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Effects of Massive Familiarization on Crossmodal Aesthetic Preference

Nicholas J. Voss, Dylan S. Campbell and Ronald S. Friedman

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Abstract

An investigation was carried out to determine whether familiarization to the experience of visual dissonance would have crossmodal effects on the preference for dissonant and consonant musical stimuli. We hypothesized that subjects who viewed a large number of disharmonious color combinations would come to show greater liking for dissonant musical stimuli than their counterparts who had seen either harmonious or single color images. Findings showed that there was no difference in preference between groups, though musical experience and score on a benign masochism measure predicted larger differences between average ratings of consonant and dissonant chords. These results are discussed in light of prior findings regarding generalized preference variables and the short-term effects of a massive familiarization procedure.

Effects of Massive Familiarization on Crossmodal Aesthetic Preference

The question of how we come to develop our unique aesthetic preferences has been one of both scientific and popular interest for some time. While most people could confidently report their tastes within domains such as art, music, and literature, they would likely find it more difficult to explain precisely how and why they came to acquire those preferences in the first place. Researchers interested in answering such questions have implicated a broad variety of causal and correlational factors related to specific domains of preference. Neurobiological and genetic causes, the roles of experience and repeated exposure, depth of domain-specific knowledge, and relationships to particular features of personality are frequent themes in the psychology of aesthetics literature. Concise explanations for why we like the things we like can be elusive; particular preferences typically depend upon a variety of such factors operating in tandem and interacting with one another to alter perception within a fleeting or more permanent time frame. That being said, the psychology of aesthetics literature has already yielded many promising and intriguing results, while providing ample opportunity for future lines of inquiry. In attempting to discover and describe this vastly complex and fascinating feature of cognition, we gain a more complete understanding of how environmental and psychological factors continuously interact to create a cohesive perceptual picture of the world around us.

Beginning at the broadest level of inquiry, many average patterns of preference have been studied and described. While some of these are rather intuitive and well known, others are less immediately obvious. The preference for consonance over dissonance in music has been found in human infants as young as two days old (Masataka, 2006; Trainor & Heinmiller, 1998; Trainor, Tsang, & Cheung, 2002) as well as in several non-human animals (Chiandetti & Vallortigara, 2011; Fannin & Braud, 1971; Sugimoto et al., 2010). In the visual domain, humans have

displayed preferences for rounded objects over angular ones (Bar & Neta, 2006), more symmetrical and complex shapes (Tinio & Leder, 2009), and natural landscapes over urban and developed ones (Hidalgo, Berto, Galindo, & Getrivi, 2006). When asked to orient objects in a pictorial frame in the most aesthetically pleasing way, subjects preferred front-facing and centered positions (Palmer, 2008). A preference for color combinations that exhibit greater similarity of hue and utilize cooler over warmer colors has also been found (Schloss & Palmer, 2010), though single colors were preferred to color combinations overall (Chen, Tanaka, Matsuyoshi & Watanabe, 2013). Preferences for sweeter flavors (Beauchamp & Moran, 1982) and odors associated with breastfeeding (Porter, Makin, Davis & Christensen, 1991) have been shown in infants as young as two weeks old. It should be noted that even with a relatively ubiquitous trait such as the preference for consonance, questions of origin are still hotly debated (Bidelman & Krishnan, 2009; Guernsey, 1928; McDermott & Oxenham, 2008; Zentner & Kagan, 1996).

Moving beyond the mere description of average preferences, much work has attempted to hone in on more specific factors associated with patterns of individual differences witnessed within these averages. Repeated exposure to musical melodies (Peretz, Gaudreau, & Bonnel, 1998), photographs of faces (Bornstein, Leone, & Galley, 1987), and edible substances (Pliner, 1982) tended to increase liking for all three. When making judgments of paintings, art students placed greater emphasis on clarity of detail and less on realism, while generally preferring less traditional and representative paintings (O'Hare, 1976). Similarly, those with a greater amount of experience in photography showed a greater preference for complex and ambiguous photos, while also rating them as being more expressive (Axelsson, 2007). Liking for short surrealistic film clips was associated with higher levels of traits such as openness to experience, ambiguity

for tolerance, and sensation seeking (Swami, Stieger, Pietschnig, & Voracek, 2010), and those with more independent styles of self-construal showed greater liking for angular over rounded shapes (Zhang, Feick, & Price, 2006). Certain genetic factors have been implicated in preferences for specific tastes (Eriksson et al., 2012; Keskitalo et al., 2007) and bodily odors (Penn, 2002).

