Give me Gestalt!

Preference for Cubist Artworks Revealing High Detectability of Objects:

A Replication Study

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Abstract

In this replication of the study "GIVE ME GESTALT - Preference for Cubist Artworks Revealing High Detectability of Objects" (Muth, Pepperell & Carbon, 2012) participants had to rate their preference for cubist artworks as well as their subjectively perceived visual detectability of objects within each painting. This replication study was done to support Open Science and to reassure the validity of the results of the original study. The authors of the original paper found that participants without expertise in cubism liked paintings more in which they were able to detect objects better. The findings of this replication study validate the findings of the original study although the correlation of liking and detectability is not as strong as in the original study. In addition to the main hypothesis of the study, the effects of coloration of the artworks as well as the impact of the artist and their personal style on the participants' preference were investigated.

Introduction

The human visual system is a sensory system whose main function is the acquisition of knowledge in order to provide the organism with information about its environment. However, visual information is often uncertain or incomplete. Therefore the human brain has to compromise mechanisms to analyse and extract useful information from uncertain stimuli (Barthelmé & Mamassian, 2009).

Artists often like to incorporate visual indeterminacies into their artworks and thereby play with the viewers' perception. Especially cubism is well known for its high level of indeterminacy and depiction of concealed objects. Cubist artworks usually illustrate everyday objects in a way that makes immediate identification difficult. The painters purposely induce uncertainty by using characteristic geometric shapes, while leaving some visual cues for the viewer (Pepperell, 2011).

Researchers have proposed that viewers derive aesthetic pleasure and rewarding effects from finding hidden objects and reducing uncertainty in artworks. Therefore it has been hypothesized that a more fluent perception of objects corresponds to a higher aesthetic response (Reber, Schwarz & Winkielman, 2004).

Muth, Pepperell and Carbon have tested this hypothesis for cubist artworks in their paper "Give me Gestalt! Preference for Cubist Artworks Revealing High Detectability of Objects" from 2012. They conducted a study in which participants were asked to rate 120 pictures of cubist artworks on a 7-point-Likert-scale. During the first block participants were asked to rate the pictures based on how much they like them. For the second block they should indicate how well they can detect objects within the artworks. A strong positive correlation

between likability and detectability with a Pearson correlation of R=.781 was observed (Muth, Pepperell & Carbon, 2012).

Replication studies are important for research as they can reassure that results are valid and reliable. Researchers have the freedom to design and analyse their experiment in various ways, for example they can choose among different test methods and different criteria to exclude data. Optimally, scientists should commit to details of the experimental procedure before collecting the data. However, this is not always the case and can tempt researchers to intentionally or unintentionally manipulate the data collection and analysis process in order to promote the desired outcome. This could have severe negative consequences for science in general as many published research findings may actually turn out to be false.

In order to avoid this and support Open Science we conducted this replication study and submitted a preregistration. In our preregistration report we committed to details of experimental design, data processing, and analysis, including our final Rmd script, prior to data collection.

This study investigates whether the viewers' appreciation of cubist paintings is linked to their ability to identify objects. Our replication differs from the original study in the way that we realized an online experiment while the original study was conducted in a laboratory. Apart from that we tried to keep the materials and procedure as close as possible to the original study. In our replication study, we hypothesised that, like in the original study, viewers prefer paintings in which they are able to detect objects better. Furthermore, we assumed that the color of the artwork as well as the artist and his style used, also affect how much a viewer likes a painting.

All hypotheses were confirmed by our study, indicating that not only the detectability of objects in cubist art, but also the artist and the color scheme of the artwork, have an effect on the viewers' preference for a painting.

Methods

Participants

We acquired 113 participants by spreading the link to our online experiment via our private social media accounts, by recruiting friends and family and by distributing it to students via e-mail.

Participants were required to have normal or corrected-to-normal vision, especially color-blind subjects were excluded. They had no or little expertise in cubist art. Furthermore, we excluded subjects who participated in the Experimental Psychology Lab class, as they might have prior knowledge about the experiment, as well as participants who took less than 5 minutes to complete the experiment as this indicates that they did not take enough time to answer the questions seriously.

