

A Cross-Cultural Comparison of Aesthetic Preferences for Neatly Organized Compositions: Native Chinese- Versus Native Dutch-Speaking Samples

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Eline Van Geert¹ , Rong Ding^{2,3},
and Johan Wagemans¹

Abstract

Do aesthetic preferences for images of neatly organized compositions (e.g., images collected on blogs like Things Organized Neatly[®]) generalize across cultures? In an earlier study, focusing on stimulus and personal properties related to order and complexity, Western participants indicated their preference for one of two simultaneously presented images (100 pairs). In the current study, we compared the data of the native Dutch-speaking participants from this earlier sample ($N = 356$) to newly collected data from a native Chinese-speaking sample ($N = 220$). Overall, aesthetic preferences were quite similar across cultures. When relating preferences for each sample to ratings of order, complexity, soothingness, and fascination collected from a Western, mainly Dutch-speaking sample, the results hint at a cross-culturally consistent preference for images that Western participants rate as more ordered, but a cross-culturally diverse relation between preferences and complexity.

¹Laboratory of Experimental Psychology, Department of Brain and Cognition, KU Leuven, Leuven, Belgium

²Peking University, Beijing, China

³Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands

Corresponding Author:

Eline Van Geert, Laboratory of Experimental Psychology, KU Leuven, Tiensestraat 102 - box 3711, BE-3000 Leuven, Belgium.

Email: eline.vangeert@kuleuven.be

Keywords

aesthetics, order, complexity, simplicity, cross-cultural differences

Images of neatly organized compositions are images of a set of objects, or parts of objects, organized in a neatly or tidy way (Van Geert & Wagemans, 2021). These images are very popular online (e.g., on the blog Things Organized Neatly[®] curated by Austin Radcliffe). To investigate aesthetic appreciation and preferences for this type of images, Van Geert and Wagemans (2021) conducted a large-scale online study focusing on stimulus and personal characteristics related to (the balance between) order and complexity. Order is defined as all aspects related to the structure and organization in a stimulus (e.g., when objects with different properties are positioned randomly vs. in an organized manner), whereas complexity relates to the quantity and variety of information in a stimulus (e.g., when the objects differ from each other vs. when they have the same properties; Van Geert & Wagemans, 2020). Images can differ, for example, in how ordered and/or complex they are on certain perceptual dimensions, such as color, texture, configuration, number of objects, type of objects, and perspective (Van Geert & Wagemans, 2021). Images of neatly organized compositions are special in the sense that they take an intermediate position between two types of stimuli that are often used in aesthetics research: very simple artificial stimuli on the one hand, and ecologically valid but very semantically complex art stimuli on the other hand.

Preferences for Neatly Organized Compositions

In the online study by Van Geert and Wagemans (2021), 421 Western participants completed a two-alternative forced choice task with 100 fixed pairs, in which aesthetic preferences were assessed: participants indicated which of two simultaneously presented images they preferred. Eighty-four of those participants completed a second optional part of the study and rated all individual images on how ordered, complex, soothing, and fascinating they perceived them to be. The results from this research (see Figure 1) suggested that different types of aesthetic appreciation correlate positively with each other (preferences, soothingness ratings, fascination ratings) for these images of neatly organized compositions, but that they show different relationships with subjective order and complexity: Soothingness related positively with order and negatively with complexity, whereas fascination related positively with both order and complexity. These different relationships of soothingness and fascination with subjective order and complexity could be taken to result from different routes toward aesthetic appreciation, one mediated by pleasure, and the other by interest (Graf & Landwehr, 2015, 2017).

This study also suggested that the balance between order and complexity depends on a combination of predictors rather than an interaction between them. Consistent

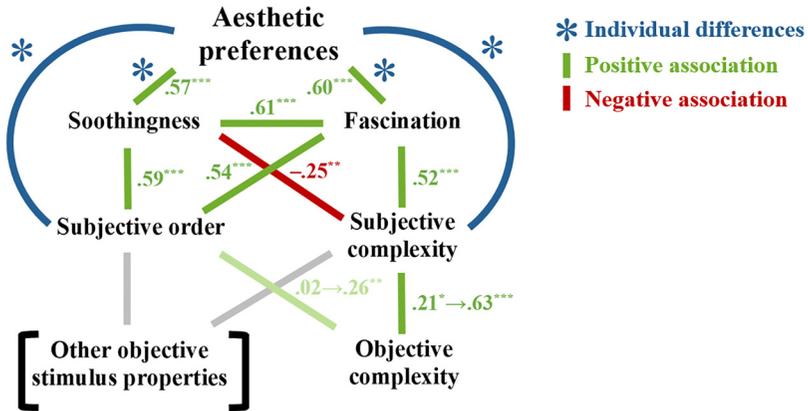


Figure 1. Schematic representation of Van Geert and Wagemans' (2021) main findings. Note. Numbers indicate Pearson product-moment correlations; * $p < .01$, ** $p < .001$, *** $p < .0001$. For the correlations with the objective complexity measures, the range of correlations is indicated, going from the correlation with the objective measure for which the correlation was smallest in absolute number to the correlation with the objective measure for which the correlation was largest in absolute number. Figure licensed under CC BY 4.0 by the authors. Retrieved from <https://doi.org/10.6084/m9.figshare.8038775>.

with the earlier literature, the relation between order and complexity seemed to be both complementary and antagonistic (Van Geert & Wagemans, 2020). On the one hand, order and complexity complemented each other in predicting how fascinating an image is perceived to be. On the other hand, order and complexity were partial opposites in their relation to soothingness.

Cross-Cultural Consistency of Relations Between Order, Complexity, and Aesthetic Preference

Here the question is asked whether the obtained findings also apply to non-Western populations. Specifically, this study explored the cross-cultural generalizability of findings concerning aesthetic preferences for neatly organized compositions and the stimulus properties, personal properties, and interactions between stimulus and person that are associated with them. Given the clear results of Van Geert and Wagemans (2021) in a relatively large Western sample, we deemed it relevant to also explore whether these results hold cross-culturally. More specifically, we chose for a comparison between Western European (i.e., native Dutch-speaking) and East Asian (i.e., native Chinese-speaking) participants, whose cultures have been repeatedly reported as highly distinct (for a review, see Kitayama & Salvador, 2024). Previous research has also reported some perceptual differences between these culturally distinct groups, sometimes related to differences in the type of culture (i.e.,

individualistic and analytic in Western European culture vs. collectivistic and holistic in East Asian culture; e.g., Boland et al., 2008; Chua et al., 2005; Masuda & Nisbett, 2001; Nisbett & Masuda, 2003; but see also Lacko et al., 2023, Miyamoto, 2013). In general, studies in non-Western populations are still very limited in number compared to the number of studies conducted in Western samples (Henrich et al., 2010; Che et al., 2018). It is therefore important to counteract this by increasing the number of studies in non-WEIRD cultures, as we do with this study.

