thought process that is operationalized in the later unconscious thought condition. In the conscious thought condition, participants were asked to carefully evaluate what they think about each of the art postcards presented. They were asked to take around one minute per postcard to write down their thoughts on each one and carefully evaluate their thoughts. Finally, they were asked to select the one they like most. In

the unconscious thought condition, participants were informed that they would be asked to select the postcard they liked most in the end of the questionnaire. Then they were given the same anagram-task as the no thought condition for 300 seconds. This anagram task required conscious thinking and distracted participants to consciously think about the postcards. After that, they were asked to now select the postcard they like most.

The following task was similar for each condition. We repeated one part of our questionnaire from experimental Block 1 asking all participants to rate the role that 10 decision criteria played for their selection of the postcard on a scale from 1 to 5. In the end, all participants received the art postcard they liked most as a surprise. We told participants this was a thank-you for their participation. In total, experimental Block 2 took 20 to 30 minutes. The detailed flow of our procedure in Experimental Block 1 is illustrated in Table 1.

Experimental Block 3. We again started off with verbal instructions and the distribution of a one-page questionnaire. Within this questionnaire, participants were asked to indicate, whether they kept their art postcard and what they did with it (i.e. hang it up or threw it away). Five items investigating art interest followed. The questionnaire ended with a manipulation check asking participants to guess the purpose of our study.

Analysis and Results

Data cleaning and descriptive statistics were carried out in R (R Core Team, 2012), analyses were carried out in JASP (JASP Team, 2019).

Analysis of Hypothesis 1: Unconscious thought leads to better decisions

We defined in our preregistration that we would examine H1 via three sub-hypotheses that examine our main dependent variables “use of item”, “finding beautiful” and “reported satisfaction”. We would accept H1, if all three sub-hypotheses were found significant. To analyse them, we planned to use three ANCOVAs with the IV condition (NT, CT, UT) and the mentioned DVs “use of item”, “finding beautiful” and “reported satisfaction” with the covariate being art interest. We expected to find three significant main effects of condition on the three DVs. Other than defined in our preregistration, we did not use ANCOVAs for all three DVs, because the variable use of item was operationalized as a yes / no response and therefore an

ANCOVA could not be conducted. We used a logistic regression for our first sub-hypothesis instead, the equivalent method when dealing with dichotomous DVs. All assumptions were met.

Analysis of Sub-hypothesis 1: Dependent variable "use of item". We fitted a binary logistic model to the data in order to test our sub-hypothesis about the relationship between the IV (mode of thought) and the DV of interest (use of item). The full model containing the predictor condition (mode of thought: NT, CT, UT) was not statistically significant [$\chi^2(102)=2.222$, $p=.528$, $r^2_{\text{Nagelkerke}} = .059$], indicating that the model was not able to distinguish between participants who used or did not use their item after they selected it.

Table 2

[DV 3 "use of item" compared between modes of thought]

	DV 3: "Use of item"		
	Yes	No	Total
IV: mode of thought			
CT	39	1	40
NT	42	4	46
UT	19	1	20
Total	100	6	106

Analysis of Sub-hypothesis 2: Dependent variable "finding beautiful". We conducted a one-way ANCOVA to determine the difference between modes of thought on finding a selected item beautiful while controlling for art interest. We failed to find a significant difference in finding the selected item beautiful [$F(1,102)=1.379$, $p=.257$, $\eta_p^2 = .026$] between modes of thought. As can be seen in Figure 1, mean values between groups (modes of thought) are only slightly different. Other than stated in our preregistration, we refrained from calculating contrasts, because the ANCOVA did not reveal a significant effect in the first place.

Analysis of Sub-hypothesis 3: Dependent variable "reported satisfaction". Similar to sub-hypothesis 2, we conducted a one-way ANCOVA to determine the difference between modes of thought on reported satisfaction while controlling for art interest. Again, we failed to find a significant difference in reported satisfaction [$F(1,102)=0.638$, $p=.530$, $\eta_p^2 = .012$] between modes of thought. As shown in Figure 2, mean values again show only slight differences. We again refrained from calculating contrasts, because of the missing main effect in the ANCOVA.

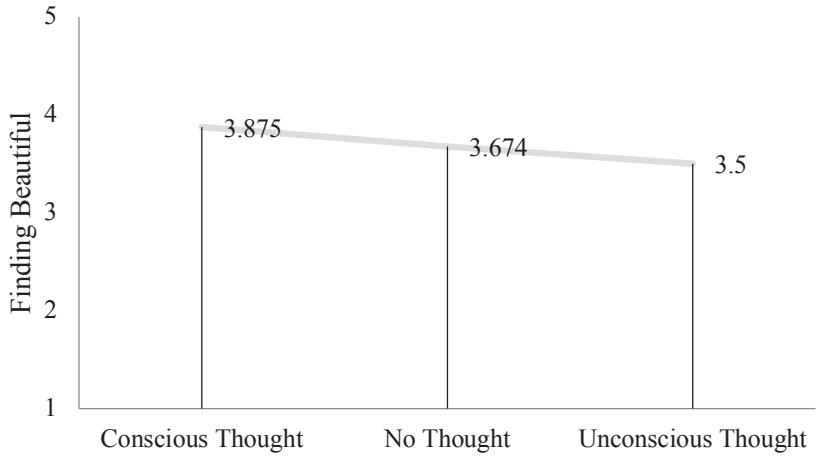

Figure 1: Mean "finding beautiful"-values between modes of thought

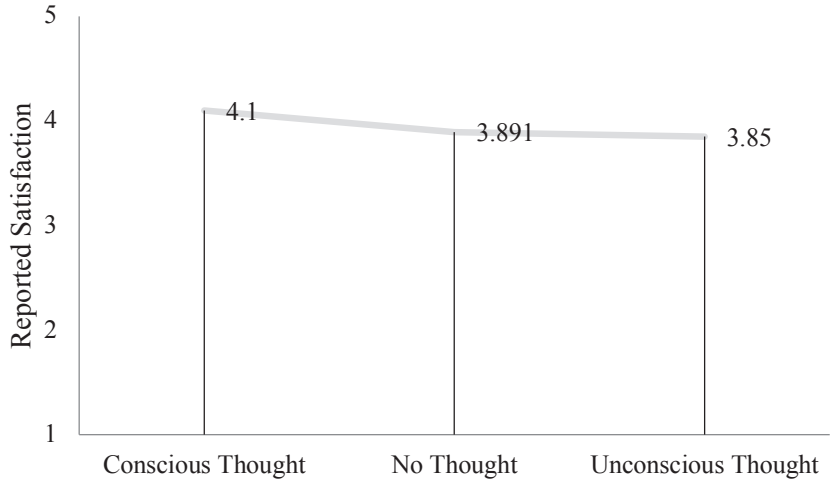

Figure 2: Mean "reported satisfaction"-values between modes of thought

Analysis of Hypothesis 2: No difference in selected item between groups

In accordance with our preregistration, a chi-square test of homogeneity was used to examine our hypothesis that there was no significant difference in chosen postcard between conditions (see details regarding the frequency of the selected postcards per group in Table 3).

Table 3

[Selected art postcards in Block 2 compared between modes of thought]

	DV: selected postcard				
	Postcard 1	Postcard 2	Postcard 3	Postcard 4	Postcard 5
IV: Mode of thought					
CT	7	11	11	2	9
NT	11	13	15	2	5
UT	2	1	9	1	7

Results confirmed no significant difference between modes of thought and selected item [$\chi^2(8) = 10.705$, p=.219]. Due to a much lower number of participants in the unconscious thought group after data cleaning, expected cell values were below 5 in forty percent of the cells (see Appendix F, Table 4). Expected cell values above 5 in 80% of the cases are a prerequisite for the chi-square test of homogeneity to deliver reliable results. Therefore we additionally conducted a Fisher exact test, which better handles cell values below 5. The Fisher exact test confirmed no significant difference in chosen postcard between condition (p=.161).

Analysis of Hypothesis 3: unconscious decisions are based on beauty

A mixed ANOVA with the between subject factor mode of thought, the within subject factor time and the DV strength of beauty has been conducted. We did not find a main effect of condition, the mode of thought [$F(1, 76)=0.376$, p=.541, $\eta_p^2 = .003$]. Similarly, we did not find a

main effect of beauty ratings over time [$F(1, 76)=1.757$, $p=.189$, $\eta_p^2 = .007$]. We could not find the significant interaction between beauty ratings over time and condition that we expected [$F(1, 76)=1.236$, $p=.27$, $\eta_p^2 = .005$]. As can be seen in Figure 3, the mean values of "finding beautiful" do not differ much between modes of thought or between Blocks. Other than stated in our preregistration, we refrained from calculating contrasts, because the mixed ANOVA did not reveal a significant effect.