According to these requirements 49 participants had to be excluded. Out of the 64 valid participants (40 female, 24 male), the age ranged from 11 to 81 years with a mean age of 29,3 years. In contrast, the original study had 20 participants (13 female, 7 male) with a mean age of 23,8 years and a range of 19 to 36 years.

Materials

We used the original stimuli of the 'Give me Gestalt!' study provided by Claudia Muth (Muth, Pepperell & Carbon, 2012). The stimuli set included 47 cubist artworks by Picasso, 40 by Gris and 33 by Braque. All of them were adapted to a format of 450x600 pixels.[1] Furthermore, we included two Ishihara color vision tests as well as one Standard Snellen's eye chart test.[2]

Design

We measured the subjective detectability of objects, treated as the independent variable and the subjective preference of the cubist artworks, which is the dependent variable. For both variables, the data was treated on an ordinal scale.

Furthermore, we defined the independent variables 'color' (monochrome / colored; pictures from the original study are tagged like this), 'color2' (monochrome / colored / sepia) and 'artist' (Picasso / Braque / Gris). Those variables are not measured, the classifications were made manually for each picture prior to data collection.

Procedure

As the experiment was realized online, it allowed participants to take part using their own devices. First the participants were shown written instructions and general information about the upcoming tasks. Before the actual trials began they had to complete two Ishihara color vision tests and a Snellen's eye chart test to ensure normal or corrected-to-normal vision.

[1] The stimuli set including the 120 artwork pictures can be accessed via the following link: https://github.com/cschier/gestalt-replication-study/tree/master/images

[2] The vision test plates and their sources can be accessed via the following link: https://github.com/cschier/gestalt-replication-study/tree/master/vision

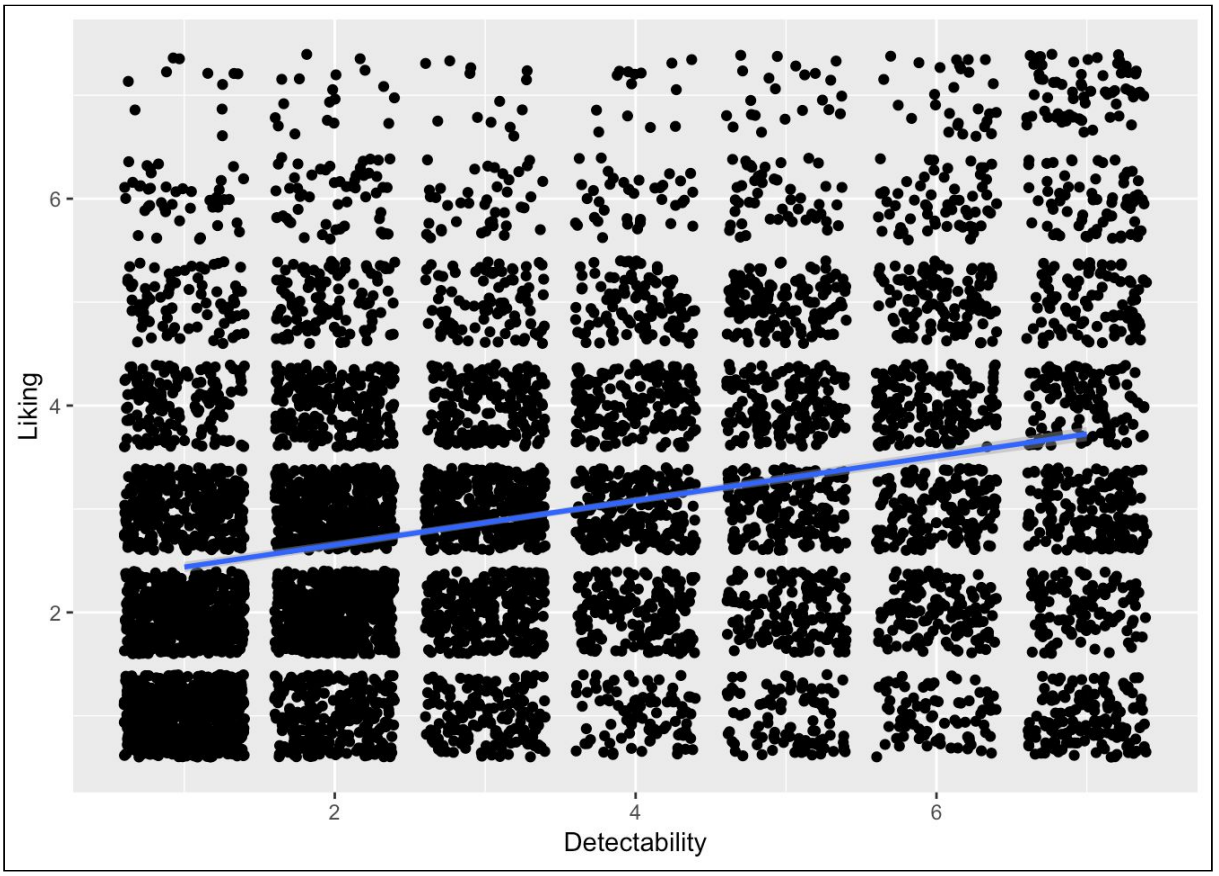
The study was structured into two blocks. During the first experimental block the participants were shown 120 pictures of cubist artworks in a randomized order and were asked to rate how much they liked them. Before the second block, the participants again read instructions for the upcoming trials. Then they were shown the same 120 artworks as before, again in a randomized order, but this time they were instructed to rate how well they could detect objects within the shown pictures.

