# Aesthetic Stability in Development

**Cameron Pugach (cameron.pugach@hws.edu)**
Department of Psychology, 300 Pulteney St., Hobart & William Smith Colleges
Geneva, NY14456 USA

**Emma Daley (ewdaley@gmail.com)**
Department of Psychology, 300 Pulteney St., Hobart & William Smith Colleges
Geneva, NY14456 USA

**Helmut Leder (helmut.leder@univie.ac.at)**
Faculty of Psychology, Liebiggasse 5, University of Vienna
Vienna, Vienna 1010 AT

**Daniel J. Graham (graham@hws.edu)**
Department of Psychology, 300 Pulteney St., Hobart & William Smith Colleges
Geneva, NY14456 USA

**Abstract**

The stability of human aesthetic preferences has been little studied. Even basic parameters such as the typical level of stability of healthy adults are unknown. This cross-sectional study focuses on stability in early child development utilizing aesthetic preference for paintings and photographs as a means of measurement. Our results show that while stability does not differ for paintings versus photographs, older children (7-9 years) are significantly more stable than younger children (3-6 years). In addition, older children perform significantly better on an explicit memory task though memory is a weak predictor of stability compared to age. Our results suggest that aesthetic stability appears to emerge surprisingly early in development, a finding that is in line with the AD patient results (Graham et al. 2013, Halpern et al. 2008) in that it confirms the robustness of aesthetic stability. It remains to be seen how other stages of development—or indeed how the panoply of relevant psychological factors—influence aesthetic stability.

**Keywords**: Aesthetics; child development; aesthetic stability; memory; art perception; memory development.

## Introduction

Stability in human aesthetic preference is an area that has been scarcely studied. Questions regarding stability in healthy adults, let alone other populations, have not been addressed. Increased interest in this area of study has prompted the empirical question of how stable different people are and the methodological question of whether single tests of preference can be considered reliable measures of human aesthetics. Recent research has shown that Alzheimer's Disease (AD) patients and frontotemporal dementia (FTD) patients do not exhibit significantly different levels of stability in aesthetic judgments of many types of paintings and pictures compared to healthy matched control groups (Halpern et al., 2008; Graham et al., 2013; Halpern & O'Connor, 2013). However, this research has also shown that patients with AD perform significantly worse on an explicit memory test of the stimuli.

In attempting to further our understanding of visual perception and human cognition, researchers have developed various viewpoints and differing methodologies in studying aesthetic perception (Chatterjee, 2014). While recent research has focused on stability in elderly populations, we argue here that increasing our understanding of aesthetic stability in young children will help us develop a better understanding of stability more generally.

In previous work, Graham et al. (2013) focused on two specific questions. 1.) Whether handmade, or painted, stimuli would produce greater aesthetic stability than other images in the AD group. 2.) What the role of image content, specifically of faces, plays in patients with AD. Similarly, Halpern et al. (2008) and Halpern and O'Connor (2013) used three types of artwork (representational, abstract and quasirepresentational) in testing AD and FTD patients. Thus, one major goal in this area of research focuses on answering the question of whether representational artwork has any significant effect on patients with dementia. These earlier studies utilize stimulus effects to examine how patients suffering from AD and FTD view art. In shifting our study to aesthetic stability in child development, our focus lies on individual effects, particularly due to age, which is a relevant factor in aesthetics given the profound changes in cognition engendered by development.

In the present study, we apply the methodology of Graham et al. (2013) to preschool and early elementary school children. Therefore, while artistic content remains important in our experiment, we are mainly interested in how results vary as a function of the ages of participants.

We hypothesized two possible outcomes. The first outcome would be that stability would be higher for older children, which we would attribute to higher memory fidelity. This is because studies on memory recall and recognition for large numbers of pictures and visual objects have suggested that, for general pictures, memory improves with age (Hoffman & Dick, 1976; Dirks & Neisser, 1977).