Early cross-cultural research in aesthetics focused on the concept of aesthetic sensitivity and found evidence for a considerable level of universality of aesthetic preferences in general between East Asian—specifically Japanese and Chinese—and Western participants (e.g., Chan et al., 1980; Eysenck & Iwawaki, 1971, 1975; Iwawaki et al., 1979; for a review, see Che et al., 2018). In light of Berlyne's (1971) ideas on aesthetics, some studies investigated the cross-cultural consistency of preferences for intermediate complexity levels and for symmetry. As Berlyne's (1970, 1971) theory predicted all organisms to prefer an intermediate arousal level, and as a consequence intermediate levels of collative variables (e.g., complexity), his theory would have predicted common preferences across cultures. Whereas the results regarding complexity differed between studies and cultures, symmetry was consistently preferred above nonsymmetry across cultures (Che et al., 2018; Leder et al., 2023). Child and Iwao (1968) reported a small positive cross-culturally consistent link (Japan vs. United States) between tolerance of complexity and aesthetic sensitivity, which suggests a common relation between some personality traits and aesthetic preferences across cultures (Che et al., 2018).

In general, the existing literature thus gives some evidence for the existence of both cross-cultural similarities and differences in the appreciation of specific types of order (i.e., symmetry) and complexity across Western and East Asian populations. However, these studies did not study the relation of appreciation with order and complexity in combination, and more data is needed on the cross-cultural appreciation of (different types of) order and complexity. Understanding the relations of order, complexity, and appreciation across cultures is especially relevant given that the general importance of order and complexity for appreciation is well-recognized within the field (for a review, see Van Geert & Wagemans, 2020). To explore whether the findings of Van Geert and Wagemans (2021) generalize to non-Western populations, a slightly shortened version of the study by Van Geert and Wagemans (2021) was conducted with native Chinese-speaking participants, and their preferences were compared to those of the native Dutch-speaking participants in the sample of Van Geert and Wagemans (2021). To increase the opportunity to find voluntary participants, we shortened the expected duration of the study compared to the original procedure. Therefore, only two out of the three original personality questionnaires and no rating data (i.e., order, complexity, soothingness, and fascination ratings) were collected in the Chinese sample. It was necessary to

shorten the study to find voluntary participants as we had no budget available to pay for participation.

Method

Participants

The criteria for participation and data collection procedures for the earlier collected Dutch-speaking sample are described by Van Geert and Wagemans (2021). In summary, anyone between 16 and 100 years old and able to understand Dutch instructions could participate. Participants were recruited via personal contacts of the Flemish researchers involved, Western-focused social media, and offline advertisements in public places and university buildings in Leuven (Flanders, Belgium). There were no restrictions regarding nationality, mother tongue, or country of living. However, as recruitment focused on Flanders, the participant sample is expected to include mainly Belgian inhabitants. For the current analysis, we selected all native Dutch-speaking participants ($N = 356$) from this earlier collected sample, which consisted of both Dutch-speaking and English-speaking participants ($N = 421$). Participation was completely voluntarily: No monetary reward was offered for participation.

Below the criteria for participation and data collection procedures for the newly collected data from the native Chinese-speaking sample are described. Anyone between 16 and 100 years old and able to understand Chinese instructions could participate. Participants were recruited via personal contacts of the researchers. There were no restrictions regarding nationality, mother tongue, or country of living. As recruitment focused on China, the participant sample is expected to include mainly Chinese inhabitants. For the analysis, only participants with Chinese as mother tongue were included. Participation was completely voluntarily: No monetary reward was offered for participation.

The Chinese version was completed by 220 native Chinese-speaking participants¹ between 17 and 77 years (137 women, 80 men, 3 other, $M_{\text{age}} = 29.7$ years, $SD_{\text{age}} = 13.4$ years).² The Dutch version was completed by 356 native Dutch-speaking participants between 16 and 77 years (232 women, 124 men, $M_{\text{age}} = 41.0$ years, $SD_{\text{age}} = 16.1$ years).³ As can be noticed from the means, the Chinese-speaking sample was slightly younger in general. Also when it comes to education level, the Chinese-speaking sample was less representative than the Dutch-speaking one: a large majority of the Chinese-speaking participants was highly educated (75.91% with a university degree and 8.18% with a college degree compared to 29.21% and 34.27% in the Dutch-speaking sample).

The order, complexity, soothingness, and fascination ratings used in the analysis are based on data from 84 participants between 20 and 75 years (56 women, 28 men, $M_{\text{age}} = 43.4$ years, $SD_{\text{age}} = 16.7$ years). Only eight participants in the second part completed the English version, whereas 76 completed the Dutch version. The study received

ethical approval from the Social and Societal Ethics Committee of the authors' institution (G-2016 04 547).

Materials

Images. The images and image pairs used in this study are the same as in the study by Van Geert and Wagemans (2021). A detailed explanation on the selection procedure used can be found there. In summary, the images were manually paired to be similar except for how ordered and/or complex they were on certain perceptual dimensions such as color, texture, configuration, number of objects, type of objects, and perspective (for more information, cf. the online Supplemental Materials of the 2021 article). Hundred image pairs involving 184 different images were selected (16 images were included twice). An overview of the images and image pairs that we are allowed to show can be found on osf.io/fxekp/.

Questionnaires. As in Van Geert and Wagemans (2021), we used the Big Five Inventory (BFI; 44 items with response options ranging from 1 (*strongly disagree*) to 5 (*strongly agree*); John et al., 1991) and the Personal Need for Structure scale (PNS; 12 items with response options ranging from 1 (*strongly disagree*) to 6 (*strongly agree*); Thompson et al., 2001). The Symmetry, Ordering, and Arranging Questionnaire (Radomsky & Rachman, 2004) was left out as no validated Chinese translation was available.

Validity information on the Chinese version of the BFI (John & Srivastava, 1999) is available in Carciofo et al. (2016). A principal components analysis with varimax rotation of the 44 BFI items was conducted on the data of participants to the Chinese version of the current study ($N=220$). The five-factor solution explained 45% of the variance, but not all items loaded on the expected dimension. Absolute primary loadings ranged from .14 to .74, with an average primary loading of .51. In addition, some absolute cross-loadings went up to .61. The results of this principal component analysis and an additional confirmatory factor analysis are included in the analysis file on osf.io/mw9q6/.

The Chinese version of the PNS (Chen et al., 2008) is based on the two-factor interpretation of Neuberg and Newsom (1993) and therefore only contains 11 items. Two principal components analyses with varimax rotation of the 11 PNS items were conducted on the data of participants to the Chinese version of the current study ($N=220$), one exploring a one-factor solution and one exploring a two-factor solution. The one-factor solution explained 31% of the variance, with loadings ranging from .19 to .79. The two-factor solution, which explained 46% of the variance, did not resemble the two factors of Neuberg and Newsom (1993): five out of the seven items that were supposed to be in the second factor loaded most highly on the first factor. Therefore, in the analyses using the PNS, the one-factor solution including 11 items was used. The results of these principal component and additional confirmatory factor analyses for the Chinese questionnaire data collected in this study are included in the analysis file on osf.io/mw9q6/.