In both blocks the participants proceeded directly to the next trial after giving their rating and were not able to go back. All ratings were made on a 7-point-Likert-scale from 1 (‘not at all’) to 7 (‘very’). After the participants finished the trials they had to rate their expertise in cubist artwork on the same scale from 1 to 7 and answered whether or not they participated in the Experimental Psychology Lab class.

Finally they were asked to complete an optional questionnaire, where they could provide information about their gender, age and mother tongue. The questionnaire also gave the participants a chance for further comments on the experiment.

Results

For both measured variables, we aggregated data across participants, revealing a positive correlation between the detectability of objects within cubist artworks and liking, indicated by a Pearson correlation of R=.283. This result is to some degree different to the original study where the authors found a Pearson correlation of R=.781. Even though the result we found is weaker, it is still a positive correlation which confirms that overall viewers tend to prefer paintings in which they are able to detect more objects.

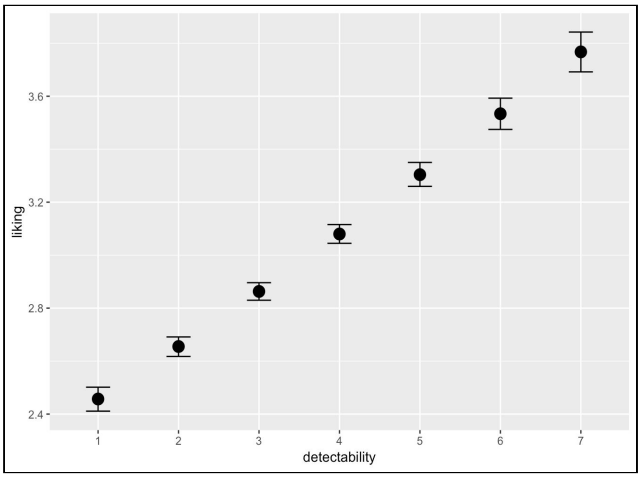


Graph 1: Correlation between Detectability and Liking

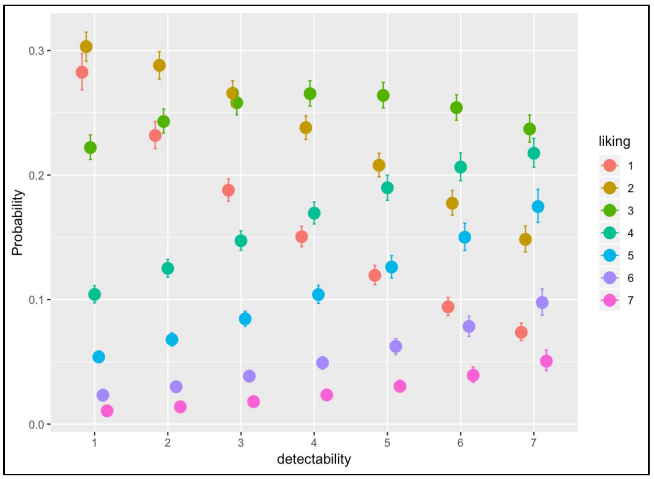