The second possible outcome is that stability will be similar in all participants, which we would expect to be the case if memory is not a principal factor, as was the case in AD and FTD. Determining how and why stability could change with age will have impacts on both our understanding of aesthetics and also on development.

## Materials and Methods

### Overview

While past studies have examined stability regarding aesthetic preference in patients with AD and FTD versus a control group, our study focused on aesthetic stability from a developmental perspective. We performed a cross sectional study of stability in preschool and early elementary school children. The study was modeled after Graham et al. (2013). Participants were asked to rank 4 sets of 8 stimuli (ranking them numerically 1-8) based on individual aesthetic preference. Two weeks later, they were asked to repeat the same task. In addition, participants were tested on explicit memory during the follow up study prior to the aesthetic stability task.

### Participants

Participants were recruited from four day-care facilities in Geneva, New York: Discovery's Playground, Roots and Shoots, the Geneva Lakefront Childcare Center, and the Geneva General Child Care Center. Children were given permission to participate through consent of caregivers and through authorization of all programs involved. There were 22 participants (7 boys, 13 girls) involved in the study and all data collected was analyzed. The age of participants ranged from 3 to 9 ($M$ = 6.2, SD = 2.04). There were no incentives given to participants.

### Stimuli

The stimuli used included 4 sets of 8 images. The 4 sets of images were categorized as follows: "painted landscape"; "photographic landscape"; "painted portrait"; and "photographic portrait." Images used were all of recognizable content and were painted in a representational style. The photographs that were chosen corresponded to the content of the paintings (i.e. same identity for face, or same landscape). For artworks used and specific image content, refer to Graham et al. (2013).

### Procedure

The first part of our study consisted of participants ranking the four sets of stimuli. The sets were presented in random order, with the 8 stimuli arranged on a table in front of the participants in random order. Subjects were asked to create a ranking of the stimuli from "least favorite" to "most favorite". Children were told that there was no time limit on the task and that there was no wrong way to rank the stimuli.

The second phase consisted of a follow up study given two weeks later. Participants were given an explicit memory task involving sixteen pairs of images with four image pairs per image category. The pairs, consisting of one image previously shown and one distractor image resembling the previously viewed stimulus (i.e. similar terrain for landscapes, same gender for faces, and same artist for paintings). Participants were asked to choose the image that they had previously been exposed to. Following the memory task, subjects were asked to repeat the rank preference task in the same manner given in the previous session two weeks prior.

## Results

### Preference Task

We analyzed the per item numerical change of stimulus rankings between the two sessions, which is termed the change score or aesthetic stability index. For more details on the change score, see Graham et al. (2013). The lowest score is 0 (no change) and the highest score is 4 (total change). **Table 1** shows the mean change score values by image type/category. Stability as a function of stimulus categories was analyzed using two-sample $t$-tests. There were no significant differences between the preference stabilities of any of the four categories.

Table 1 - Aesthetic stability for children ages 3 to 9 for each stimulus category. Differing n values reflect missing data in the experiment.

| Stimulus Category | Participants Change Score | n |
|---|---|---|
| Landscape Paintings | 1.57 (0.19) | 21 |
| Landscape Photos | 1.87 (0.21) | 21 |
| Portrait Paintings | 1.57 (0.18) | 19 |
| Portrait Photos | 1.74 (016) | 21 |