Image Questionnaire. Participants rated the general pleasantness of looking at these images (i.e., “How pleasant did you find the images to look at in general?”) on a scale ranging from 1 (*not at all pleasant*) to 7 (*very pleasant*). Moreover, they were asked to indicate their previous experience with this type of images (i.e., “Did you see similar images before?”) on a scale ranging from 0 (*never*) to 4 (*very often*). If the participants indicated to have seen similar images before, they also indicated whether they had already consciously sought for similar images (i.e., “If so, did you already consciously search for similar images?”) on the same scale ranging from 0 (*never*) to 4 (*very often*). If they did already search for similar images, they were asked to describe why they had done so (i.e., “If so, why?”).

Procedure

Data from the Dutch-speaking sample were collected online from May 2016 until January 2017. Data from the Chinese sample were collected online from May 2017 until August 2017. When participants visited the webpage of the questionnaire, they were provided with a short description of the study and were asked for their informed consent. If participants agreed to participate, they were asked to log in with an e-mail address, to complete some basic demographic information (i.e., gender, age, mother tongue, and highest education level), and the BFI (44 items).

Then, a 2AFC image task was conducted, in which participants had to indicate which of two simultaneously shown images they preferred. Participants were presented with 100 image pairs and were asked each time to click on the image they preferred. The image pairs were presented in a semi-random order, preventing that pairs including images used in more than one pair were shown immediately after each other. Additionally, the position (i.e., left or right) of the images hypothesized to be the more complex was counterbalanced between participants: For approximately half of the participants, the image hypothesized to be more complex (“id1” from now on) was always the right image presented on the screen, whereas for the other half this image was the left one.⁴ When participants had indicated their preference for one of the images, the presentation sequence automatically continued to the next pair.

Afterward, participants completed the PNS scale (11 items), as well as the short questionnaire about their aesthetic appreciation of the type of images that were shown and their previous experience with them. After completing the questionnaires, participants were given a short debriefing text and they could indicate if they wanted to be informed about the results of the study. The mean completion time of the study was 20 min and 55 s for the Chinese version and 23 min and 14 s in the Dutch version.

Image Calculations and Ratings. Further information on the calculated statistical image properties and collected image ratings can be found in Van Geert and Wagemans (2021). In the light of the results below, we clarify that the objective measures, among other measures, included HOG-based complexity and Fourier slope. HOG-based complexity reflects the mean magnitude of changes in luminance or color in an image,

with higher values indicating higher complexity (Redies et al., 2012). Fourier slope indicates the strength of low spatial frequencies (representing coarse detail) relative to high spatial frequencies (representing fine detail) in the image (Redies et al., 2015). A slope value of -2 indicates that the relative strength of low and high spatial frequencies stays constant when zooming in or out of the image. In images with slope values higher than -2 high spatial frequencies are more prominent, whereas low spatial frequencies are more important in images with slope values lower than -2 (Redies et al., 2015).

Data Analysis

The data analysis focused on comparing estimates of the association of aesthetic preferences and stimulus and personal properties related to order and complexity between a native Chinese-speaking and a native Dutch-speaking sample. We examined the cross-cultural generalizability of the aesthetic preferences in general (i.e., the proportion of times image id1 was preferred over image id0 in each image pair, compared across language groups), as well as the language groups' preferences for images that Western participants rated as relatively more ordered, complex, soothing, or fascinating. Furthermore, we also explored cross-cultural differences in the relation between preferences and a set of objective complexity measures. To explore the association between aesthetic preferences and several stimulus aspects, we calculated Pearson product-moment correlations (and their corresponding 99% confidence interval) between the different image pair measures and proportions of preference for a specific image in the pairs. To explore individual differences in preference for order, complexity, soothingness, or fascination, Pearson correlation coefficients between the different preferences and the measured personal properties were calculated. To test differences in the correlations of aesthetic preference with image pair and personal properties between both language groups, we calculated Zou's (2007) confidence interval for comparing two correlations based on dependent groups with overlapping variables, using the cocor R package (Diedenhofen & Musch, 2015).

All data processing and analyses were conducted using the statistical program R (Version 3.6.1; R Core Team, 2019) and the following R packages: tidyverse (Wickham et al., 2019), lavaan (Rosseel, 2012), psych (Revelle, 2018), cowplot (Wilke, 2019), knitr (Xie, 2020), corrplot (Wei & Simko, 2017), cocor (Diedenhofen & Musch, 2015), Hmisc (Harrel Jr, 2019), SemiPar (Wand, 2018), and qgraph (Epskamp et al., 2012). The data, analysis code, and other open materials for this study are available on osf.io/xtva8/.

Results

Overall Pleasantness and Experience

Overall, most participants perceived the images as pleasant to look at (i.e., 60.5% of Chinese and 78.4% of Dutch participants indicated somewhat pleasant, pleasant, or very pleasant) and did not regularly see similar images before (i.e., 87.7% of Chinese and 89.1% of Dutch participants). Of the participants who had seen similar

images before, almost no participants indicated to search for this type of images regularly (i.e., 2.3% of 60.5% and 1.8% of 78.4%, which is in both cases approximately 1.4% of all participants; see Supplemental Figures S1 and S2).

Aesthetic Preferences for Neatly Organized Compositions

Amount of Variability Between Image Pairs and Participants. As expected, image pairs differed in the amount of individual variation in preference that was present: Proportions of preference for the supposedly most complex image id1 varied between 0.13 and 0.84 ($M = .4553$, $SD = .1487$) in the Chinese-speaking sample and between 0.22 and 0.80 ($M = .4990$, $SD = .1315$) in the Dutch-speaking sample. Preferences for image id1 also varied between participants, with preference proportions ranging from 0.11 to 0.79 ($M = .4552$, $SD = .1247$) in the Chinese-speaking sample and from 0 to .89 ($M = .4990$, $SD = .1336$) in the Dutch-speaking sample.

Cross-Cultural Consistency in General Aesthetic Preferences. In general, aesthetic preferences were rather similar across cultures. Preferences in the Chinese and the Dutch sample were highly positively correlated, $r(98) = 0.58$, 99% CI [.38, .73] (see Figure 2).

Cross-Cultural Consistency in Aesthetic Preferences for Order and Soothingness. In both the Chinese-speaking and the Dutch-speaking sample, differences within an image pair in order and soothingness (as rated by Western participants) related positively to aesthetic preferences (see Figures 3 and 4). In other words, the larger the difference in order ratings for the images within a pair, the more often the more ordered image was preferred, $r_{\text{Chinese}}(98) = .33$, 99% CI [.09, .54] and $r_{\text{Dutch}}(98) = .36$, 99% CI [.11, .56]. Furthermore, a larger difference in soothingness ratings between the images in a pair related to a higher preference for the more soothing image in the pair, $r_{\text{Chinese}}(98) = .53$, 99% CI [.31, .69] and $r_{\text{Dutch}}(98) = .57$, 99% CI [.37, .72]. Note that the ratings of order and soothingness used here were based on a Western sample of participants only, so these results should be interpreted with a Western interpretation of these concepts in mind. All correlations of the different image pair measures with the proportion of preference for the image preferred on average in each language group are reported in Figure 3.