The collected data was tested in five models (M1-M5). While the first three models are only about the effect of detectability on liking, the last two ones also include the independent

variables ‘artist’ and ‘color2’.

In the first approach, we treated the detectability scale as an interval / numeric scale and compared the sample points for each category of detectability (2 to 7) to the sample points from the category detectability = 1. In the analysis, this model shows a significant gradient of 0.27. In graph 2, we can see that the liking is higher when the detectability is higher. In graph 3, the probabilities of the different liking categories are displayed given the detectability. It is especially interesting to see that liking = 1 and liking = 2 is more probable when the detectability is lower, while higher likings are more probable for higher detectability.

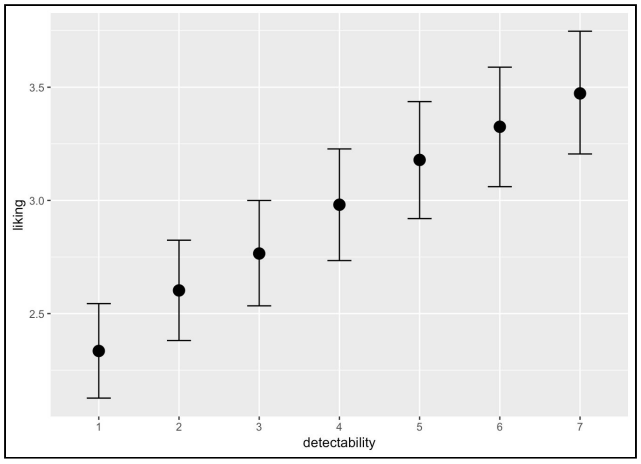


Graph 2: effect of detectability on liking in M1

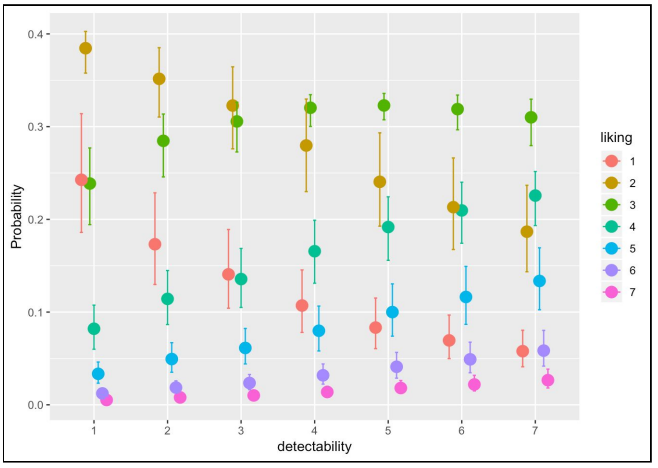


Graph 3: probability of liking depending on detectability in M1

In the second model and all the further ones, ‘detectability’ is treated as monotonic. Model 2 also includes random effects. In the analysis it shows that the estimate of ‘modetectability’ is positive, meaning that we have a positive gradient for detectability. As its 95%-confidence interval does not include the 0, this number and the effect are significant.