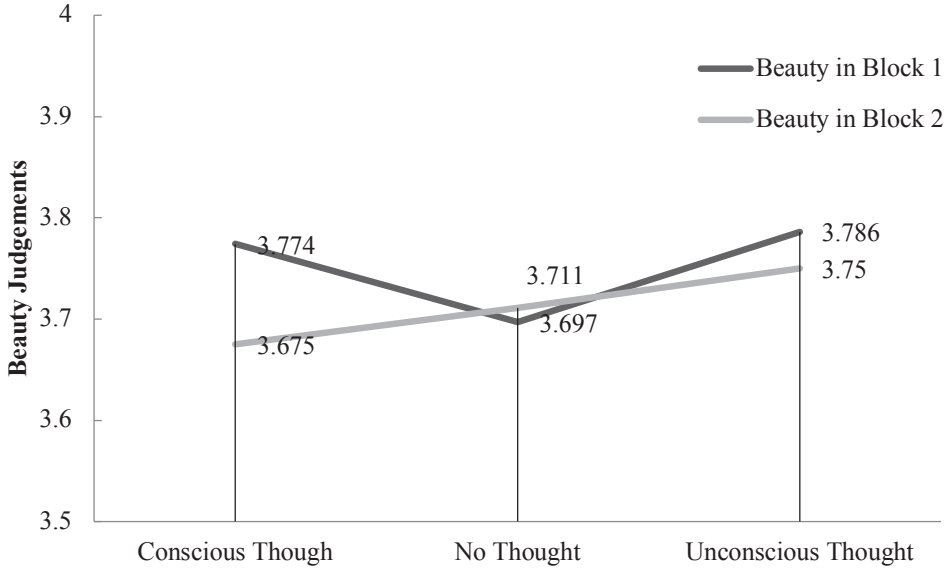

Figure 3: Beauty judgments between modes of thought in Blocks 1 and 2.

Exploratory analyses

We decided to regroup the independent variable in order to reflect one group of conscious thought and one group where no conscious thought process happened. That second group consisted of all the data from the former UT and NT group. The reasons were two-fold: One, only few participants finished the study in the UT condition (n = 20), while at least a double number of participants finished either in the CT (n = 40) or the NT (n = 46) condition. Two, existing literature indicates that there might not be a difference between conscious and unconscious thought, but a difference between deliberate thinking processes and no deliberate thinking processes (Acker, 2008; Huizenga et al., 2012; Newell et al., 2009; Rey et al., 2009; Waroquier et al., 2009; Wilson et al., 1993; Wilson & Schooler, 1991). We made our decision to have a closer look at our data from this different angle only our confirmatory analysis has been

conducted and it has not been part of our preregistration, therefore analyses and results have a purely exploratory character.

We repeated analyses of Hypothesis 1 with the regrouped sample, which revealed no indication of an effect whatsoever. A binary logistic model containing the predictor condition (mode of thought: CT, no CT) did not indicate any effect [χ^2 (103)= 1.987, p=.370, $r^2_{Nagelkerke}$ = .053]. Similarly, a one-way ANCOVA did not indicate a difference between CT and no CT participants in either finding their selected item beautiful [F(1,103)=2.106, p=.150, η^2_p = .020], or reported satisfaction [F(1,103)=1.241, p=.268, $r^2_{Nagelkerke}$ = .012]. We also repeated the chi-square test of homogeneity, which again revealed no indication of any difference in chosen item between CT and no CT group [χ^2(4) = 1.319, p=.858]. The repetition of the mixed ANOVA did not indicate a different result from what we found before. Again, there was no indication of a main effects of condition [F(1, 76)=1.163, p=.687, η^2_p = .001] or of time [F(1, 76)=2.375, p=.127 η^2_p = .009]. And again, we did not find an interaction between time and condition [F(1, 76)=1.88, p=.174, η^2_p = .008]. In total, our exploratory analyses that compared conscious thinker with non-conscious thinkers indicated the same results we found in our confirmatory analyses. There is no indication of a possible effect if we compare those two modes of thought.

Discussion

We failed to replicate existing findings regarding the superiority of decisions based on unconscious over conscious thought or immediate decision-making. Hypothesis 1 was that unconscious thought leads to better decisions. In order to investigate this hypothesis, we defined three sub-hypothesis, in which we expected participants, who think unconsciously about their decision, a) to use their item more often, b) to find it more beautiful and c) to report higher post-decision satisfaction compared to conscious thinkers or immediate decision-makers. Our data revealed no significant effects in any of our sub-hypotheses, so there is no evidence supporting Hypothesis 1. Hypothesis 2 was that there was no difference in selected postcard between groups. Our data confirmed this hypothesis. Hypothesis 3 expected unconscious thinkers to base their decision on beauty more than the other two groups. Our results did not confirm this hypothesis. However, we found beauty has been rated high in all modes of thought and all points in time. Taken together, we could not find any evidence that there was any difference

between modes of thought in weighing in beauty as the relevant decision criterion for making a better decision. There are multiple explanations as to why we failed to find those expected results, some of them concern methodological, some concern theory-based issues.

Methodological and procedural issues

Our study arrangement was rather complex, including multiple experimental blocks and a complex combination of variables. One of the unexpected problems was that we had to handle huge dropout rates (64% after Experimental Block 1 alone) and repeat the study in multiple classes. As pointed out above, this left us with less than half of the number of participants in the UT (n=20) condition than either the CT (n=40) or NT (n=46) condition. There is no reason to assume that this dropout rate is somehow connected to our manipulation, but we cannot rule out this possibility either. The obvious result of the struggle to recruit an adequate number of participants is missing power. We strove for a power of 80%, but recruited only 106 participants, which is 66% less than needed to achieve that power. We do not want to "simply" blame power for our failure to find any effect, but it is important for us to mention this topic and underline that it could be a matter of missing power that we could not detect an effect. It is difficult to interpret data that is based on only 20 participants in the condition of interest. Having said that, multiple other topics in the context of methodology and procedure could have led to us failing to detect an effect.

One, it remains unclear if our measures, namely our instructions, led to different thought processes during Experimental Block 2. As Dijksterhuis and Nordgren (2006) clearly state in their theory, unconscious thought processes need goal dependency. It is necessary to have and follow a specific goal within the thought process in order for the unconscious thought process to work (Bargh, 2011; Bos et al., 2008; Dijksterhuis & Nordgren, 2006). After having executed our studies, the one using art postcards and the one using ballpoint pens as stimuli, we cannot be sure whether this important aspect definitely worked. Did participants in the setting of their university lectures really follow the important instruction and process the information properly, that they would have to make a decision later? We believe it is possible that our manipulation might not worked in that respect and therefore participants did not really engage in unconscious thought processes.

Two, we cannot rule out the possibility that all participants made an immediate decision about which postcard they liked most, ergo they found best, when they were first presented with the picture of all the postcards on slide. It has been pointed out before that this could be a limitation of the theory and change the thought processes altogether (Dijksterhuis & Nordgren, 2006). Presentation duration was 45 seconds and arguably long enough to build an opinion. Here again our study setup could have influenced the intended manipulations in an unintended and negative way. So, our failure replicate could be explained by an early and spontaneous decision that happened immediately when participants were presented with the stimuli. This problem is especially complex, because in order for unconscious thought to happen, integrating the presented information in a meaningful way is essential (Dijksterhuis, 2004; Dijksterhuis & Nordgren, 2006). One has to make sure that this information integration in the beginning really happens; nevertheless, this could lead to the undesired effect that participants judge during this phase already.

Three, another possible explanation concerns our implementation of the unconscious thought condition: In the end of Experimental Block 2, we let participants decide which art postcard they found best and immediately afterwards asked them to introspect about their reasons. To do so, we provided them again with the different decision criteria we had used in Experimental Block 1 already. The problem here could be that participants in fact did make their decision unconsciously, but the effect could have been destroyed by this post-decision introspection. In order to avoid this methodological problem, we suggest including an option that allows participants to indicate that their decision "just felt right".

Four, we let participants indicate in Experimental Block 1, which decision criteria they would use to select one item out of multiple ones. Though we used five different item groups here to mask the goal of our study, art postcards and ballpoint pens were also part of those five items. We cannot rule out that the execution of Experimental Block 1 influenced the later decision process in Experimental Block 2. This way we might have primed the given criteria in Block 1, so they were immediately present in all the three modes of thought in Experimental Block 2, which happened only one week later. Future studies should be sensitive about this possible issue and maybe use a different approach to include decision criteria into studies about unconscious thought.