Cross-Cultural Diversity in Aesthetic Preferences for Complexity and Fascination. However, the relations between aesthetic preference and complexity and fascination (as rated by Western participants) were very different between Chinese-speaking and Dutch-speaking samples (see Figure 5). First, in the Chinese sample, a preference for simplicity was present: the larger the difference in complexity rating between the images in a pair, the more often the less complex image was preferred, $r(98) = -.43$, 99% CI [-.62, -.20]. This negative relation was absent in the Dutch-speaking sample, $r(98) = .04$, 99% CI [-.21, .30]. The estimated difference in

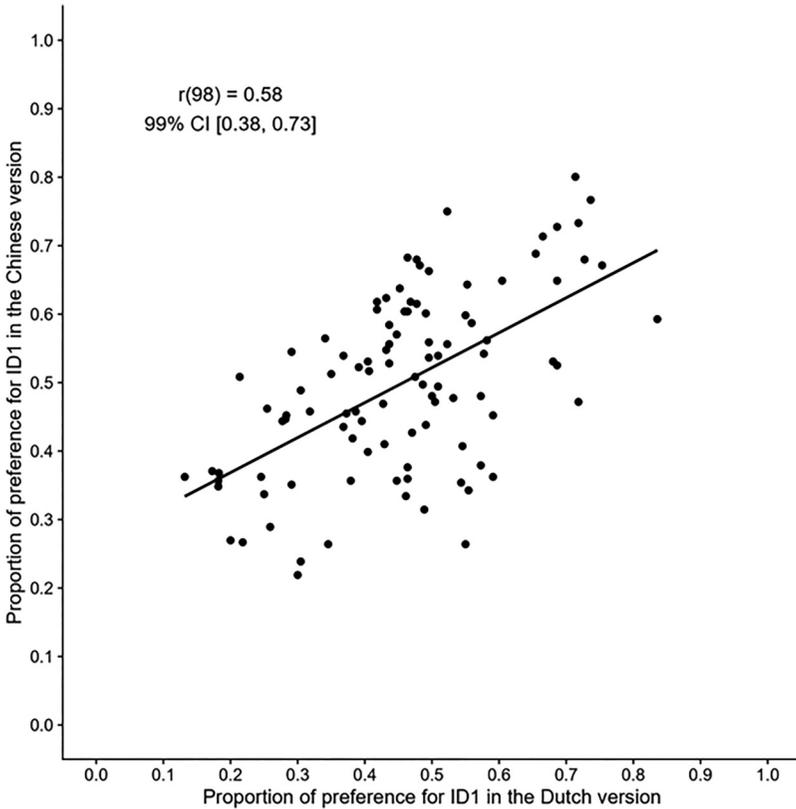


Figure 2. Cross-cultural consistency of aesthetic preferences in general.

correlation was significantly different from zero, estimate = -0.48 , 99% CI [-0.69 , -0.25]. Second, in the Dutch-speaking sample, there was a strong positive relation of aesthetic preference with fascination: the larger the difference in fascination ratings between the images in a pair, the more often the more fascinating image was preferred, $r(98) = .58$, 99% CI [$.38$, $.73$]. This positive relation was absent in the Chinese-speaking sample, $r(98) = .08$, 99% CI [-0.18 , $.33$]. Also this estimated difference in correlation was significantly different from zero, estimate = -0.50 , 99% CI [-0.72 , -0.29]. Note that the ratings of complexity and fascination used here were based on a Western sample of participants only, so these results should be interpreted with a Western interpretation of these concepts in mind.

It is important to note that the size of differences in order ratings and the size of differences in complexity ratings in the image pairs were unrelated, $r(98) = -0.10$. Also, the order and complexity ratings for the images themselves were unrelated, $r(182) = -0.07$. The results regarding order and complexity, therefore, do not follow

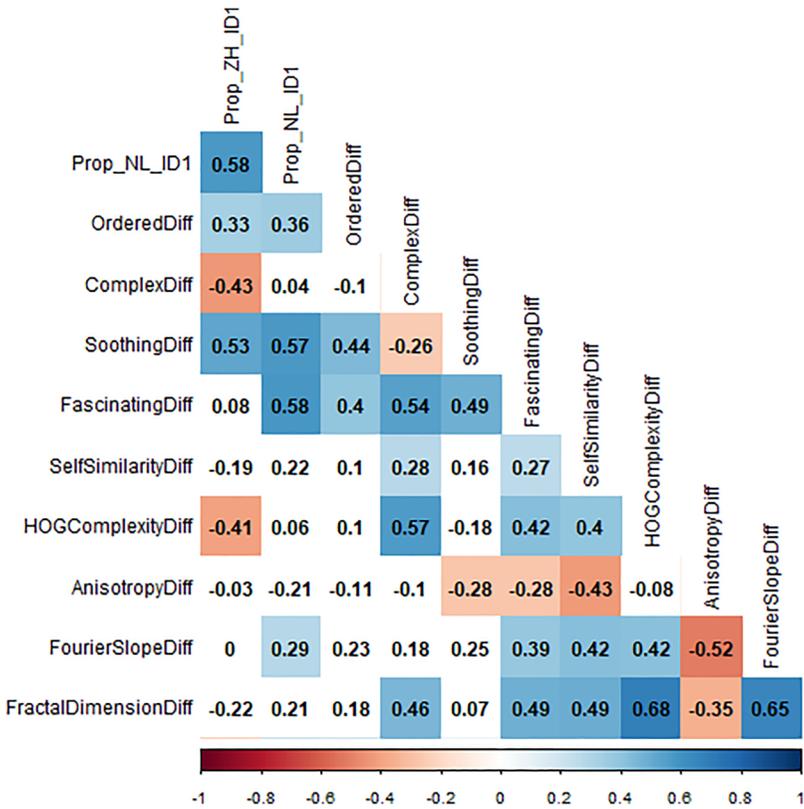


Figure 3. Correlations between average preferences per language group with other image pair properties ($N = 100$ pairs). Correlation plot generated with the R package corrrplot (Wei & Simko, 2017). Prop_ZH_ID1 = proportion of preference for ID1 in the Chinese-speaking sample; Prop_NL_ID1 = proportion of preference for ID1 in the Dutch-speaking sample. Correlations with $p < .01$ are shown on a colored background.

from each other (i.e., they are independent). The results for soothingness and fascination, however, seem to follow from (i.e., are not independent of) the results for order and complexity, as differences in soothingness were strongly positively correlated with the differences in order and negatively with differences in complexity, and differences in fascination were strongly positively correlated with differences in both order and complexity (see Figure 3).