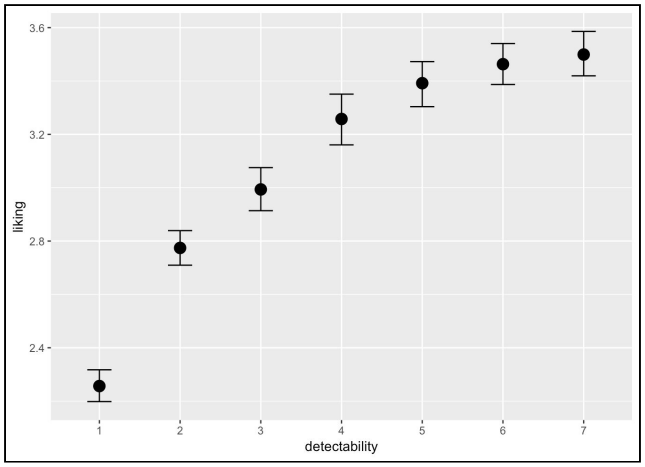


Graph 4: effect of detectability on liking in M2

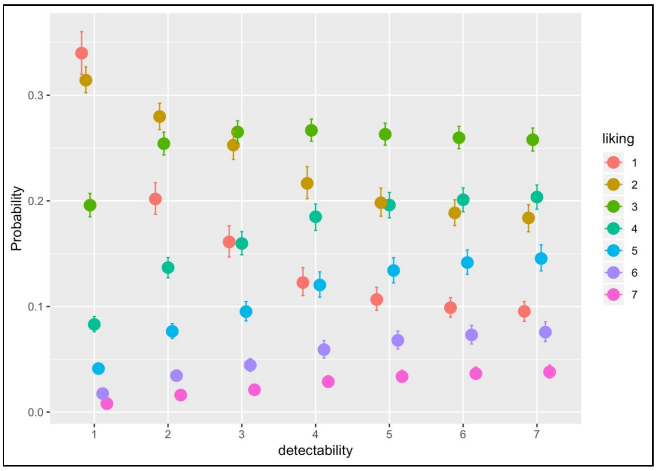


Graph 5: probability of liking depending on detectability in M2

In the third model, which is like M2 but without random effects, it could be observed that the estimate was positive for the effect of detectability as well. Furthermore, we can see that the difference in liking of two adjacent categories of detectability is not always the same, meaning that the difference between for example liking of detectability = 1 and detectability = 2 is not necessarily the same as the difference between liking of for instance detectability = 2 and detectability = 3.



Graph 6: effect of detectability on liking in M3



Graph 7: probability of liking depending on detectability in M3

From the first three models we concluded that there is a positive correlation, meaning that liking is affected by detectability. This effect can also be observed in the mean values of detectability and liking (table 1a and 1b). This indicates that our first hypothesis, that viewers prefer paintings in which they are able to detect objects better, can be confirmed.

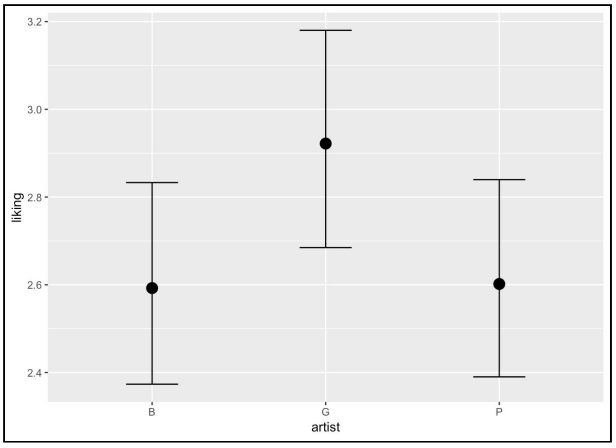
liking <dbl>	meanDetect <dbl>
1	2.684138
2	2.883998
3	3.368059
4	3.740741
5	4.124309
6	4.276353
7	5.127907