Five, we did not find any difference in beauty ratings between the experimental blocks and between modes of thought. In other words, beauty ratings did not change significantly over time and within our group of interest. The obvious explanation is that beauty ratings were high in all three groups (modes of thought) to begin with. Arguably, one could define beauty as obvious decision criterion when selecting art postcards, especially if working with non-experts, who have been found to rely on what they like as the obvious criterion in art evaluation (see i.e. Leder et al., 2012). So, if mainly naïve participants select art postcards, what other criterion should be more important than beauty? And if beauty is especially important to begin with, there is little room to see differences between modes of thought. Although the similar approach and using posters as stimuli has worked before (see Dijksterhuis & van Olden, 2006; Wilson et al., 1993), we find this setup problematic in order to easily show clear differences. This result should not only be criticized. Our data indicates that beauty indeed plays an important role in this kind of decision. Future research could try and vary stimulus types in order to understand in detail, when beauty plays an important role and when it does not. Our results indicate that all thought processes led to equally good decisions and that all decisions were equally based on beauty. After all, 94.33% of the participants reported that they kept their postcard.

The constitution of a good decision

Measurements. An important aspect to mention is the measurement of decision quality. The Unconscious Thought Theory (Dijksterhuis & Nordgren, 2006) is based on multiple empirical studies that evaluate decision quality. There are two approaches in these studies as to the definition of decision quality. Most of the studies investigating Unconscious Thought Theory use decision scenarios in which an objectively better decision can be defined. Dijksterhuis and van Olden (2006) let participants select the best roommate and the best apartment, Bos et al. (2008) use cars as stimuli. In decisions like that, the best decision can be objectively defined by using the features given about each object. Dijksterhuis and Nordgren (2006) gave participants 48 pieces of information in order for them to come to a decision. The second approach as to how decision quality is measured is clearly subjective. Asking participants which poster they find best (Dijksterhuis & van Olden, 2006) and measuring the satisfaction with their decision is a subjective measure. It is important to point out that those decisions cannot be defined as right or wrong or better or worse. There is no best poster to choose, it is a matter of taste, which is influenced by multiple factors, i.e. expertise (Leder, Gerger, Brieber, & Schwarz, 2014; Leder et

al., 2012). In our study, we investigated this type of subjectively measurable decision quality; therefore we can only draw conclusions about those decisions. It remains unclear, if we would have found a difference between modes of thought if participants had to make an objectively better decision. Also, we did not give the participants a lot of information about the art postcards, since we wanted to stay close to the procedure Dijksterhuis and Nordgren (2006) used. Future research could try and add additional information the participants receive during encoding. It would make an objective evaluation of the best decision possible. Plus, beauty would only be one of the criteria given.

A related open question concerns the measured satisfaction. We did not find any differences between modes of thought regarding this quality criterion. This could either mean that there actually is no difference, or that there was a difference immediately after making the decision, but it got lost over time. A hint for the latter is our observation that multiple participants asked for the option to change their selected postcard once they understood that they get to keep the selected postcard as a present. We did not allow any selection to be changed, but the participants' asking could indicate that they were already unhappy with the selection they made immediately after they made it. During the postcard distribution at the end of Experimental Block 2, it was not feasible to collect data about the group those participants were in. Plus, we do not know if the participants, who were unhappy with their choice, came back when Experimental Block 3 was conducted. Therefore we do not know whether their data is included in our final dataset. In any case, future research should focus on that topic. Maybe asking participants immediately after they received their item, if they are happy with the decision, could shed some light onto this question. The fact that multiple participants asked to change once they understood that they would get the postcard also raises the question, why they did not choose the one they would like to take home in the first place. It is possible that they selected a postcard they thought must be the best without really believing it. Or they did not take the instruction seriously and would have decided differently, if they knew that they would get to keep the item. It is worth to reflect on the idea of changing the setup of the study in the future: Instead of surprising participants and mask the distribution of the postcards as a thank you for participation, participants should know what they choose an item they get to keep. This could make them take the instruction more seriously and give their honest opinion about the best

postcard. This also touches upon a related issue, the relevance of the decision for the participants.

Dijksterhuis and Nordgren (2006) clearly point out that unconscious thought processes are goal dependent. Without having the goal to unconsciously process information, unconscious thought does not occur (Bos et al., 2008; Dijksterhuis & Nordgren, 2006). In the past, replication attempts have been criticized for not including this important issue (Bargh, 2011). In our study, we asked participants to make a choice, namely to select *the postcard they liked best*. After knowing now that multiple participants would have liked to change their chosen postcard when they received it as a thank you, we could argue that the decision was not as important to the participants as it could have been. Informing participants that they choose for themselves could create more relevance of the decision and strengthen the goal to process the information in all conditions. Our data does not reveal concrete evidence that this goal was not pursued, but it also does not rule it out. Although the original study using posters did not do that either (Dijksterhuis & van Olden, 2006), nevertheless future research could touch upon this question.

Another important issue to mention concerns the decision's complexity. The Unconscious Thought Theory clearly states that unconscious thought is superior to conscious thought when making complex decisions (Dijksterhuis & Nordgren, 2006). And although we designed our procedure as close as possible to what Dijksterhuis and van Olden (2006) did in their poster study, the missing complexity of the decision could have influenced our results. In retrospect, we question whether the selection of one postcard out of five counts as complex decision, especially since we did not give the participants additional information about the postcards. In simple decision tasks, Dijksterhuis and Nordgren (2006) find conscious thought to be superior. In our exploratory analyses, we did not find any indication of a superiority of any mode of thought over the other. However, the question remains, if the selection of a postcard or a similar setup counts as complex decision-making. And especially if future research tries to get further insights into the Unconscious Thought Theory in the realm of aesthetics, this question needs to be addressed.

The logic of Hypothesis 2. In retrospect, not only the decision itself, but also the underlying logic of expected effects lead to additional questions for us. As already emphasized, it was our goal to stay close to the procedure that Dijksterhuis and van Olden (2006) used, in order to be able to replicate the supposed effects. After having conducted the experiments, we

find one of the expectations worthy of re-evaluation. In the original study, the authors do not dwell on the fact that there was no difference in choice of poster between modes of thought (Dijksterhuis & van Olden, 2006). They simply establish this in a short annotation (Dijksterhuis & van Olden, 2006, p. 629). We did not question this issue and included it into our set of hypotheses. We expected to find no difference in chosen postcard between modes of thought, while finding significant differences regarding usage of the postcard, beauty-ratings, and reported satisfaction. Our data did not confirm any of those expectations, except for Hypothesis 2: There was no difference in selected postcard between modes of thought. To understand, why we question the logic of this expectation, we have to circle back to the foundation of the Unconscious Thought Theory and the different types of decisions that have been investigated.

In their theory, Dijksterhuis and Nordgren (2006) clearly describe the differences between studies investigating normative, objective decisions, and studies that investigate idiosyncratic, subjective decisions. While in the former, decisions can be clearly defined as better or worse, because there are positive and negative attributes to each of the alternatives to choose from, the latter are a question of attitudes, personal preference, taste. Although Dijksterhuis and Nordgren (2006) emphasize that also objective decisions do not happen without the influence of personal preferences, they stay with their differentiation of objective and normative decisions. And interestingly, in the experiments investigating objective decisions, participants indeed make an objectively better choice: after thinking unconsciously, they really are better at finding the best combination of positive and negative attributes and choose the corresponding object (Bos et al., 2008; Dijksterhuis, 2004; Dijksterhuis & Nordgren, 2006). Thus it appears that unconscious thought leads to better, *different*, decisions in the context of normative decision tasks. In the case of subjective decision tasks however, no difference regarding selected items is established (Dijksterhuis & van Olden, 2006). In other words: Participants of all groups make the same decision, but they are not equally satisfied with it. They do not make a better decision; they make the exact same decision, but feel better about it. To our knowledge, this important distinction is not discussed thoroughly in literature so far. In retrospect, it leads to further questions that should be raised in the future when conducting research in the realm of the Unconscious Thought Theory.

If the argument made by Dijksterhuis and Nordgren (2006) as well as Wilson et al. (1993) is true, and conscious introspection really does lead to changes in the weighing scheme, why

does it not lead to different choices? Is it a valid conclusion to judge decisions as *better*, if they really are not different? If introspection leads to a different weighing scheme, but the choices stay similar, the only valid conclusion should be that we feel better or worse about our decisions. Dijksterhuis and Nordgren (2006) report a difference in strength of preference between modes of thought. Unconscious thinkers have less strong preferences and are found to be more satisfied with their decision (Dijksterhuis & Nordgren, 2006). A different interpretation of this finding could simply focus on those two aspects: Unconscious thought leads to less strong attitudes, which again lead to more satisfaction. In other words, the decision per se is not better, but having less strong feelings about it leads to more satisfaction. Unfortunately we did not collect data regarding the attitudes of our participants towards every single postcard, but we believe it is worth focusing on this aspect when planning future research.