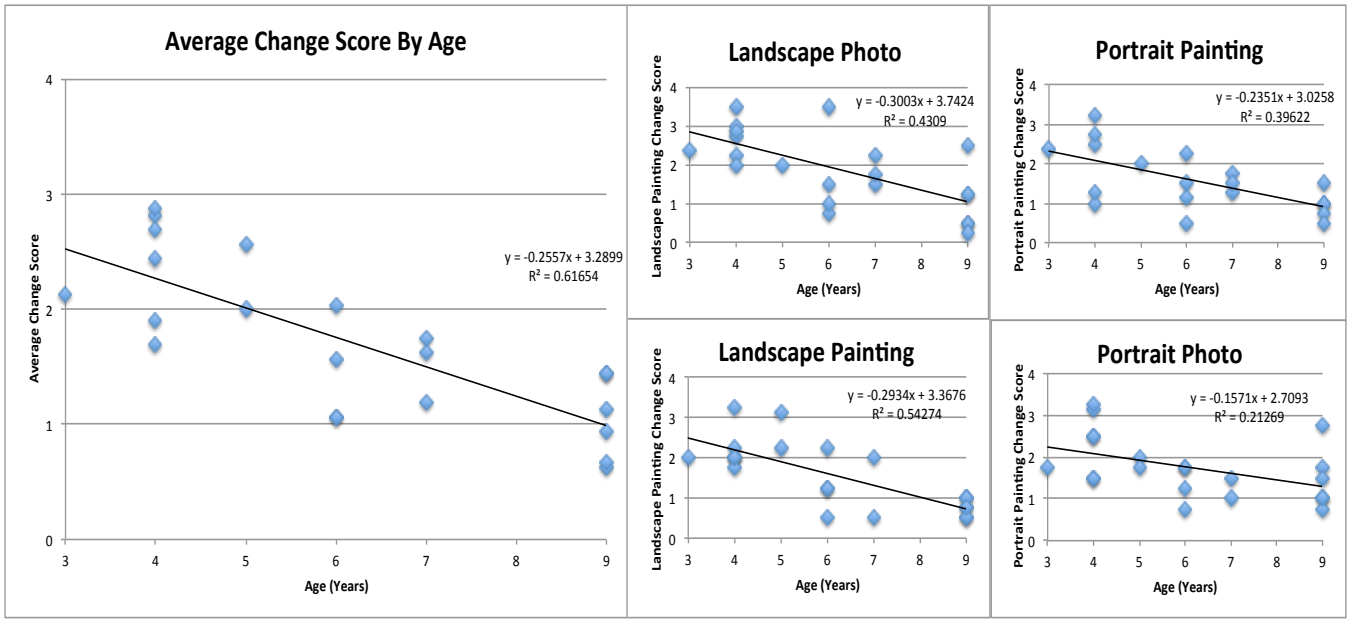


Figure 1 – The change score for all four stimuli categories across the initial and follow up studies for children ages 3 to 9.

A regression comparing age to average change score averaged over image category showed a strong negative correlation with age ($p < 0.001$, $R^2 = 62$ %); that is, older children showed higher aesthetic stability. A *t*-test of our data with a median split (median = 6.18) revealed that older children showed higher stability (age 7-9, $M = 1.20$, SE = 0.13) than younger children (age 3-6, $M = 2.06$, SE = 0.17) with $p < 0.001$ (two-sample *t*-test) seen in **Figure 1**. We note that the portrait photo category displayed a lower $R^2$ value in comparison to the other three image types, which echo the results of the AD participants but do not rise to the level of significance. Interestingly, however, when separated by image type and compared by a two-sample *t*-test, older children exhibit significantly higher stability compared to younger children for photos ($p = 0.001$) but not paintings ($p = 0.459$). **Table 2** shows further breakdown for *p*-values for *t*-tests testing the difference in stability of image category for older versus younger children. Gender showed no significant difference on aggregate results ($p = 0.07$, two-sample *t*-test).

Table 2 – *P*-values for *t*-tests testing the difference in stability between older and younger children for each image category.

| **Image Category** | ***p*** |
|---|---|
| Landscape Paintings | < 0.001 |
| Landscape Photos | 0.014 |
| Portrait Paintings | 0.019 |
| Portrait Photos | 0.077 |

In order to dismiss the possibility of random guessing amongst participants, a simulation of 100,000 pairs of preference orderings was conducted in order to obtain an average chance value for randomness ($M = 2.63$). This value was compared to the averaged preference values for all four image categories and by a median-split age group using a one-sample *t*-test (all $p < 0.002$), confirming that the stimuli in all preference tasks were not selected at random.