While such a vast web of interrelated influences on preference may seem hard to untangle, some factors may help us predict broader patterns in individuals' tastes that emerge across different domains and sensory modalities. Hans Eysenck was among the first to empirically investigate such a "generalized preference variable" for aesthetic judgment. Eysenck (1940) provided subjects with sets of unfamiliar stimuli from a broad range of categories including odors, colors, portraits, statues, photographs, curves of mathematical functions, clocks, and polygons, and asked them to rank order the items in each set by preference. Eysenck isolated what he referred to as '*T*' – an underlying variable correlated with an individual's rankings across all twenty-one types of stimuli used in the study and that could be used to help predict how far from average an individual's preferences would lie.

In a modern analog to this research, Palmer and Griscom (2013) obtained subjects' ratings of "harmony" and "liking" for stimuli in four classes: color combinations, dot patterns, spatial orientations of individual dots, and classical piano music. Average differences between individuals' ratings of harmony and preference, referred to as their *Preference for Harmony (PfH)*, were calculated within these four domains. Similar to Eysenck (1940), Palmer and Griscom found that an individual's *PfH* scores across all four domains tested were significantly correlated with one another. Furthermore, those with greater amounts of training and experience in art and music tended to have lower *PfH* for stimuli relevant to their area, and to some degree,

for all four classes of stimuli tested. These findings suggest that levels of preference for generalized aesthetic attributes such as “harmony” may be domain general, and are related to a person’s amount of experience with and exposure to stimuli sharing that attribute or to a broader variety of stimuli in general. This leaves the question of causality open, however. Is it the case that experience in various aesthetic domains is *causing* aspects of preference to change over time, or merely that certain preexisting preferences drove people to pursue these fields in the first place?

There exists some support for the former hypothesis, indicating that substantial exposure to certain types of stimuli may significantly shape preference even within a single experimental session. After undergoing a “massive familiarization” procedure – viewing several hundreds of images of human faces – subjects came to give higher preference ratings to new faces that shared similar facial features as those seen previously (Tinio, Gerger, & Leder, 2013). Despite a global preference for symmetrical body movements, subjects came to like asymmetrical choreography sequences more after being exposed to several such sequences in a row (Orgs, Hagura, & Haggard, 2013). Short-term familiarization with piano melodies increased liking for those melodies (Peretz, Gaudreau, & Bonnel, 1998), an effect that has been witnessed with both tonal and atonal music (Mull, 1957; Johnson, Kim, & Risse, 1985; Verveer, Barry, & Bousfield, 1933). A short-term familiarization procedure has yet to be tested in reference to a generalized preference variable like the ones studied by Eynsenck (1940) and Palmer and Griscom (2013), however. If someone were to be inundated with stimuli having a certain general aesthetic attribute, would we witness a domain-general increase in liking for stimuli sharing that attribute as in former research focused on narrower classes of stimuli?

The Present Research

An experiment was designed to test whether a massive familiarization procedure similar to that used by Tinio, Gerger and Leder (2013) would impact preference ratings for a separate class of stimuli sharing a general aesthetic characteristic with the original stimuli. Following Palmer and Griscom (2013), we chose the amount of “harmony” present in color combinations and musical chords as the aesthetic feature of interest to be manipulated. We hypothesized that subjects familiarized to a large number of “disharmonious” color combinations would give reliably higher ratings for subsequently presented dissonant piano chords than subjects who had seen either “harmonious” color combinations or single-color images. By being repeatedly exposed to elements that traditionally seem to “clash” in combination with one another, the aversive reaction to disharmony in general may lessen over time, as it has within more narrow classes of stimuli in the past (Mull, 1957; Orgs, Hagura, & Haggard, 2013). Such an effect would shed light on the role of experience in *PfH* found by Palmer and Griscom (2013) provide support for the notion that aesthetic preference can be quite malleable, changing even within the course of a single experimental session.