Other criteria constituting a valid conclusion. Besides questions around decision type, measure and operationalization, more general issues regarding the constitution of a valid unconscious thought effect should be mentioned. In his research, Dijksterhuis (2004) investigates two hypotheses: Decisions based on unconscious thought are superior to decisions with no unconscious thought period, and decisions based on conscious thought are inferior to decisions based on unconscious thought. Newell and Shanks (2012) heavily criticize Dijksterhuis (2004) for reporting significant effects without finding both of their hypotheses confirmed in their experiments. They state that the superiority of unconscious thought can only ever be accepted if both of the hypotheses are confirmed (Newell & Shanks, 2012). It appears to be an open question, what really constitutes a valid conclusion in the realm of the Unconscious Thought Theory. Does it apply to complex decisions only and if yes, how are those complex decisions defined? Does it work similarly for objective decisions as well as normative decisions? Are decisions based on unconscious thought processes superior, decisions based on conscious thought processes inferior (as suggested by Rey et al., 2009) or is it a combination of the two? Our results cannot answer these questions, but add to a body of literature that consists of various empirical studies indicating different possibilities.

Bargh (2011) introduces the view that replication failures do not necessarily speak against the Unconscious Thought Theory. Besides his general criticism of the critics, he argues that finding no differences between modes of thought in decision quality can be interpreted as proof that all the modes of thought led to equally good decisions (Bargh, 2011). According to him, only

a superiority of the conscious thought mode over the unconscious thought mode would prove that unconscious thought does not lead to better decisions (Bargh, 2011). While this approach is an interesting thought experiment, we are not sure whether this conclusion should be drawn offhandedly. Finding no difference can indicate more than equality in decision quality between modes of thought. It could mean that the manipulation did not work, that one or more modes of thought could not be initiated by the given instruction, or that unconscious processing does not even exist. We argue that we should be careful before interpreting the absence of a significant difference as proof for equal decision quality lightly. Based on that logic, we could also state that we found evidence that beauty leads to better decisions. After all, we found beauty to be an important criterion in all the decisions. We could argue that all the participants used the same strategy, rely on beauty, independently from mode of thought. We think it is dangerous to draw conclusions like this from what our data tells us. But it is a great starting point for future research.

Conclusion. Is beauty a shortcut for better decisions? We cannot give an unambiguous answer. In our study we focused on this question in the realm of the Unconscious Thought Theory and did not find compelling evidence in any regard. Other than expected, we were not able to replicate existing findings surrounding the Unconscious Thought Theory, nor did we find our idea supported that beauty played a bigger role in the unconscious thought mode compared to conscious evaluation or spontaneous decisions. We can only speculate as to why we were not able to gain more insights into the supposed effects. Our results clearly show that we need more insight into the existing idea of unconscious thought processes in order to make definite statements about them. Similarly, it remains unclear, what exact role beauty plays in the whole scenario. We could not find a significant difference between conditions regarding beauty as decision-criterion. But this does not mean that it is not important. On the contrary, we found beauty to be an important decision criterion in all conditions and at all times. Maybe beauty is a shortcut for better decisions, independently from mode of thought. Future research will hopefully contribute to this question and help us understand beauty's nature even better.

References

Acker, F. (2008). New findings on unconscious versus conscious thought in decision making: additional empirical data and meta-analysis. *Judgement and Decision Making*, *3*(4), 292–303.

Augustin, D., & Leder, H. (2006). Art expertise : a study of concepts and conceptual spaces. *Psychology Science*, *48*(2), 135–156.

Bargh, J. A. (2011). Unconscious thought theory and its discontents: A critique of the critiques. *Social Cognition*, *29*(6), 629–647. https://doi.org/10.1521/soco.2011.29.6.629

Bos, M. W., Dijksterhuis, A., & Baaren, R. B. va. (2008). On the goal-dependency of unconscious thought. *Journal of Experimental Social Psychology*, *44*, 1114–1120. https://doi.org/10.1016/j.jesp.2008.01.001

Bos, M. W., Dijksterhuis, A., & van Baaren, R. B. (2011). The benefits of "sleeping on things": Unconscious thought leads to automatic weighting. *Journal of Consumer Psychology*, *21*, 4–8. https://doi.org/10.1016/j.jcps.2010.09.002

Brieber, D., Nadal, M., Leder, H., & Rosenberg, R. (2014). Art in time and space: Context modulates the relation between art experience and viewing time. *PLoS ONE*, *9*(6), 1–8. https://doi.org/10.1371/journal.pone.0099019

Buechel, E. C., & Townsend, C. (2018). Buying beauty for the long run: (Mis)predicting liking of product aesthetics. *Journal of Consumer Research*, *45*, 275–297. https://doi.org/10.1093/jcr/ucy002

Chatterjee, A. (2013). *The Aesthetic Brain: How We Evolved to Desire Beauty and Enjoy Art*. Oxford: Oxford University Press.

Conway, B. R., & Rehding, A. (2013). Neuroaesthetics and the Trouble with Beauty. *PLoS Biology*, *11*(3), e1001504. https://doi.org/10.1371/journal.pbio.1001504

Dijksterhuis, A. (2004). Think different: The merits of unconscious thought in preference development and decision making. *Journal of Personality and Social Psychology*, *87*(5), 586–598. https://doi.org/10.1037/0022-3514.87.5.586

Dijksterhuis, A., Bos, M. W., Nordgren, L. F., & Baaren, R. B. va. (2006). On Making the Right Choice : The Deliberation-Without-Attention Effect. *Science (New York, N.Y.)*, *311*(5763), 1005–1008.

Dijksterhuis, A., Bos, M. W., Van der Leij, A., & van Baaren, R. B. (2009). Predicting soccer

matches after unconscious and conscious thought as a function of expertise. *Psychological Science*, *20*(11), 1381–1387.

Dijksterhuis, A., & Meurs, T. (2006). Where creativity resides: The generative power of unconscious thought. *Consciousness and Cognition*, *15*, 135–146. https://doi.org/10.1016/j.concog.2005.04.007

Dijksterhuis, A., & Nordgren, L. F. (2006). A Theory of Unconscious Thought. *Perspectives on Psychological Science*, *1*(2), 95–109. https://doi.org/10.1111/j.1745-6916.2006.00007.x

Dijksterhuis, A., Smith, P. K., Baaren, R. B. Van, & Wigboldus, D. H. J. (2005). The Unconscious Consumer : Effects of Environment on Consumer Behavior. *Journal of Consumer Psychology*, *15*(3), 193–202.

Dijksterhuis, A., & van Olden, Z. (2006). On the benefits of thinking unconsciously: Unconscious thought can increase post-choice satisfaction. *Journal of Experimental Social Psychology*, *42*, 627–631. https://doi.org/10.1016/j.jesp.2005.10.008

Dion, K., Berscheid, E., & Walster, E. (1972). What is beautiful is good. *Journal of Personality and Social Psychology*, *24*(3), 285–290. https://doi.org/10.1037/h0033731

Domanski, A. (2012). The quest for absolute beauty in Plato's Symposium. *Phronimon*, *13*(1), 39–53.

Eagly, A. H., Ashmore, R. D., Makhijani, M. G., & Longo, L. C. (1991). What Is Beautiful Is Good, But...: A Meta-Analytic Review of Research on the Physical Attractiveness Stereotype. *Psychological Bulletin*, *110*(1), 109–128. https://doi.org/10.1037/0033-2909.110.1.109

Faul, F., Erdfeller, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191. https://doi.org/10.3758/BF03193146

Gerger, G., Leder, H., & Kremer, A. (2014). Context effects on emotional and aesthetic evaluations of artworks and IAPS pictures. *Acta Psychologica*, *151*, 174–183. https://doi.org/10.1016/j.actpsy.2014.06.008

González-Vallejo, C., Lassiter, G. D., Bellezza, F. S., & Lindberg, M. J. (2008). "Save Angels Perhaps": A Critical Examination of Unconscious Thought Theory and the Deliberation-Without-Attention Effect. *Review of General Psychology*, *12*(3), 282–296. https://doi.org/10.1037/a0013134

Hassenzahl, M. (2004). The interplay of beauty, goodness, and usability in interactive products. *Human-Computer Interaction*, *19*, 319–349. https://doi.org/10.1207/s15327051hci1904_2

Hassenzahl, M. (2012). Everything Can Be Beautiful. *Interactions*, 60–65.

Huizenga, H. M., Wetzels, R., van Ravenzwaaij, D., & Wagenmakers, E. J. (2012). Four empirical tests of Unconscious Thought Theory. *Organizational Behavior and Human Decision Processes*, *117*, 332–340. https://doi.org/10.1016/j.obhdp.2011.11.010

Ishai, A. (2007). Sex, beauty and the orbitofrontal cortex. *International Journal of Psychophysiology*, *63*, 181–185. https://doi.org/10.1016/j.ijpsycho.2006.03.010

Jamal, A., & Goode, M. (2001). Consumers' product evaluation: A primary Study evaluative in the precious Jewellery Markert in UK. *Journal of Consumer Behaviour*, *1*(2), 140–155.