Cross-Cultural Diversity in Aesthetic Preferences for Objective Complexity. In line with the results regarding the complexity ratings, also the relation between preferences and objective complexity measures was cross-culturally diverse (see Figure 3, Figure 6, and Figure S3). For four out of five objective complexity measures

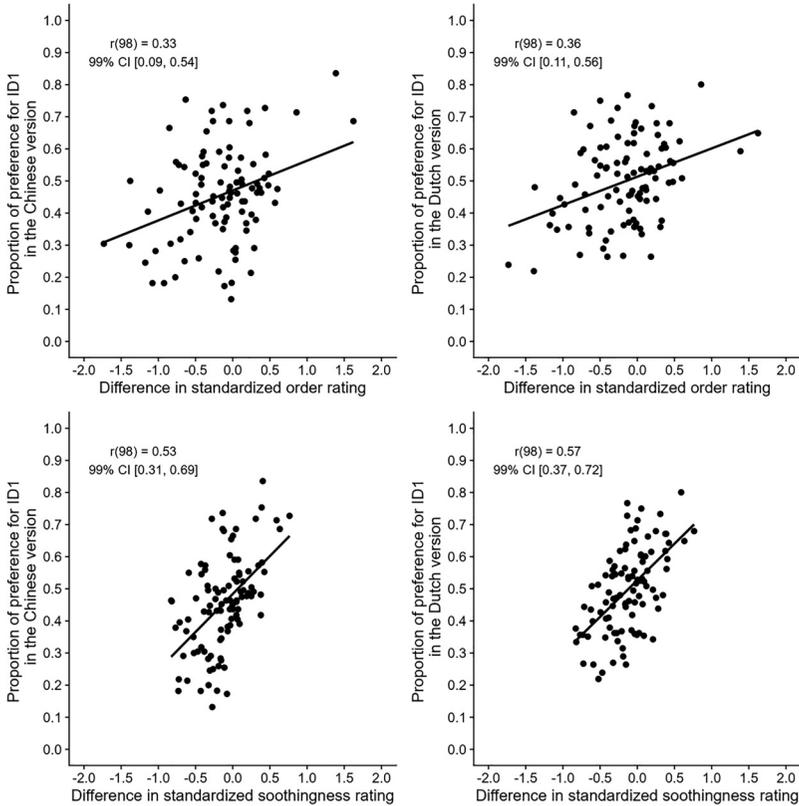


Figure 4. Correlation between difference in standardized order rating (top) and standardized soothingness ratings (bottom) and aesthetic preference in the Chinese (left) and Dutch (right) version, respectively.

(i.e., self-similarity, HOG complexity, Fourier slope, and fractal dimension), there was a significant difference in the relation with aesthetic preference between both samples (see Table 1). Furthermore, also for the fifth objective complexity measure, the difference was in the same direction.⁵ Consistent with the correlation difference for the complexity ratings between both samples, objective complexity had a more negative relation with preference in the Chinese-speaking sample than in the Dutch-speaking sample. Overall, the Chinese-speaking sample showed a slight negative relation between objective complexity measures and preference: the larger the difference between the images in a pair in objective complexity, the more often the less objectively complex image was preferred. In the Dutch-speaking sample, correlations between preference and objective complexity were slightly positive.

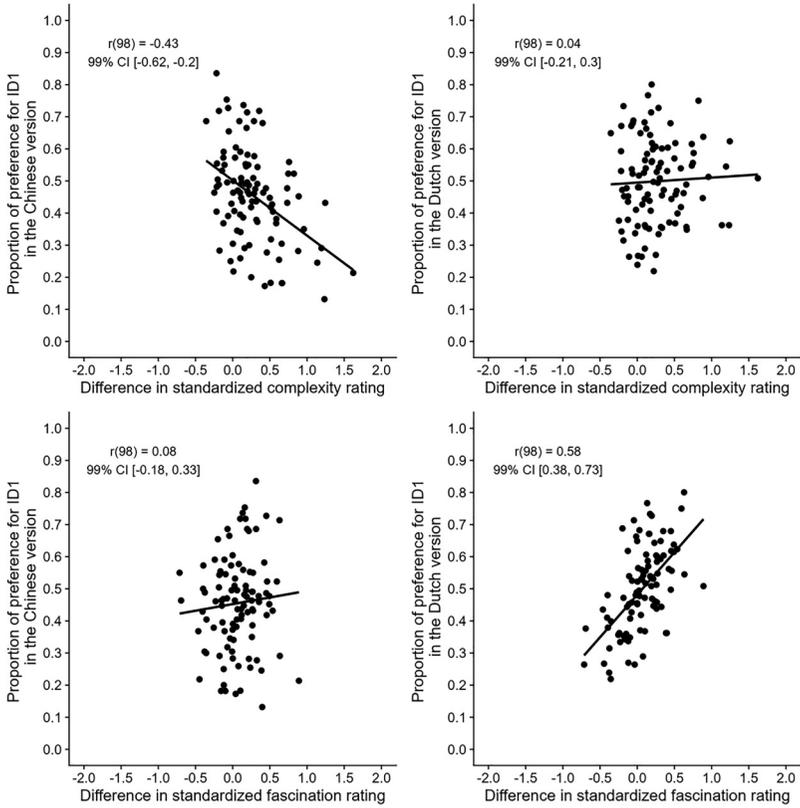


Figure 5. Correlation between difference in standardized complexity rating (top) and standardized fascination ratings (bottom) and aesthetic preference in the Chinese (left) and Dutch (right) version, respectively.

Individual Differences in Aesthetic Preferences and Relation to Personal Properties. Except for the correlations with PNS, the pattern of correlations between individual preferences (for order, complexity, soothingness, and fascination as rated by Western participants) and other personal properties (see Figure 7) was rather similar in direction and strength. For example, in both language groups, preferring the more complex image in the pairs was related slightly positively with scoring high on Openness to Experience, $r_{\text{Chinese}}(218) = .27$, 99% CI [.10, .42], $r_{\text{Dutch}}(354) = .22$, 99% CI [.09, .35]. In addition, age correlated negatively with preferences for fascination and complexity in both language groups, $r_{\text{Chinese}}(218) = -.45$, 99% CI [-.58, -.30], $r_{\text{Dutch}}(354) = -.21$, 99% CI [-.33, -.07] for complexity and $r_{\text{Chinese}}(218) = -.43$, 99% CI [-.57, -.28], $r_{\text{Dutch}}(354) = -.27$, 99% CI [-.39, -.14] for fascination.

The correlations of the personality measures and age with preference for order, soothingness, and complexity in the Chinese-speaking sample should be interpreted