The raw ranking data for both the initial (see **Figure 2**) and follow up study did not show strong image biases that were shared by participants. This essentially means that there was nothing extraordinary about any one stimulus (for both paintings and photographs) in comparison to the others that would externally bias a subject's opinion.

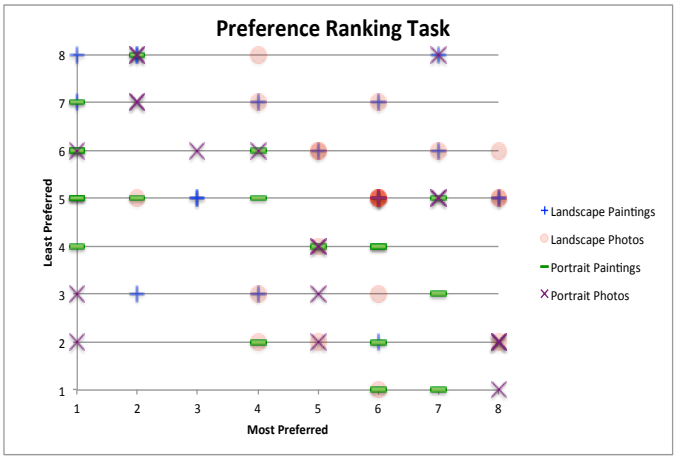


Figure 2 – Depicts the most preferred versus least preferred stimuli for the preference ranking task for each subject.

## Explicit Memory Task

Children that were asked to choose the image that they were exposed to two weeks prior had a recall rate of 85 % (SE = 4 %).

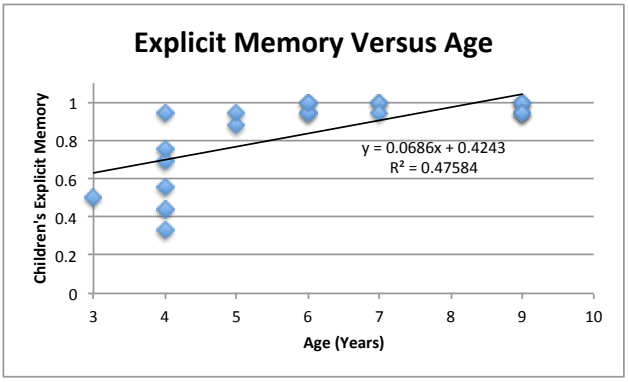


Figure 3 – The explicit memory values of children ages 3 to 9 for the explicit memory task.

We performed the same median split as described earlier dividing participants into an older age 7-9) and a younger age 3-6) subset. On the memory task, the older group ($M$ = 0.97, SE = 0.01) and the younger group ($M$ = 0.76, SE = 0.07) showed a significant difference in explicit memory ($p$ = 0.007, two-sample $t$-test). **Figure 3** shows a regression of age versus memory, which also indicates that explicit memory for images increases with age. However, when we normalize memory and stability data and perform regressions, we find that age ($R^2$ = 60 %) is a better predictor of change score than is memory ($R^2$ = 30 %). There was no significant difference in explicit memory by gender ($p$ = 0.87, two-sample $t$-test).

We tested whether participants had better recall of paintings versus photos. Results indicated that there was no significant difference between the recall rates of paintings versus photos ($p$ = 0.21, two-sample t-test, n = 61). Results correspond with the preference task that showed that there was no significant difference between painting and photo aesthetic stability in children ($p$ = 0.20, two-sample $t$-test).