Method

Participants

Participants were 159 (86 female, 72 male, 1 other) University at Albany undergraduates between the ages of 18 and 32 ($M = 19.31$; $SD = 1.81$) who participated in exchange for course credit in an introductory psychology course. Participants were recruited via the university’s research pool website for a study entitled “Color and Music Ratings”.

Materials

The *visual stimuli* used in the study were intended to provide a visual analog to the experience of hearing a dissonant or consonant musical chord. A set of three-color triads (arranged as equal-area segments of a circle and displayed on a solid black background) were prepared based on two-color combinations previously studied by Schloss and Palmer (2010). Combinations that had been previously rated more favorably were used to create a “harmonious” set of color combinations, while combinations that had been rated less favorably were used to create a “disharmonious” set. These two sets, along with several novel triads of our own creation were then pilot tested, with participants answering the question “How well do you think these colors go together?” for each image. The 13 lowest and 13 highest-rated of these combinations were then used to create our final harmonious and disharmonious color sets composed of 39 colors each (three different rotational orientations for each unique color triad). A set of 39 single-color images was also created for use in a control group.

The *musical stimuli* were created using the Mini Grand piano synthesizer (Version 1.2.0.17886; AIR Music Technology, 2015) with Pro Tools music editing software (Version 11.0.1; Avid, 2013). Six consonant and six dissonant chord shapes were chosen based on mean dissonance ratings provided in McLachlan, Marco, Light and Wilson (2013). These were used to create 24 unique chords, repeating all 12 chord shapes in the keys of C and D (starting at root notes C₄ and D₄).

Procedure

Upon arriving at the lab, subjects were seated at individual computer stations, given a pair of headphones, and provided with a brief set of instructions. Subjects were told that they would be asked to give their opinions on various visual and auditory stimuli and complete several personality questionnaires. After a brief practice session, subjects viewed four blocks of

images, each containing all 39 of the unique color triads for that set presented in randomized order for a total of 156 images in all. Subjects saw either the “harmonious”, “disharmonious”, or single-color images based on their random group placement. After viewing each image for 5 seconds, participants then answered one of two questions: “How much do you like this color (combination)?” or “How interesting do you think this color (combination) is?” Answers were given on scale ranging from 1 (“not at all” or “not at all interesting”) to 9 (“very much” or “very interesting”). The responses to these questions were not a principal dependent measure of interest, but rather served to provide greater motivation for the participant to focus their attention on the image. The two different questions were included to investigate the possibility that they might differentially impact subjects’ strategies of appraisal of the chords in the second phase of the experiment. Subjects then listened to the 24 computer-synthesized piano chords for 3 seconds each, presented in a randomized order such that the likelihood of hearing more than three consonant or dissonant chords in a row would be very unlikely. After each chord, subjects were asked to rate how much they liked each chord on a scale from 1 (“not at all”) to 9 (“very much”). Subjects then completed a brief questionnaire about their informal and formal experience in music and art and several individual difference measures thought to be of potential relevance to a preference for dissonance over consonance: a 20-item sensation-seeking scale (Arnett, 1994), a 10-item openness to experience measure (John & Srivastava, 1999), and an 8-item measure of benign masochism adapted from Rozin, Guillot, Fincher, Rozin, and Tsukayama (2013). Finally, subjects provided demographic information, completed a brief deception check, and were debriefed before leaving the lab.