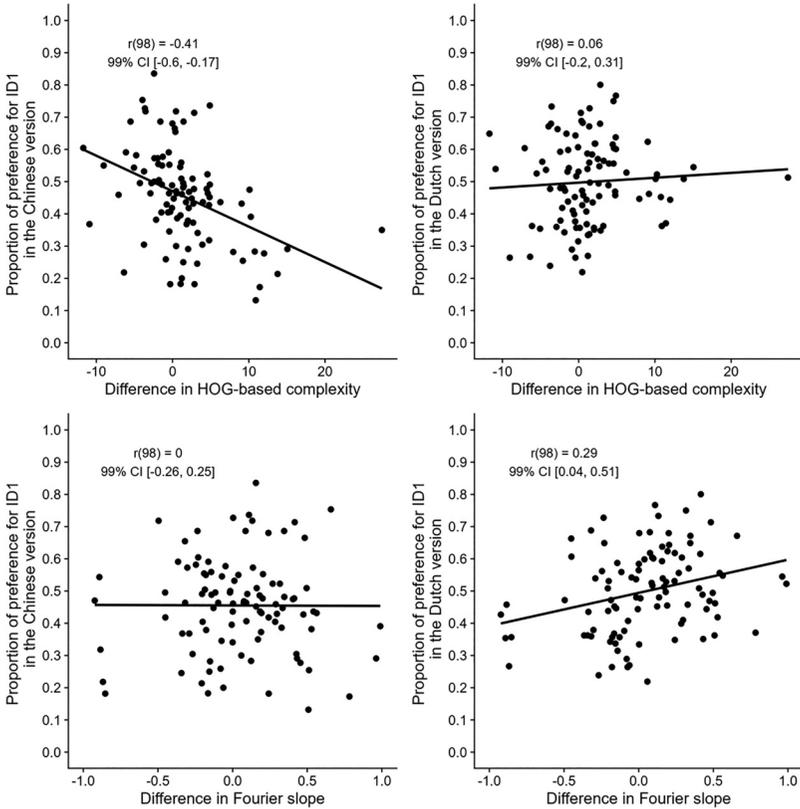


Figure 6. Correlation between difference in HOG-based complexity (top) and Fourier slope (bottom) and aesthetic preference in the Chinese (left) and Dutch (right) version, respectively.

Table 1. Test of Differences in the Correlations of Aesthetic Preference with the Objective Complexity Measures Between the Chinese-Speaking and the Dutch-Speaking Samples.

Measure	Difference estimate	99% confidence interval	
		LL	UL
Difference in self-similarity*	-.41	-.62	-.18
Difference in HOG-based complexity*	-.47	-.68	-.24
Difference in anisotropy	.18	-.05	.41
Difference in Fourier slope*	-.29	-.51	-.06
Difference in fractal dimension*	-.43	-.64	-.20

Note. Differences significant at the 99% confidence level are indicated with an asterisk (*). LL = lower limit, UL = upper limit.

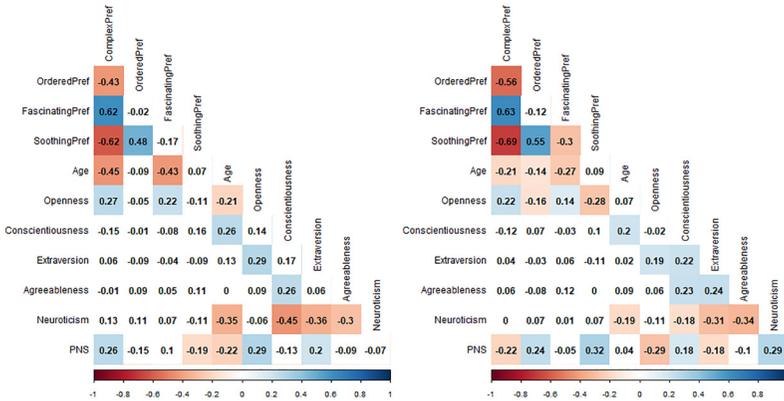


Figure 7. Correlations between different participant measures for the Chinese-speaking (left) and the Dutch-speaking sample (right; $n_{\text{Chinese}} = 220$, $n_{\text{Dutch}} = 356$). Correlation plot generated with the R package *corrplot* (Wei & Simko, 2017). OrderedPref= preference for ordered images; ComplexPref= preference for complex images; SoothingPref= preference for soothing images; FascinatingPref= preference for fascinating images; PNS = Personal Need for Structure. Correlations with $p < .01$ are shown on a colored background.

with the necessary caution. In the case of the PNS, there were some differences between the two samples but the effects are small, and there is no clarity on the validity of the Chinese PNS questionnaire in the current sample (cf. Questionnaires in “Method” section). In the case of age, the correlations are driven by the rather few older participants in the Chinese sample. When it comes to the correlations with the Big Five traits, the validity of the Chinese BFI questionnaire was not optimal, but for the Openness factor, for instance, most items loaded most highly on that factor. Note that the ratings of order, complexity, soothingness, and fascination used here were based on a Western sample of participants only, so these results should be interpreted with a Western interpretation of these concepts in mind.

Discussion and Conclusion

In summary, three main findings were obtained. First, average aesthetic preferences were very similar across cultures. Second, in both language groups, participants preferred images that Western participants rated as more ordered and more soothing over images that Western participants rated as less ordered and less soothing. Third, cross-cultural differences were present as well. For example, the Dutch language group showed a preference for fascinating images (according to Western ratings of the images) that was absent in the Chinese-speaking sample. In addition, the Chinese language group showed a preference for images that Western participants rated as less complex (and thus more simple), and this preference was absent in the Dutch-speaking sample. Furthermore, the same cross-cultural difference came back

when inspecting objective complexity measures: these measures showed a more negative relation with preference in the Chinese-speaking than in the Dutch-speaking sample.

The cross-cultural consistency in average aesthetic preferences accords well with earlier cross-cultural research on aesthetics suggesting a considerable level of universality (e.g., Chan et al., 1980; for a review, see Che et al., 2018).

Whereas the soothingness of an image can be predicted by high order and low complexity, how fascinating an image is perceived to be associated with high order and high complexity (Van Geert & Wagemans, 2021). Individuals within a culture but also between cultures differ in the extent to which their aesthetic preferences are associated with perceived order and complexity, and (consequently) also in the extent to which their aesthetic preferences are associated with soothingness and fascination. This study brings evidence for cross-cultural differences in the role complexity plays in aesthetic appreciation. On average, complexity was more disliked in the Chinese-speaking sample than in the Dutch-speaking sample: the strong negative correlation between preference and complexity in the Chinese-speaking sample was absent in the Dutch-speaking sample. In addition, fascination (positively linked to complexity) played a positive role in aesthetic appreciation in the Dutch-speaking sample, but not in the Chinese-speaking sample (probably as a result of the Chinese-speaking sample's strong dislike of complexity). These findings are in line with the findings of Fingerhut et al. (2020), who asked Japanese and German participants to rate figurative artworks differing in level and type of complexity, and found the relation between complexity and aesthetic ratings to be more positive and more consistent for Western European than for East Asian observers.

From these results, we propose that the relationship between order and aesthetic appreciation is cross-culturally consistent, but that the relation between complexity and aesthetic appreciation is cross-culturally diverse. This is in line with previous evidence on the existing variance within as well as between cultures. Che et al. (2018) reviewed earlier cross-cultural work on complexity and symmetry and concluded that the relation between aesthetic appreciation and complexity differed between studies and cultures, while the relation between appreciation and symmetry (i.e., a form of order) was much more consistent across cultures. Van Geert and Wagemans (2021) found more variation between individuals (within a Western sample) in their correlation of soothingness and fascination with complexity than in their correlation of soothingness and fascination with order (see Figure S17 and Figure S18 in the Supplemental Material of Van Geert & Wagemans, 2021). Order thus seems to be a more consistent factor in aesthetic appreciation, both within and across cultures.