Kahnemann, D. (2012). *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux.

Kawabata, H., & Zeki, S. (2004). Neural Correlates of Beauty. *Journal of Neurophysiology*, *91*, 1699–1705. https://doi.org/10.1152/jn.00696.2003

Krogerus, M., & Tschäppeler, R. (2017). *The Decision Book: Fifty Models for Strategic Thinking*. London: Profile Books.

Leder, H., Belke, B., Oeberst, A., & Augustin, D. (2004). A model of aethetic appreciation and aesthetic judgements. *British Journal of Psychology*, *95*, 489–508.

Leder, H., Gerger, G., Brieber, D., & Schwarz, N. (2014). What makes an art expert? Emotion and evaluation in art appreciation. *Cognition and Emotion*, *28*(6), 1137–1147. https://doi.org/10.1080/02699931.2013.870132

Leder, H., Gerger, G., Dressler, S. G., & Schabmann, A. (2012). How art is appreciated. *Psychology of Aesthetics, Creativity, and the Arts*, *6*(1), 2–10. https://doi.org/10.1037/a0026396

Leder, H., Tinio, P. P. L., Brieber, D., Kröner, T., Jacobsen, T., & Rosenberg, R. (2019). Symmetry Is Not a Universal Law of Beauty. *Empirical Studies of the Arts*, *37*(1), 104–114. https://doi.org/10.1177/0276237418777941

Lemay Jr., E. P., Clark, M. S., & Greenberg, A. (2010). What is beautiful is good because what is beautiful is desired: Physical attractiveness stereotyping as projection of interpersonal goals. *Personality and Social Psychology Bulletin*, *36*(3), 339–353. https://doi.org/10.1177/0146167209359700

Lüthe, R. (1984). Kants Lehre von den ästhetischen Ideen. *Kant-Studien*, *75*, 65–74.

https://doi.org/10.1515/kant.1984.75.1-4.65

Makkai, K. (2009). Kant on recognizing beauty. *European Journal of Philosophy*, *18*(3), 385–413. https://doi.org/10.1111/j.1468-0378.2009.00356.x

McGonigal, A. (2006). The autonomy of aesthetic judgement. *British Journal of Aesthetics*, *46*(4), 331–348. https://doi.org/10.1093/aesthj/ayl019

Miller, G. A. (1956). The Magical Number Seven, plus or minus two: some limits on our capacity for processing information. *The Psychological Review*, *63*(2), 81–97. https://doi.org/10.1177/001088049003100202

Newell, B. R., & Shanks, D. R. (2012). Unconscious influences on decision making: A critical review. *Behavioral and Brain Sciences (in Press)*, 1–72.

Newell, B. R., Wong, K. Y., Cheung, J. C. H., & Rakow, T. (2009). Think, blink or sleep on it? the impact of modes of thought on complex decision making. *Quarterly Journal of Experimental Psychology*, *62*(4), 707–732. https://doi.org/10.1080/17470210802215202

Prometheus - Das verteilte digitale Bildarchiv für Forschung und Lehre. (2018). Retrieved from https://prometheus-bildarchiv.de/en/imprint

Rabb, N., Nissel, J., Alecci, A., Magid, L., Ambrosoli, J., & Winner, E. (2016). Truths about beauty and goodness: Disgust affects moral but not aesthetic judgments. *Psychology of Aesthetics, Creativity, and the Arts*, *10*(4), 492–500. https://doi.org/10.1037/aca0000051

Ramachandran, V. S., & Hirstein, W. (1999). The Science of Art: A Neurological Theory of Aesthetic Experience. *Journal of Consciousness Studies*, *6*(7), 15–51.

Rey, A., Goldstein, R. M., & Perruchet, P. (2009). Does unconscious thought improve complex decision making? *Psychological Research*, *73*, 372–379. https://doi.org/10.1007/s00426-008-0156-4

Specker, E., Forster, M., Brinkmann, H., Boddy, J., Pelowski, M., Rosenberg, R., & Leder, H. (2018). The Vienna Art Interest and Art Knowledge Questionnaire (VAIAK): A Unified and Validated Measure of Art Interest and Art Knowledge. *Psychology of Aesthetics, Creativity, and the Arts*, 1–14. https://doi.org/10.1037/aca0000205

Thielsch, M. T., & Hassenzahl, M. (2008). Achtmal Schönheit. *I-Com*, *3*(3), 50–55. https://doi.org/10.1524/icom.2008.0036

Thorsteinson, T. J., & Withrow, S. (2009). Does unconscious thought outperform conscious thought on complex decisions ? A further examination. *Judgement and Decision Making*,

4(3), 235–247.

Tractinsky, N, Katz, A. S., & Ikar, D. (2000). What is beautiful is usable. *Interacting with Computers*, *13*, 127–145.

Tractinsky, Noam. (2004). A few notes on the study of beauty in HCI. *Human-Computer Interaction*, Vol. 19, pp. 351–357. https://doi.org/10.1207/s15327051hci1904_3

Tsukiura, T., & Cabeza, R. (2011). Shared brain activity for aesthetic and moral judgments: Implications for the Beauty-is-Good stereotype. *Social Cognitive and Affective Neuroscience*, *6*, 138–148. https://doi.org/10.1093/scan/nsq025

Wald, C. (2015). 4 Big Questions. *Nature*, *526*, 17.

Wang, T., Mo, L., Mo, C., Tan, L. H., Cant, J. S., Zhong, L., & Cupchik, G. (2015). Is moral beauty different from facial beauty? Evidence from an fMRI study. *Social Cognitive and Affective Neuroscience*, *10*, 814–823. https://doi.org/10.1093/scan/nsu123

Waroquier, L., Marchiori, D., Klein, O., & Cleeremans, A. (2009). Methodological pitfalls of the unconscious thought paradigm. *Judgment and Decision Making*, *4*(7), 601–610.

Weiß, N., & Forster, M. (2018). Preregistration: Beauty as a Shortcut. Retrieved June 12, 2018, from aspredicted.org website: https://aspredicted.org/see_one.php

Wilson, T. D., Lisle, D. J., Schooler, J. W., Hodges, S. D., Klaaren, K. J., & LaFleur, S. J. (1993). Introspecting about Reasons can Reduce Post-Choice Satisfaction. *Personality and Social Psychology Bulletin*, *19*(3), 331–339. https://doi.org/10.1177/0146167293193010

Wilson, T. D., & Schooler, J. W. (1991). Thinking Too Much: Introspection Can Reduce the Quality of Preferences and Decisions. *Attitudes and Social Cognition*, *60*(2), 181–192.

Wiswede, G. (2012). *Einführung in die Wirtschaftspsychologie Ökonomische Psychologie* (5th ed.). München: Ernst Reinhard GmbH & Co KG.

Zhang, W., He, X., Lai, S., Wan, J., Lai, S., Zhao, X., & Li, D. (2017). Neural substrates of embodied natural beauty and social endowed beauty: An fMRI study. *Scientific Reports*, *7*, 1–12. https://doi.org/10.1038/s41598-017-07608-8

List of Figures

List of Tables

Appendix A. Abstract.

Our research project is based on two pillars that each have been investigated before: beauty and decision-making. We strove to replicate existing findings surrounding the Unconscious Thought Theory, developed by Dijksterhuis and Nordgren (2006), in the realm of empirical aesthetics. According to the Unconscious Thought Theory, decisions based on unconscious thought processes are superior to decisions based on conscious evaluation or without thinking at all. We expect beauty to be the reason for this superiority: We hypothesized that unconscious thought leads to better decisions in terms of post-choice satisfaction, because they unconsciously weigh in the important decision criterion beauty appropriately. Our research project was adapted from Dijksterhuis and van Olden (2006) and consisted of two experiments using different stimulus sets. This paper focuses on the first of the two experiments we conducted, using art postcards as stimuli. Based on the data of 106 participants taking part in the study, we could not replicate existing evidence that unconscious thought leads to better decisions. Similarly, we did not find any evidence that beauty plays a significant role in unconscious thought processes compared to conscious thought process or immediate decisions. Nevertheless, our data indicates that beauty is an important criterion in every thought process and decision.