Results

For each subject, two mean preference ratings were calculated: one for the 12 dissonant chords and one for the 12 consonant chords. The mean dissonant chord ratings were entered as the dependent variable in a 3 (color: harmonious vs. disharmonious vs. single color) x 2 (question: liking vs. interest) analysis of covariance (ANCOVA), using the average consonant chord ratings as a covariate. Our primary hypothesis was not supported; no differences in liking for the dissonant chords were found between the groups who saw harmonious color combinations ($M = 3.69$, $SD = 1.51$), disharmonious color combinations ($M = 4.03$, $SD = 1.56$), or single colors ($M = 4.01$, $SD = 1.38$), $F(2,152) = .492$, $p = .613$. Additionally, no difference was found between the subjects who received the “liking” question after each image ($M = 3.99$, $SD = 1.47$) and those who received the “interesting” question ($M = 3.84$, $SD = 1.50$), $F(1,152) = 1.651$, $p = .201$. No interaction was found between color and question, $F(2,152) = .884$, $p = .415$.

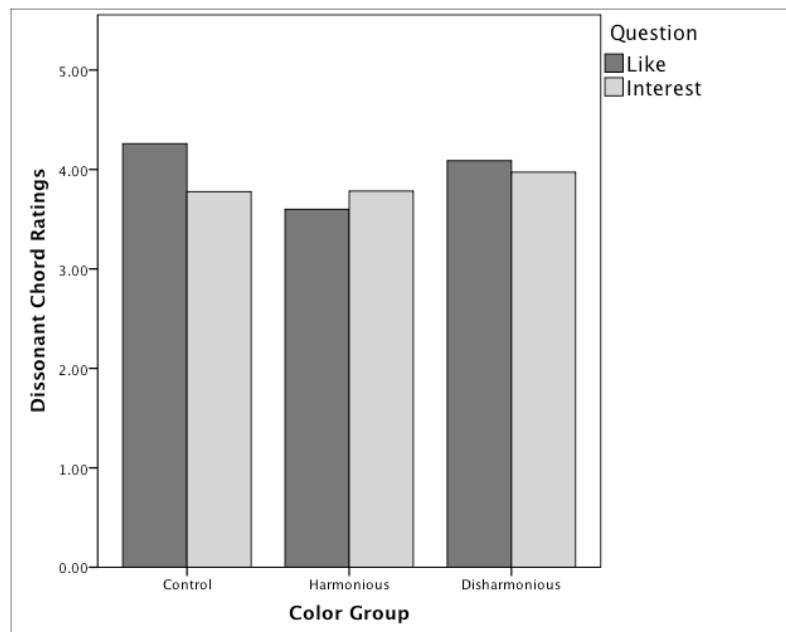


Figure 1. Mean dissonant chord ratings by group (type of color combinations seen and question asked after viewing colors).

Next, we examined relationships between our individual difference measure scores and a difference score variable (mean dissonant chord rating subtracted from mean consonant chord rating) using a multiple regression procedure. The analysis showed that years of music experience ($\beta = .183$, $t(147) = 2.213$, $p = .028$) and score on the benign masochism measure ($\beta = .202$, $t(147) = 2.071$, $p = .04$) significantly predicted difference scores. This indicates higher ratings of consonant chords, lower ratings of dissonant chords, or some combination of the two by those with greater scores on these measures.

Discussion

In contrast to findings from prior studies examining the effects of repeated dissonance or asymmetry over time (Mull, 1957; Orgs, Hagura, & Haggard, 2013), and general increasing in liking as a result of repeated, massive exposure to a specific type of stimuli (Tinio, Gerger, & Leder, 2013), we found no support for the existence of an effect on general liking for dissonance as a result of repeated exposure over a short period of time. It could simply be that such an effect is too subtle to overcome the relatively entrenched and stable preference for consonant over dissonant music. There could also be something unique to the experience of consonant and dissonant music that distinguishes it from other types of stimuli, as some prior research (Pallensen et al., 2005) has indicated that greater music experience may in fact predict the opposite relationship to what we expected based on Palmer and Griscom's (2013) findings. Due to the fact that the familiarization to the colors took about 25-30 minutes in total, it is also possible that boredom effects played a part in creating the pattern of results we found. If subjects were not adequately attending to either the color or musical stimuli while viewing, listening and rating them, this could have had a systematic effect on our results.