Individual differences in preferences for complexity and fascination related positively with Openness to Experience and negatively with age in both the Chinese- and Dutch-speaking samples. These results indicate a cross-culturally consistent relationship and converge with some earlier work suggesting a common relation between some personality traits and aesthetic preferences across cultures (Che et al., 2018;

Child & Iwao, 1968). The results regarding the PNS scale do not follow this cross-culturally consistent pattern, but could be due to invalidity of the Chinese data for the PNS in this study.

Post Hoc Interpretation of Preference for Simplicity in the Chinese-Speaking Sample

As this study was meant to be exploratory, we did not have any concrete hypotheses on the existence or direction of differences in preferences for order or complexity between the native Chinese-speaking and native Dutch-speaking samples. However, based on our analysis of additional literature, we can suggest the following interpretation.

Whereas Western aesthetics is concerned with beauty, symmetry, order, disinterest, and pleasure, traditional Chinese aesthetics is more concerned with balance, tranquility, and purity, among others (Mattice, 2013). In the ancient Chinese ways of thinking, everything in the world is related and cannot be easily separated from each other (Wang et al., 2012). Nisbett and colleagues have described several studies in which East Asian individuals tend to be more attentive to both salient and contextual information, whereas North American individuals focus on the salient information only (for a list of references, see Wang et al., 2012). Wang et al. (2012) suggest that East Asian individuals will have a more holistic orientation, leading to a larger difficulty to separate target from peripheral information and the main message from the details. In contrast, North American individuals tend to focus on salient, core information while ignoring less core information like context or details.

Fingerhut et al. (2020) studied the appreciation of three different types of complexity across cultures. They found the relation between aesthetic ratings and complexity defined as the number of objects in the stimulus to be positive in a Western European sample but rather negative in an East Asian participant sample. Western European observers showed a strong positive correlation between aesthetic ratings and complexity defined as the diminishing amount of empty space, a correlation for which no evidence was found in the East Asian sample. Complexity defined as the amount of texture present in an image was positively correlated with aesthetic ratings in both the Western European and the East Asian sample. When inspecting the image pairs in the current study for which a large difference in preference was present (see examples in Figure 8), the main factors distinguishing the images in a pair seem to be the number of objects and the overall, holistic organization of the display. Participants in the native Chinese-speaking sample more often seemed to prefer the image containing a smaller number of objects compared to participants in the native Dutch-speaking sample. In addition, Chinese-speaking participants more often seemed to prefer the image in the pair in which the relation between different objects in the display is more clearly defined, more harmonious, and less cluttered than Dutch-speaking participants.

East Asian and Western individuals may not only differ in the level of complexity they prefer on average, they may also differ in how they experience complexity.

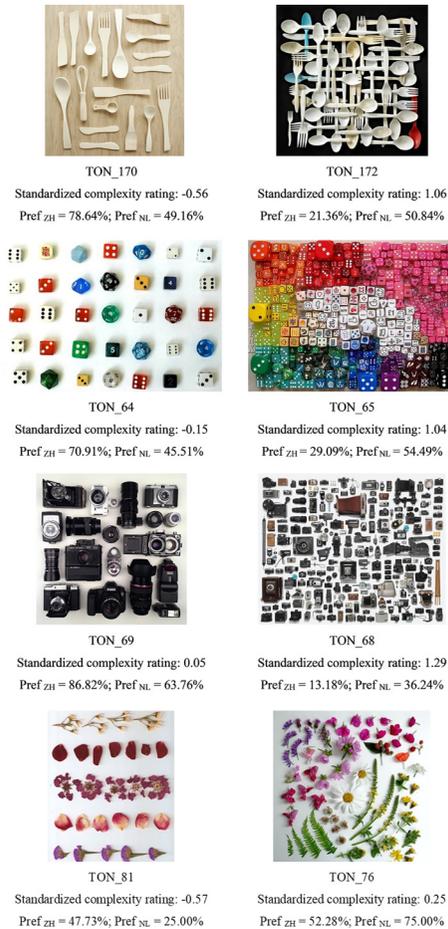


Figure 8. Examples of image pairs with a large difference in preference between the Chinese-speaking (ZH) and Dutch-speaking (NL) sample (pair ids: TEX_32, CL + TX_5, NUM_9, TEX_6). From top to bottom and from left to right: (a) Image from “Interior design at housing fairs,” by Kristiina Kurronen (<https://susannavento.fi/project/interior-design-for-deko-house/>). Copyright by Kristiina Kurronen 2019. (b) Forks Knives Spoons. From “Found in Nature,” by Barry Rosenthal (<http://barryrosenthal.com/found-in-nature/single-gallery/13513644>). Copyright by Barry Rosenthal 2020. Reprinted with permission. (c) Dice. From “Day 114,” by Lisa Congdon (<http://collectionaday2010.blogspot.com/2010/04/day-114.html>). Copyright by Lisa Congdon 2010. Reprinted with permission. (d) A splash of color therapy with my dice. Image by jenix5 (<https://www.pinterest.com/pin/269793833915908952/>). Copyright by jenix5. (e) Image by Andreas Reinholdt Poulsen (<https://thingsorganizedneatly.tumblr.com/post/49704637467/photo-from-instagram-by-reinholdtp>). Copyright by Andreas Reinholdt Poulsen. (f) Camera Collection. Image by Jim Golden and Kristin Lane (<https://jimgolden.tumblr.com/post/35853915763/new-work-camera-collection-i-collaborated-with>). Copyright by Jim Golden. Reprinted with permission. (g) Flowers Set Iv. From “Flowers Set IV,” by pastelliyon (<https://pastelliyon.tumblr.com/post/21808633841>). Copyright by pastelliyon 2018. (h) Image by unknown photographer.

As Chinese-speaking participants may have more attention for context and details, the images judged as “less complex” by Western participants may be experienced as more complex by East Asian participants, like the native Chinese-speaking individuals in our study, than by Western participants, like the native Dutch-speaking individuals in our study. For example, in East Asian cultures, empty space is seen as a substance that depicts something (Zhang, 2004; Pelowski et al., 2012). The optimal amount of information may thus differ between cultures, partly because different cultures vary in how much complexity they experience in an image. This experienced level of complexity may be influenced by how much attention an individual pays to details and contextual information.

Earlier research found East Asian cultural products to be more information-rich than North American cultural products, which tend to be simpler (Wang et al., 2012). This may be a consequence of East Asian individuals being more sensitive to contextual information, and North American individuals focusing on some major pieces of information while ignoring further context (Choi et al., 2003; Masuda et al., 2008; Masuda et al., 2012). That individuals in East Asian cultures would be more habituated to information-rich stimuli does not necessarily imply that they will also prefer information-rich stimuli in all contexts. The harmony or order between parts in an image may play a crucial role in whether more or less information-rich products are preferred by East Asian participants. For example, in a cross-cultural study of color drawings, Japanese participants used a larger number of hues in their colorings than North American participants but the Japanese colorings were more harmonious: the hues they used were less contrasting and less intense (Ishii et al., 2014).

The interpretation laid out in this paragraph cannot be evaluated based on the current study, as the complexity ratings for the images were based on a fully Western sample of participants. Future research could additionally collect ratings from an East Asian sample and verify whether there is a mean difference in how complex the images are experienced in general.