Unser Forschungsprojekt basiert auf zwei thematischen Säulen, die beide für sich bereits erforscht werden: Schönheit und Entscheidungsfindung. Wir haben die Replikation bestehender Studien rund um die *Unconscious Thought Theory,* die von Dijksterhuis und Nordgren (2006) entwickelt wurde, im Umfeld der empirischen Ästhetik angestrebt. Nach der *Unconscious Thought Theory* sind Entscheidungen, die auf unbewussten Denkprozessen beruhen, denjenigen Entscheidungen überlegen, die auf Basis von bewusster Evaluation oder spontan getroffen werden. Wir erwarten, dass Schönheit der Grund für diese Überlegenheit ist. Unsere Hypothesen nehmen an, dass unbewusstes Denken zu besseren Entscheidungen führt, das heißt zu mehr Zufriedenheit mit der getroffenen Entscheidung, weil es unbewusst das wichtige Entscheidungskriterium Schönheit angemessen gewichtet. Unser Forschungsprojekt ist von Dijksterhuis und van Olden (2006) adaptiert und besteht aus zwei Experimenten, in denen wir unterschiedliche Stimuli-Sets verwenden. Diese wissenschaftliche Arbeit widmet sich dem ersten dieser beiden Experimente, in dem wir Kunstpostkarten als Stimuli verwendet haben. Basierend auf den Daten von 106 Teilnehmern und Teilnehmerinnen konnten wir bestehende

Evidenzen, dass unbewusste Denkprozesse zu besseren Entscheidungen führen, nicht replizieren. Wir konnten außerdem keine Hinweise darauf finden, dass Schönheit eine signifikante Rolle in unbewussten Denkprozessen spielt, verglichen mit bewussten Denkprozessen oder spontanen Entscheidungen. Nichtsdestotrotz deuten unsere Daten daraufhin, dass Schönheit in jedem Denkprozess und in jeder Entscheidung ein wichtiges Kriterium darstellt.

Appendix B. Preregistration.

AS PREDICTED

Beauty as a shortcut - the role of beauty in post-decision satisfaction (#17542)

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1) Have any data been collected for this study already?
It's complicated. We have already collected some data but explain in Question 8 why readers may consider this a valid pre-registration nevertheless.

2) What's the main question being asked or hypothesis being tested in this study?
1. Main hypothesis: Participants, whose decision is based on beauty, make better decisions (=more satisfied in the long-term).
We assign participants to one of three conditions: the unconscious thought condition (UT), the conscious thought condition (CT) and the no-thought condition (NT). These conditions are based on the unconscious thought theory by Dijksterhuis (2004b) that states that unconscious thought leads to more post-decision satisfaction (=better decisions).
The study consists of three blocks.

We measure the better decision through the following sub-hypotheses: Participants in the UT condition made the better decision, because they
1.1 report to still have their postcard more often than participants of the other two conditions (CT, NT) several weeks after the selection,
1.2 find their postcard more beautiful several weeks after the selection compared to participants of the CT or NT condition,
1.3 report that they are satisfied with their selection several weeks after the selection more strongly than participants of the CT- or NT-condition (=post-decision satisfaction).
1.4 We investigate the variable art interest and its influence on the above, while we do not expect that there is a significant influence of art interest on the above hypotheses.

2. Participants are being tested in three conditions (UT, CT, NT). We expect that there is no significant difference between groups regarding the chosen item.

3. We expect that participants, who think unconsciously about their decision (UT), make their decision based on beauty more strongly than participants in the other two conditions (CT or NT). While we expect no significant difference between groups regarding the reported decision criteria in block 1 (baseline-comparison), we expect there is a significant difference between participants in the UT and participants in the two other conditions (NT, CT) in block 2 regarding the reported strength of beauty as decision criterion.

3) Describe the key dependent variable(s) specifying how they will be measured.
1. Main hypothesis: the dependent variable (DV) is the better decision, measured through
1.1 the dependent variable "keeping of item", which will be measured on a dichotomous scale (Yes/No).
1.2 the dependent variable "finding beautiful" several weeks after the decision measured on a 7-point Likert scale.
1.3 The dependent variable "reported post-decision satisfaction" several weeks after the decision measured on a 7-point Likert scale.
1.4 There is no significant influence of art interest as a covariate on the above (1.1-1.3). Art interest will be measured with 5 items (7-point Likert scale) from the art interest questionnaire developed at the University of Vienna. The art interest score of the participants is the mean rating of the participants over those 5 items.
2. The dependent variable is "number of selected items by condition".
3. The dependent variable "strength of beauty" as decision criterion will be measured on a 5-point scale in experimental block 1 and experimental block 2.

4) How many and which conditions will participants be assigned to?
Participants will be assigned to three conditions: (1) the conscious thought condition (CT), (2) the unconscious thought condition (UT) and (3) the no thought condition (NT).

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.
1. Our main hypothesis will be examined using an ANCOVA:
Independent variable: condition (UT, CT, NT)
Dependent variables: (1.1) keeping of item, (1.2) finding beautiful, (1.3) reported post-decision satisfaction
Covariate: Art interest (index based on 5 items)
We expect three significant main effects of condition on the three DVs (1.1) keeping of item, (1.2) finding beautiful and (1.3) reported post-decision satisfaction.
We expect no influence of art interest.

We will be using contrasts to examine the differences between groups for all three DVs. We expect a significantly higher mean in UT than in both other conditions (CT, NT) for all three DVs (=UT > -CT & NT).

ASPREDICTED

2. We use the χ2-test of homogeneity to examine our hypothesis that there's no significant difference in chosen item between groups. We will accept the null hypothesis (=our hypothesis) if the χ2-test has a non-significant result.

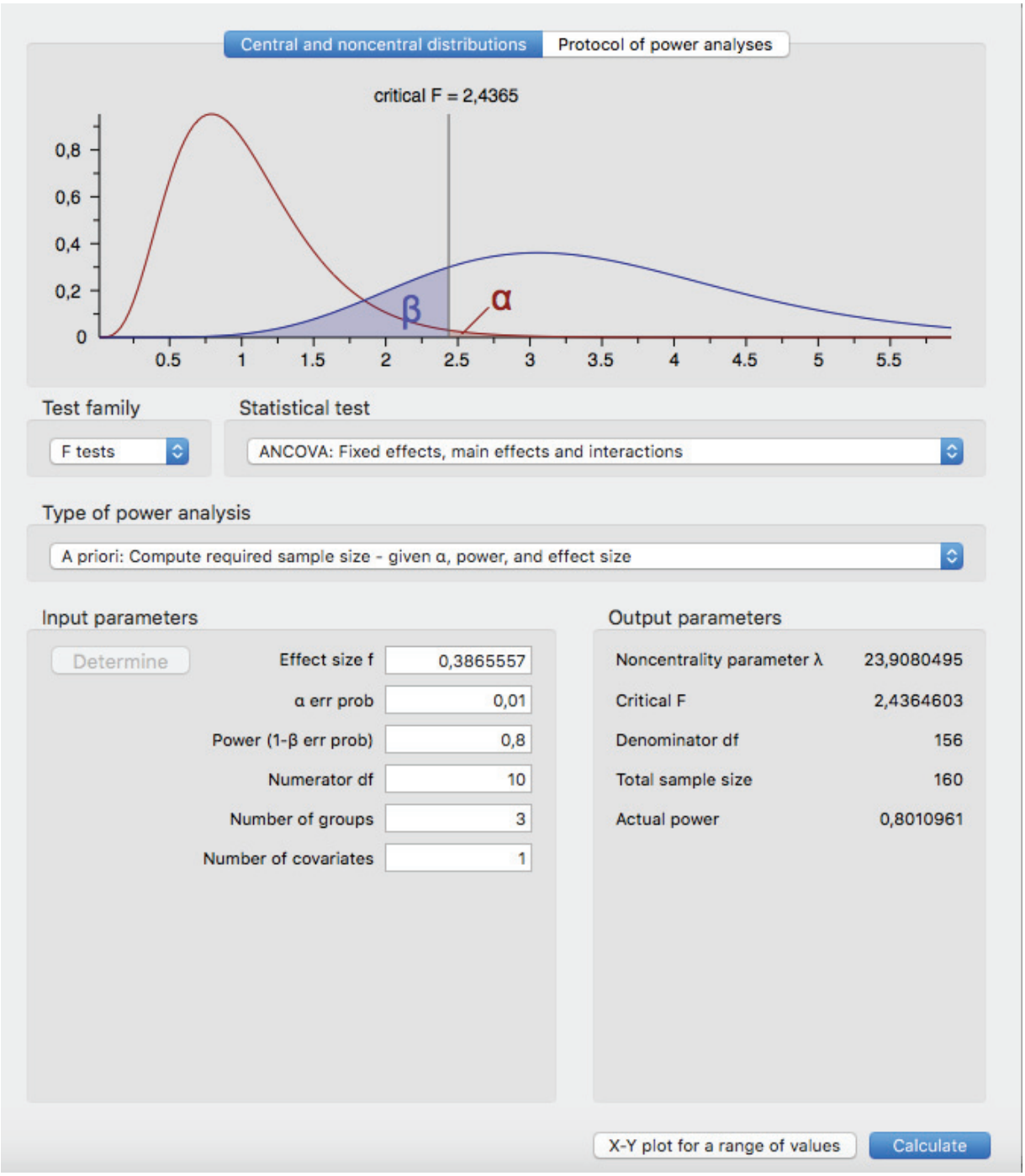
3. We will examine our third hypothesis using a mixed ANOVA:
Between subject factor: condition (UT, CT, NT)
Within-subject factor: time (block 1, block 2)
Dependent variable: strength of beauty
We expect a significant interaction between time and condition. We expect no differences in the DV in block 1, but a significant difference between UT and both CT and NT in block 2, which we will examine using contrasts. We expect the contrast to show a significantly higher mean in UT in block 2 than both CT and NT in block 2 (=UT > -CT & NT).