As our primary goal during the first part of the experiment was to maximize the experience of disharmony for the subjects, future research might utilize a variety of disharmonious stimuli instead of just colors as we did in order to prevent possible boredom effects. Using a greater variety of visually dissonant stimuli (colors in combination with shapes, photographs, etc.) for example, may help the subject stay attentive during the study. Furthermore, an effect might be found when reversing the order of the study, familiarizing subjects to the dissonant music stimuli before rating color combinations to see if preference changes more going from the auditory to visual domain instead of the other way around. If the hypothesized effect were quite subtle, such a procedure might be able to detect it more effectively. Future research is needed to clarify whether greater experience with music will in fact lead to less or greater liking for dissonant music. Results in Pallesen et al. (2005) demonstrated that experienced musicians found dissonant musical chords more unpleasant than non-musicians did, in agreement with our finding that subjects with greater music experience showed greater differences between consonant and dissonant chord ratings. While the effect here was subtle, this relationship should be further explored.

Conclusion

Here, we employed a massive familiarization procedure in an attempt to further explore changes in perception as a function of exposure and the generalizability of certain variables of aesthetic preference. While our primary hypothesis was not supported, the existence of generalized preference variables and their susceptibility to change will require further research. Greater knowledge of the stability of preference over time and the mechanisms by which it changes serves as a complement to a fuller understanding of cognitive and aesthetic psychology.

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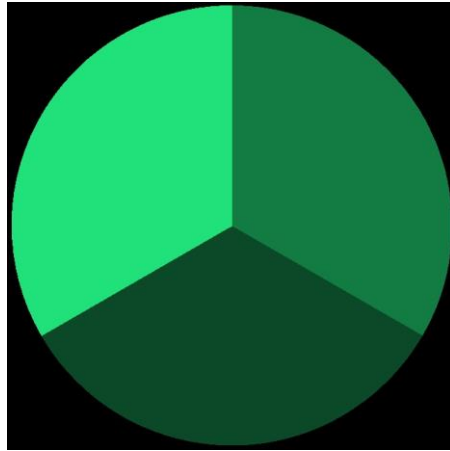
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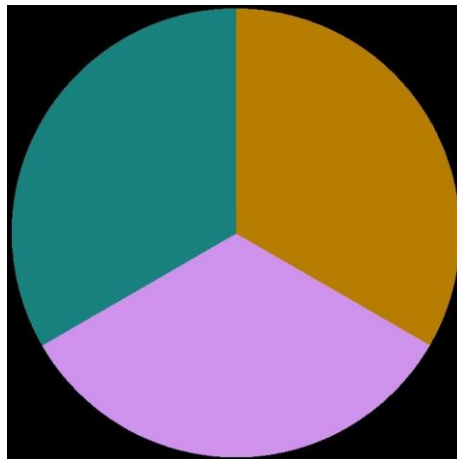
Appendix A

Examples of Visual Stimuli

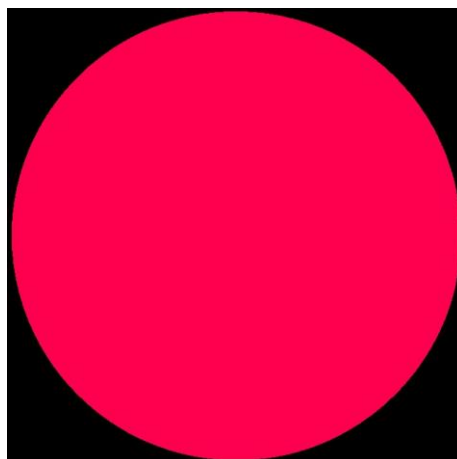
Harmonious/Consonant:



Disharmonious/Dissonant:



Single-Color:



Appendix B

Musical Stimuli

Consonant Chords (root note at C₄)*

Major Triad	C E G
Perfect 5 th	C G
Major 3 rd	C E
Minor 6 th	C A \flat
Minor Triad	C E \flat G
Minor 3 rd	C E \flat

Dissonant Chords (root note at C₄)*

Major 2 nd	C D
Flattened 5 th triad	C E G \flat
Augmented 5 th triad	C E A \flat
Diminished 5 th triad	C E \flat G \flat
Suspended 2 nd triad	C D G
Tritone	C G \flat

* All chords were replicated one whole tone up, in the key of D.