Table 1a: mean detectability depending on liking

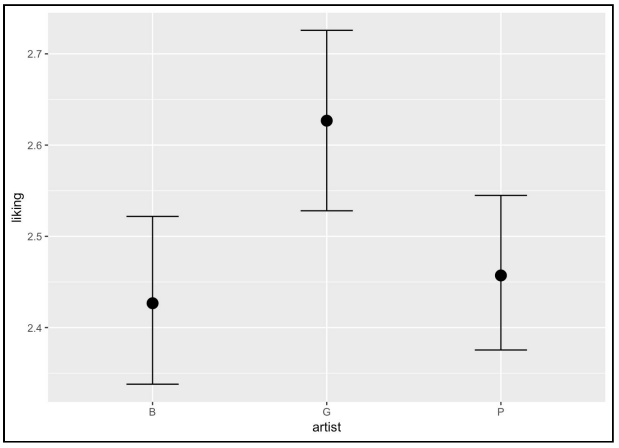
detectability <dbl>	meanLike <dbl>
1	2.273090
2	2.751497
3	2.952632
4	3.232643
5	3.396705
6	3.514132
7	3.494102

Table 1b: mean liking depending on detectability

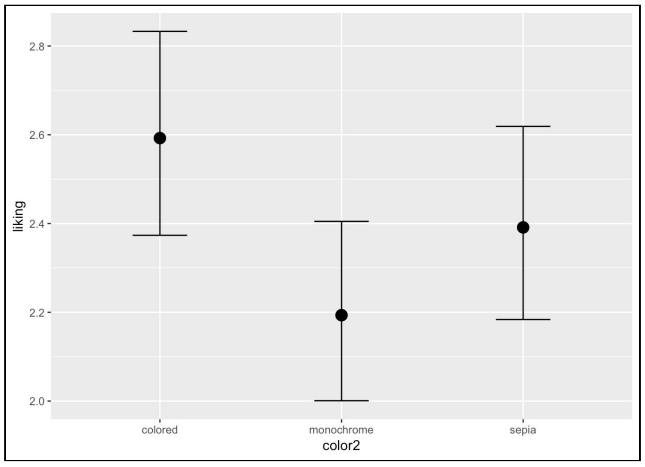
The fourth and fifth model are similar to M3 but also include the independent variables ‘artist’ (Braque, Gris or Picasso) and ‘color2’ (differentiating between color, monochrome and sepia). Model M4 includes random effects whereas M5 does not. In both models the effect of the different artists demonstrates that if we take Braque as the baseline, Gris has a positive effect compared to Braque whereas Picasso does not show a significant difference to Braque (graph 8a and 8b). Regarding the color, both models emphasize that monochrome and sepia have negative effects on liking compared to colored where the effect of monochrome is bigger (more negative, see graph 10a and 10b). Both models show a gradient for detectability that is slightly smaller than in the previous models. The results from these models propose that how much a viewer likes a painting is significantly affected by its color, also suggesting that colored is preferred over sepia which is preferred over monochrome. Liking is also significantly affected by the artist where Gris is preferred over Braque and Picasso.



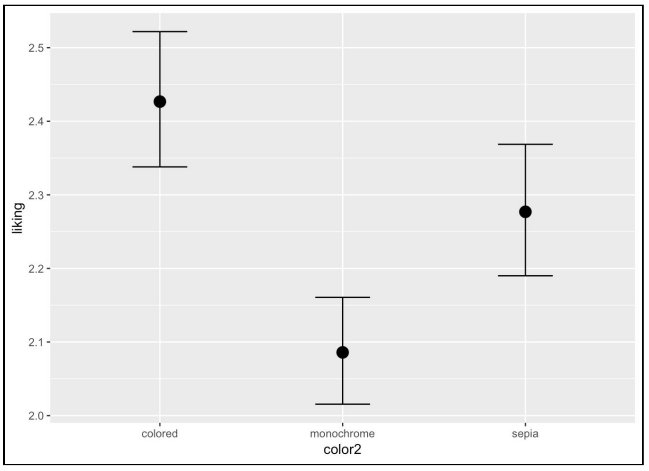
Graph 8a: effect of artist on liking in M4



Graph 8b: effect of artist on liking in M5



Graph 9a: effect of color on liking in M4



Graph 9b: effect of color on liking in M5

A comparison of all models showed that Model M4 fits the data best which means that all hypotheses can be confirmed. Overall, the models that include random effects fit our data better than the ones that do not include random effects.