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.
We will exclude participants, who do not finish at least block 2 and block 3 of the study.
Participants, who do not finish block 1 can still be included in our analysis of our main hypothesis (1) through sub-hypotheses 1.1, 1.2 and 1.3 as well as hypothesis 2. They will be excluded from our analysis of hypothesis 3, since this analysis relies on data from block 1 and block 3.
Moreover we will exclude participants whose answers on the decision criteria in block 1 or block 2 indicate that they have not followed the instruction by giving the same answer for every criterion and every item.
We will also exclude participants, who have missing values on the dependent variables of a hypothesis from the analysis of that hypothesis.

7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.
Participants of this study are all students of a lecture at the University of Vienna. Given the attendance list of the lecture we expect a total sample size of 250 students.

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)
Three exploratory analyses are planned:
1. Which decision criteria do students report to be relevant in the process of selecting one out of five items in block 1?
2. In the conscious thought condition participants are asked to carefully think about their decision and they are invited to take notes. Our exploratory analysis will focus on those notes and we will try to find interesting patterns that may help the development of future questions.
3. We will investigate the participants' answers to the additional questions in block 3. After indicating whether they kept their postcard or not we'll ask some additional questions about what they did do with their selected postcard (hang it up, sent it to someone, threw it away etc.).

Appendix C. Power Analysis.



Appendix D. Stimuli.

Postcard 1: Georges Braque, 1939: “Der Maler und sein Model”

Postcard 2: Gustave de Smet, 1915: “Vondelpark”

Postcard 3: John Constable, 1821: “Heuwagen”

Postcard 4: Clara Peters, 1625: “Stillleben mit Käse, Artischocke und Kirschen”

Postcard 5: Fernand Leger, 1923: “Creation of the World”

Appendix E. Paper Pencil Questionnaires.

Experimental Block 1

Versuchspersonen-Code (6-stellig): _____

Im Folgenden stelle dir bitte vor du möchtest dich jeweils aus einer Auswahl von Gegenständen für einen Gegenstand entscheiden. Bitte kreuze auf der Skala an, wie wichtig dir die folgenden Kriterien bei der Entscheidungsfindung sind. Du findest über den Skalen jeweils die Gegenstandskategorie angegeben.
Der Wert 1 bedeutet dabei „gar nicht wichtig", der Wert 5 bedeutet „sehr wichtig". Mit den Werten dazwischen kannst du deine Einschätzung abstufen.

Ein Paar Handschuhe aus einer Auswahl an **Handschuhen**

	gar nicht wichtig	1	2	3	4	5	sehr wichtig
Qualität		□	□	□	□	□	
Design		□	□	□	□	□	
Verarbeitung		□	□	□	□	□	
Langlebigkeit		□	□	□	□	□	
Komfort		□	□	□	□	□	
Preis		□	□	□	□	□	
Schönheit		□	□	□	□	□	
Vielfältigkeit		□	□	□	□	□	
bereitgestellte Zusatzinformation		□	□	□	□	□	
Künstler / Hersteller		□	□	□	□	□	
	gar nicht wichtig	1	2	3	4	5	sehr wichtig
Keine von oben/Sonstige, bitte angeben:							

Eine Postkarte aus einer Auswahl an **Postkarten**

	gar nicht wichtig	1	2	3	4	5	sehr wichtig
Qualität		□	□	□	□	□	
Design		□	□	□	□	□	
Verarbeitung		□	□	□	□	□	
Langlebigkeit		□	□	□	□	□	
Komfort		□	□	□	□	□	
Preis		□	□	□	□	□	
Schönheit		□	□	□	□	□	
Vielfältigkeit		□	□	□	□	□	
bereitgestellte Zusatzinformation		□	□	□	□	□	
Künstler / Hersteller		□	□	□	□	□	
	gar nicht wichtig	1	2	3	4	5	sehr wichtig
Keine von oben/Sonstige, bitte angeben:							

Ein Wandkalender aus einer Auswahl an **Wandkalendern**

	gar nicht wichtig	1	2	3	4	5	sehr wichtig
Qualität		□	□	□	□	□	
Design		□	□	□	□	□	
Verarbeitung		□	□	□	□	□	
Langlebigkeit		□	□	□	□	□	
Komfort		□	□	□	□	□	
Preis		□	□	□	□	□	
Schönheit		□	□	□	□	□	
Vielfältigkeit		□	□	□	□	□	
bereitgestellte Zusatzinformation		□	□	□	□	□	
Künstler / Hersteller		□	□	□	□	□	
	gar nicht wichtig	1	2	3	4	5	sehr wichtig

Keine von oben/Sonstige, bitte angeben:

Ein Kugelschreiber aus einer Auswahl an **Kugelschreibern**

	gar nicht wichtig	1	2	3	4	5	sehr wichtig
Qualität		□	□	□	□	□	
Design		□	□	□	□	□	
Verarbeitung		□	□	□	□	□	
Langlebigkeit		□	□	□	□	□	
Komfort		□	□	□	□	□	
Preis		□	□	□	□	□	
Schönheit		□	□	□	□	□	
Vielfältigkeit		□	□	□	□	□	
bereitgestellte Zusatzinformation		□	□	□	□	□	
Künstler / Hersteller		□	□	□	□	□	
	gar nicht wichtig	1	2	3	4	5	sehr wichtig

Keine von oben/Sonstige, bitte angeben:

Eine Handy-Schutzhülle aus einer Auswahl an **Handy-Schutzhüllen**

	gar nicht wichtig	1	2	3	4	5	sehr wichtig
Qualität		□	□	□	□	□	
Design		□	□	□	□	□	
Verarbeitung		□	□	□	□	□	
Langlebigkeit		□	□	□	□	□	
Komfort		□	□	□	□	□	
Preis		□	□	□	□	□	
Schönheit		□	□	□	□	□	
Vielfältigkeit		□	□	□	□	□	
bereitgestellte Zusatzinformation		□	□	□	□	□	
Künstler / Hersteller		□	□	□	□	□	
	gar nicht wichtig	1	2	3	4	5	sehr wichtig

Keine von oben/Sonstige, bitte angeben:

Experimental Block 2

Questionnaire conscious thought group.

Versuchspersonen-Code (6-stellig): _____

Studie: Visual preferences and the evaluation of art

1. Demografische Angaben

Geschlecht: weiblich ☐ männlich ☐ anderes/möchte ich nicht angeben ☐

Geburtsjahr: _____

2. Es wird nun ein Bild auf die Wand projiziert. Bitte schaue dir das Bild an, bis es verschwindet. Anschließend kannst du umblättern und den Fragebogen bearbeiten.

3. Die Bilder, die auf der vorherigen Seite abgebildet sind, hast du soeben an die Wand projiziert gesehen. Bitte nehme dir die kommenden fünf Minuten Zeit, um jede der Kunstpostkarten sorgfältig zu betrachten und zu überlegen, wie gut sie dir gefällt und warum. Unten auf dieser Seite findest du Platz für deine Notizen. Bitte achte darauf, jeder Postkarte die gleiche Zeit (1 Minute) zu widmen.

Notizen Kunstpostkarte 1:

Notizen Kunstpostkarte 2:

Notizen Kunstpostkarte 3:

Notizen Kunstpostkarte 4:

Notizen Kunstpostkarte 5:

4. Bitte entscheide, welche der fünf Postkarten dir am besten gefällt.





Postkarte 1 □	Postkarte 2 □	Postkarte 3 □	Postkarte 4 □	Postkarte 5 □

3. Bitte gib auf der Skala an, wie wichtig dir die genannten Kriterien bei deiner **eben getätigten Auswahl der Kunstpostkarte** waren.
Der Wert 1 bedeutet dabei „gar nicht wichtig", der Wert 5 bedeutet „sehr wichtig". Mit den Werten dazwischen können Sie Ihre Einschätzung abstufen.

	gar nicht wichtig	1	2	3	4	5	sehr wichtig
Qualität		□	□	□	□	□	
Design		□	□	□	□	□	
Verarbeitung		□	□	□	□	□	
Langlebigkeit		□	□	□	□	□	
Komfort		□	□	□	□	□	
Preis		□	□	□	□	□	
Schönheit		□	□	□	□	□	
Vielfältigkeit		□	□	□	□	□	
bereitgestellte Zusatzinformation		□	□	□	□	□	
Künstler / Hersteller		□	□	□	□	□	
	gar nicht wichtig	1	2	3	4	5	sehr wichtig
Keine von oben/Sonstige, bitte angeben:							

Vielen Dank für deine Teilnahme an dieser Studie. Du leistest damit einen wertvollen Beitrag zur Forschung!