Appendix C

Music and Art Experience Questionnaire

Instructions for all questions: If 'YES', enter the number of years of training you have below. If 'NO', enter '0'.

Music

- 1) Do you have any formal musical training (private lessons, post-high school coursework, etc.)?
- 2) Do you have any informal music experience (have you played an instrument, sang in a choir, etc. as a hobby)?

Art

- 1) Do you have any formal art training (private lessons, post-high school coursework, etc.)?
- 2) Do you have any informal art experience (have you done any painting, drawing, photography, etc. as a hobby)?

Appendix D

AISS -- Arnett Inventory of Sensation Seeking (Arnett, 1994)

For the following items, indicate which response best applies to you. The options will be:

- (A) does not describe me at all**
- (B) does not describe me very well**
- (C) describes me somewhat**
- (D) describes me very well**

- 1) I can see how it would be interesting to marry someone from a foreign country.
- 2*) When the water is very cold, I prefer not to swim even if it is hot day.
- 3*) If I have to wait in a long line, I'm usually patient about it.
- 4) When I listen to music, I like it to be loud.
- 5) When taking a trip, I think it is best to make as few plans as possible and just take it as it comes.
- 6*) I stay away from movies that are said to be frightening or highly suspenseful.
- 7) I think it's fun and exciting to perform or speak before a group.
- 8) If I were to go to an amusement park, I would prefer to ride the rollercoaster or other fast rides.
- 9) I would like to travel to places that are strange and far away.
- 10*) I would never like to gamble with money, even if I could afford it.
- 11) I would have enjoyed being one of the first explorers of an unknown land.
- 12) I like a movie where there are a lot of explosions and car chases.
- 13*) I don't like extremely hot and spicy foods.
- 14) In general, I work better when I'm under pressure.
- 15) I often like to have the radio or TV on while I'm doing something else, such as reading or cleaning up.

16) It would be interesting to see a car accident happen.

17*) I think it's best to order something familiar when eating in a restaurant.

18) I like the feeling of standing next to the edge on a high place and looking down.

19) If it were possible to visit another planet or the moon for free, I would be among the first in line to sign up.

20) I can see how it must be exciting to be in a battle during war.

** Item is reverse scored.*

Appendix E

Openness Subscale of the Big-Five Inventory (John & Srivastava, 1999)

The next questionnaire lists a number of characteristics which may or may not apply to you. For example, do you believe that you are someone who *likes to spend time with others*? Please choose a number for each statement to indicate the extent to which you agree or disagree with that statement.

disagree strongly - 1

disagree a little - 2

neither agree nor disagree - 3

agree a little - 4

agree strongly - 5

I see myself as someone who...

- 1) is original, comes up with new ideas
- 2) is curious about many different things
- 3) is ingenious, a deep thinker
- 4) has an active imagination
- 5) is inventive
- 6) values artistic, aesthetic experiences
- 7*) prefers work that is routine
- 8) likes to reflect, play with ideas
- 9*) has few artistic interests
- 10) is sophisticated in art, music, or literature

* *Item is reverse-scored.*

Appendix F

Shortened Benign Masochism Scale (Rozin, Guillot, Fincher, Rozin, & Tsukayama, 2013)

For the following questions, you will use a scale ranging from 0 (“not at all”) to 100 (“as much as I like anything”) to rate how much you like the items. You can input any number between 0 and 100, and may enter ‘999’ if you are unfamiliar with the item in the question.

SAD

- 1) crying in response to sad movies or novels

BURN

- 2) spicy foods

DISGUST

- 3) disgusting jokes

FEAR

- 4) pounding heart in response to frightening experiences or movies

PAIN

- 5) massages which produce some pain

ALCOHOL

- 6) scotch whiskey

EXHAUST

- 7) the feeling of being physically exhausted, after extended effort

BITTER

- 8) unsweetened coffee