Discussion

The first hypothesis, which dealt with the relation of preference and detectability, was confirmed by the results of the replication study even though the Pearson correlation was not as high as in the original study. One possible explanation for this difference is that the participants in the original study were probably more selectively chosen than the participants in the online experiment. We speculate that it took a certain level of interest in psychology or art to show up for an experiment in a laboratory, which is not such a big factor in an online survey. As will be explained later, interest has a major impact on the preference and on the ability to recognise objects. Additionally, the average age of the participants in the original study was lower and the age range was smaller. Different preferences for artworks among different demographic groups could be a possible explanation for the different results.

Furthermore, one aspect that we would like to criticise in the original and therefore also in our replication study is the small range in cubist art or abstract art in general represented in the set of artworks used. Only artworks of three different artists with very distinct style were considered. We believe that this range is too small to generalize the results for cubism or abstract art and it should be considered to repeat this study using a broader range of cubist artworks from various artists. Every individual has a different taste in art depending on several factors.

According to Bhattacharya and Petsche (2002) art analysis is composed of three factors. The first factor is the needed neural effort for the analysis of the content and style, the second one is the input of associations initiated by the stimulus and the third factor are the emotions produced by these associations initiated by the stimulus. In this art analysis process multiple conditional operations take place in the brain.

Lengger et al. (2007) investigated the relation between brain activity in certain brain regions in relation to abstract art and came to the conclusion that the input of information simplifies the neural processing of the stimuli, which eventually influences the liking. These results suggest that the perception of art strongly depends on the individual expertise in the respective art form. Even though we tried to filter out experts in the data collection, it is impossible to select participants with the exact same level of expertise in cubism to make a legitimate comparison between detectability of objects and liking without the influence of the expertise and prior knowledge.

Another theory for why we appreciate abstract art is given by Verved Aviv (2014). She claims that abstract art frees the brain from reality, creates new emotional and cognitive associations and activates brain states that are usually hard to access. These processes allow the viewer to discover new territories of his or her own brain which is suggested to be the reason for enjoying abstract art.

An overlapping field that deals with reasons for appreciation of cultural assets is the Philosophy of aesthetics. Just to demonstrate the extensiveness of this field, here are some ideas from the culturally conditioned guidelines by the philosopher Denis Dutton for causes for human art appreciation: The artistic skills, the ability to classify artworks to a specific style, the dramatic focus on experiences or the imitation of real experiences (where abstract art is an exception) (Denis Dutton, 2010). Needless to say that there is a great number of people and discussions which indicated exceptions to this set of rules.

This shows that there are many different approaches to explain the cause for different preferences in abstract artwork. Therefore, it is very difficult to isolate a single variable and investigate its impact without other confounding variables.

In addition to the main hypothesis, we investigated the impact of coloration and the artworks artist on the preference. The results show a downgrading of values from colored to sepia to monochrome. Regarding the artists, artworks by Gris were preferred most, then the paintings of Braque second, followed by Picasso's cubist artworks. The results of the assessments of the three artists shows that Gris, whose paintings were created on average later than the ones by Picasso and Braque, enjoy the highest appreciation.

Around 1907, cubism was invented inter alia by Picasso and Braque who both lived in Paris at this time. Because of the similar influences in terms of time (1908-1914) and location (Paris), their artworks have a certain similarity in contrast to Gris' work, which was produced later between 1912 and 1919 (Biography.com Editors, 2014).

These effects show empirically that there are various confounding variables like coloration and artist that were not considered in the original experiment.

In conclusion, the positive correlation between preference in cubist artwork and the ability to detect objects found in the original study "GIVE ME GESTALT - Preference for Cubist Artworks Revealing High Detectability of Objects" (Muth, C., Pepperell, R., & Carbon, C. C., 2012) could be confirmed by our replication study even though the Pearson correlation was not as high as in the original study. However, other factors, like for example the color scheme or the style of the artist, seem to have an effect on the viewers' preference for an artwork which makes predictions about preference difficult.

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