Potential Limitations

Difference in Familiarity with Type of Stimuli? The current findings could be influenced by the type of stimuli used in the study, that is, images of neatly organized compositions. As images of neatly organized compositions are a Western cultural phenomenon, one may assume Chinese-speaking participants to be less familiar with this type of images. Chinese-speaking participants were however not less familiar with this type of images than Dutch-speaking participants: in both samples, approximately only 12% of participants had often or very often seen this type of images before (see Supplemental Figure S1).

Less Representative Chinese-Speaking Sample. Just like the Dutch-speaking sample, the Chinese-speaking sample was a convenience sample. The resulting Chinese sample was less diverse in age and education levels than the Dutch sample, and also less

representative for the population. Based on feedback from some participants, the reasons could be that desktop use is very uncommon among older Chinese and that many older Chinese with lower education level have no email address (which was required to participate) or very limited digital knowledge and skills. Nevertheless, we are confident that the results are interpretable, even with this less representative sample. The strong negative correlation between aesthetic preference and complexity in combination with a strong negative correlation between age and preference for complexity suggests that the difference between the language groups would even be more outspoken with a more representative Chinese-speaking sample.

Image Ratings Based on Western Participants Only. The subjective image ratings of order, complexity, soothingness, and fascination used to determine the more ordered, complex, soothing, and/or fascinating image in the pair were based on a Western sample of participants only ($N=84$, mostly Dutch-speaking, some English-speaking). The resulting findings are thus based on a Western interpretation of the concepts “order,” “complexity,” “soothingness,” and “fascination.” It could be the case that these concepts would be interpreted differently in a native Chinese sample, or that the level of complexity experienced in the used images would be different (as suggested earlier in the “Discussion” section). This difference in the experience of complexity could lead to different order and complexity ratings and consequently different findings could be the result when the ratings were based on a native Chinese sample. This would not invalidate the current findings, however; it only specifies in which way the current results should be interpreted (i.e., from a Western point of view on the concepts of order, complexity, soothingness, and fascination). Future research could collect ratings from a native Chinese sample to investigate whether “order,” “complexity,” “soothingness,” and “fascination” have different meanings or are experienced differently in Chinese culture.

Doubtful Validity of the Chinese PNS Questionnaire. Although we used a validated Chinese version of the PNS, the validity in the current sample was doubtful (cf. Questionnaires in “Method” section). We therefore suggest not to interpret the correlations between aesthetic preference and this personality questionnaire and the differences in these correlations compared to the Dutch sample.

Low Experimental Control. As the study was conducted online and we did not ask participants about the device used, we had no control on the screen size of participants’ device. Based on feedback from some participants, we expect more participations on smartphone in the native Chinese sample compared to the native Dutch sample, which could have influenced the ease of participating in the study (i.e., more horizontal and vertical scrolling involved when participating on smaller device). We do not have any concrete indications, however, that this potential confound would actually have had any influence. The larger proportion of smartphone use in combination with the reduced ease of participation on smartphone may explain the large proportion of

dropout in the Chinese-speaking sample (see Footnotes 2 vs. 3). In addition, the size in which the images were presented stayed the same across devices, as size was determined absolutely (maximum width of 600 pixels and maximum height of 800 pixels, keeping the original aspect ratio of the image).

Conclusion

In conclusion, aesthetic appreciation for images of neatly organized compositions was relatively consistent across cultures (i.e., Chinese and Dutch-speaking language groups). Whereas preferences for images that Western participants rated as more ordered or soothing were very cross-culturally consistent, some cross-cultural differences emerged as well. Chinese-speaking participants preferred images that are subjectively experienced by Western participants as less complex (i.e., simpler). Chinese-speaking participants also more often preferred objectively less complex images than the Dutch-speaking participants. This strong preference for simplicity was absent in the Dutch-speaking sample. As a consequence of this differing relation between preference and complexity, Dutch-speaking participants did and Chinese-speaking participants did not show a preference for fascinating images, which are often rather complex (cf. the positive correlation with both objective complexity measures and perceived complexity as rated by Western participants in Figure 3). This cross-cultural difference in the appreciation of complexity relates to earlier findings indicating more interindividual variation in the relation between aesthetic appreciation and complexity than between aesthetic appreciation and order (cf. Figures S17 and S18 in the online Supplemental Materials of Van Geert & Wagemans, 2021). The association between order and aesthetic appreciation is thus more consistently positive than the association between complexity and aesthetic appreciation, both within and between cultures. Further investigations should focus on further investigating and theoretically explaining the cross-cultural consistencies and differences found.

Authors' Note

Eline Van Geert, Laboratory of Experimental Psychology, Department of Brain and Cognition, KU Leuven, Belgium; Rong Ding, Peking University, China, Max Planck Institute for Psycholinguistics, The Netherlands; Johan Wagemans, Laboratory of Experimental Psychology, Department of Brain and Cognition, KU Leuven, Belgium. This work has been supported by a PhD fellowship from the Research Foundation – Flanders (FWO) awarded to Eline Van Geert (Grant 11D3619N and 11D3621N) and by long-term structural funding from the Flemish Government awarded to Johan Wagemans (METH/14/02 and METH/21/02).

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ORCID iD

Eline Van Geert  <https://orcid.org/0000-0002-7848-5998>

Supplemental Material

Supplemental material for this article is available online.

Notes

1. This included 217 participants indicating Chinese (中文) and 3 participants indicating Chinese, simplified script (简体中文) as their mother tongue.
2. In total, the Chinese version was started 323 times. One hundred and three participations were not completed.
3. In total, the Dutch version was started 413 times. Fifty-seven participations were not completed.
4. Averaged over all image pairs, which image within each pair was positioned left or right had no influence on the proportion of preference for that image, based on a two-sample test for equality of proportions, $\chi^2(1) = 1.75, p = .19$ for the Chinese version and $\chi^2(1) = 2.23, p = .14$ for the Dutch version.
5. Note that anisotropy is coded inversely here compared to the other objective complexity measures, with a higher value on the measure indicating lower complexity.

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Author Biographies

Eline Van Geert, is a postdoctoral researcher at the Department of Brain & Cognition at KU Leuven in Belgium. By conducting human behavioral experiments in the lab or online, she explores how stimulus, person, and context interact to determine how we visually and aesthetically perceive the world. Her research interests include perceptual organization, empirical aesthetics, and individual and contextual differences in perception and appreciation.

Rong Ding, is currently a PhD student at the Max Planck Institute for Psycholinguistics. Using various techniques including MEG and computational modeling, her doctoral research seeks to understand how internal linguistic knowledge is

represented and processed via oscillatory dynamics of the brain during spoken language comprehension.

Johan Wagemans, is full professor at the Department of Brain & Cognition at the University of Leuven (KU Leuven) in Belgium. He has published more than 350 papers in international peer-reviewed journals, has edited the *Oxford Handbook of Perceptual Organization*, and is senior editor of *Cognition*, and Editor-in-Chief of *Art & Perception*. He is currently leading two large interdisciplinary research programs on perception and appreciation of images and art, one funded by the Flemish Government (Methusalem) and one funded by the ERC (GRAPPA).