Questionnaire no thought group.

Versuchspersonen-Code (6-stellig): _____

Studie: Visual preferences and the evaluation of art

1. Demografische Angaben

Geschlecht: weiblich ☐ männlich ☐ anderes/möchte ich nicht angeben ☐

Geburtsjahr: _____

2. Es wird nun ein Bild auf die Wand projiziert. Bitte schaue dir das Bild an, bis es verschwindet. Anschließend kannst du umblättern und den Fragebogen bearbeiten.

Vielen Dank für deine Teilnahme an der Studie. Du leistest damit einen wertvollen Beitrag zur Forschung!

3. Du hast eben Bilder von fünf Kunstpostkarten an die Wand projiziert gesehen. Bitte entscheide, welche der gezeigten Postkarten dir am besten gefällt.





Postkarte 1 □ Postkarte 2 □ Postkarte 3 □ Postkarte 4 □ Postkarte 5 □

4. Bitte erinnere dich an deine Auswahl der Kunstpostkarte, die dir am besten gefallen hat, zu Beginn dieses Fragebogens. Bitte gib auf der Skala an, wie wichtig dir die genannten Kriterien **bei der tatsächlich getätigten Auswahl** waren.
Der Wert 1 bedeutet dabei „gar nicht wichtig", der Wert 5 bedeutet „sehr wichtig". Mit den Werten dazwischen können Sie Ihre Einschätzung abstufen.

	gar nicht wichtig	1	2	3	4	5	sehr wichtig
Qualität		□	□	□	□	□	
Design		□	□	□	□	□	
Verarbeitung		□	□	□	□	□	
Langlebigkeit		□	□	□	□	□	
Komfort		□	□	□	□	□	
Preis		□	□	□	□	□	
Schönheit		□	□	□	□	□	
Vielfältigkeit		□	□	□	□	□	
bereitgestellte Zusatzinformation		□	□	□	□	□	
Künstler / Hersteller		□	□	□	□	□	
	gar nicht wichtig	1	2	3	4	5	sehr wichtig
Keine von oben/Sonstige, bitte angeben:							

5. Jede Buchstabenkombination in den folgenden Zeilen lässt sich zu einem Wort umformen (=Anagramme). Bitte löse in den kommenden 5 Minuten so viele Anagramme, wie möglich.

ITNTE _____ NTDSZUA _____

IDSPEOE _____ ERDNRE _____

LORLE _____ NATGES _____

EAGRTB _____ AZTZSU _____

GULEK _____ OTRKDO _____

ILRSPAE _____ GANMUG _____

FAGRATU _____ ETZNDO _____

LAHUSAW _____ REZARIG _____

HCEPOE _____ UNMGPFI _____

Questionnaire unconscious thought group.

Versuchspersonen-Code (6-stellig): _____

Studie: Visual preferences and the evaluation of art

1. Demografische Angaben

Geschlecht: weiblich ☐ männlich ☐ anderes/möchte ich nicht angeben ☐

Geburtsjahr: _____

2. Es wird nun ein Bild auf die Wand projiziert. Bitte schaue dir das Bild an, bis es verschwindet. Anschließend kannst du umblättern und den Fragebogen bearbeiten.

3. Wir werden dich **am Ende dieses Fragebogens** darum bitten auszuwählen, **welche der fünf soeben projizierten Kunstpostkarten dir am besten gefällt**. Bitte erledige zuerst die kommende Aufgabe, bevor du deine Entscheidung triffst.

4. Jede Buchstabenkombination in den folgenden Zeilen lässt sich zu einem Wort umformen (=Anagramme). Bitte löse in den kommenden 5 Minuten so viele Anagramme, wie möglich.

ITNTE	_____	NTDSZUA	_____
IDSPEOE	_____	ERDNRE	_____
LORLE	_____	NATGES	_____
EAGRTB	_____	AZTZSU	_____
GULEK	_____	OTRKDO	_____
ILRSPAE	_____	GANMUG	_____
FAGRATU	_____	ETZNDO	_____
LAHUSAW	_____	REZARIG	_____
HCEPOE	_____	UNMGPFI	_____

5. Bitte entscheide, welche der fünf zu Beginn gezeigten Postkarten dir am besten gefällt.


Postkarte 1 □


Postkarte 2 □


Postkarte 3 □


Postkarte 4 □


Postkarte 5 □

6. Bitte erinnere dich an deine Auswahl der Kunstpostkarte, die dir am besten gefallen hat, zu Beginn dieses Fragebogens. Bitte gib auf der Skala an, wie wichtig dir die genannten Kriterien **bei der tatsächlich getätigten Auswahl** waren.
Der Wert 1 bedeutet dabei „gar nicht wichtig", der Wert 5 bedeutet „sehr wichtig". Mit den Werten dazwischen können Sie Ihre Einschätzung abstufen.

	gar nicht wichtig	1	2	3	4	5	sehr wichtig
Qualität		□	□	□	□	□	
Design		□	□	□	□	□	
Verarbeitung		□	□	□	□	□	
Langlebigkeit		□	□	□	□	□	
Komfort		□	□	□	□	□	
Preis		□	□	□	□	□	
Schönheit		□	□	□	□	□	
Vielfältigkeit		□	□	□	□	□	
bereitgestellte Zusatzinformation		□	□	□	□	□	
Künstler / Hersteller		□	□	□	□	□	
	gar nicht wichtig	1	2	3	4	5	sehr wichtig
Keine von oben/Sonstige, bitte angeben:							

Vielen Dank für deine Teilnahme an der Studie. Du leistest damit einen wertvollen Beitrag zur Forschung!

Experimental Block 3

Versuchspersonen-Code (6-stellig): _____

Studie: Visual preferences and the evaluation of art

Du hast im Rahmen von Testzeitpunkt 2 dieser Studie eine Kunstpostkarte sowie einen Kugelschreiber erhalten. Bitte beantworte die folgenden Fragen auf der jeweiligen Skala.

Ich habe die **Kunstpostkarte** noch Ja □ Nein □

Wenn ja, bitte zutreffende Aussagen ankreuzen
- □ Ich habe die Kunstpostkarte aufgehängt
- □ Ich bewahre die Kunstpostkarte auf
- □ Ich sehe die Kunstpostkarte regelmäßig an
- □ Anderes, bitte spezifizieren: _____

Wenn nicht, bitte zutreffende Aussagen ankreuzen
- □ Ich habe die Kunstpostkarte verloren
- □ Ich habe die Kunstpostkarte weggeworfen
- □ Ich habe die Kunstpostkarte verschenkt/verschickt
- □ Anderes, bitte spezifizieren: _____

	überhaupt nicht	1	2	3	4	5	sehr
Wie schön findest du die von dir ausgewählte Kunstpostkarte?		□	□	□	□	□	
Wie zufrieden bist du mit deiner ausgewählten Kunstpostkarte?		□	□	□	□	□	

	überhaupt nicht	1	2	3	4	5	6	7	sehr
Wie kunstinteressiert bist du?		□	□	□	□	□	□	□	

	seltener als einmal pro Jahr	einmal pro Jahr	einmal pro Halbjahr	einmal in 3 Monaten	einmal im Monat	einmal in 2 Wochen	einmal pro Woche oder öfter
Wie oft besuchst du durchschnittlich Kunstmuseen bzw. Kunstgalerien?	□	□	□	□	□	□	□
Wie oft liest du Bücher, Zeitschriften oder Kataloge über Kunst?	□	□	□	□	□	□	□
Wie oft siehst du dir Abbildungen von Kunstwerken an (Bildbände, Internet, etc.)?	□	□	□	□	□	□	□
Wie oft besuchst du Veranstaltungen zu Kunst oder Kunstgeschichte (Seminare, Projekte, Festivals, etc.)?	□	□	□	□	□	□	□
	seltener als einmal pro Jahr	einmal pro Jahr	einmal pro Halbjahr	einmal in 3 Monaten	einmal im Monat	einmal in 2 Wochen	einmal pro Woche oder öfter

Appendix F

Table 4

[Assumption check for the chi-square test of homogeneity: Expected cell values]

	Postcard 1	Postcard 2	Postcard 3	Postcard 4	Postcard 5
CT	7.547	9.434	13.208	1.887*	7.924
NT	8.679	10.849	15.189	2.170*	9.113
UT	3.774*	4.717*	6.604	0.943*	3.962*

Note: The assumptions for the planned chi-square test of homogeneity are were not met. Expected cell values were below 5 in 6 out of 15 (40%) cells. The corresponding cells are marked with an asterisk.