## Data Comparison To Control Group

We also compared our subject pool to the elderly control group observed in Graham et al. (2013). The control group consisted of 15 participants (10 female, 5 male) with an average age of 74.2 (SD = 13.2). Change scores in the preference task for the control group appeared to be flat as a function of age, as shown in **Figure 4**. This was confirmed by a two-tailed $t$-test (p = 0.908) comparing the younger portion ($M$ = 1.70, SE = 0.153) to the older portion ($M$ = 1.67, SE = 0.213) of the population of the control group divided via a median split. The entire elderly control groups average change score for preference was then compared to that of the younger children and older children from our study by a two-tailed $t$-test. The result for the older group of children was marginally significant ($p$ = 0.014) while the results of the younger group of children was marginally insignificant ($p$ = 0.084).

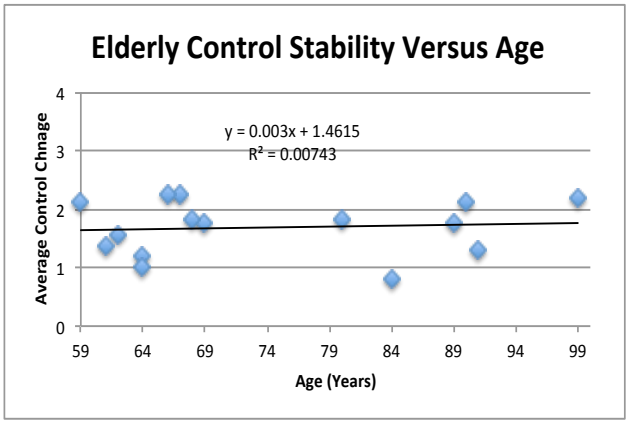


Figure 4 – Change values of the control group from Graham et al. (2013) for the preference ranking task.

## Discussion

The results of our experiment add significant understanding to the area of aesthetic perception with regard to child development. We found that older children (age > 6) had a significantly more stable aesthetic preference in comparison to younger children. We found that the older children also performed significantly better than the younger children on the explicit memory task. However, memory performance was a relatively weak predictor of stability compared to age. This finding suggests that aesthetic development may be distinct from memory development.

Previous work on memory development appears to agree with this interpretation though few studies have been performed in this area. Hoffman and Dick (1976) studied forced-choice recognition in 3 year olds, 7 year olds, and adults following exposure to either 300 or 600 picture stimuli. The results of this experiment indicate poorer performance in younger children as the number of picture recognition choices was increased. The authors attribute this to an increase of efficient and effective processing of information with age. Another study by Dirks and Neisser (1977) involved 7, 9, 12 year olds, and adults in three tasks testing whether subjects could recognize and/or recall movements, deletions, or additions of toy objects or photos of these objects after being shown an initial set-up. The results of this experiment were that in all three categories tested, score improvements were made with an increase in age. While these two experiments do not necessarily prove that memory capacity for images increases with age during early childhood, they do suggest that our ability to organize, process, store and retrieve information pertaining to memory increases with age. While this may help us explain why older children had a significantly higher ability to recall previously seen stimuli, it does not provide a sufficient explanation for increased aesthetic stability in older children. Indeed, based on the AD results (Graham et al. 2013), explicit memory is not a key factor in stability since AD patients did poorly on the memory task but still had stable preferences.

Interpreting our results is made more challenging by the paucity of cross-sectional studies of the development of aesthetic perception, especially for preschoolers. Research conducted by Gardner (1970) studied sensitivity to painting style in a sample of 6, 8, 11, and 14 year olds. His findings indicated that the only significant difference in performance was that the 14 year olds performed better than any other group, which he attributed to increased familiarity with art and an ability to overlook the superficiality of color and content to examine technique (i.e., brush strokes). Carothers & Gardner (1979) later explored the ability of children to perceive and produce aesthetic characteristics in drawings. Their findings suggested that 7 year olds had little success both perceiving and producing aesthetic characteristics. In contrast, 10 year olds were able to perceive but not produce these characteristics and 12 year olds could both perceive and produce aesthetic characteristics in drawings. However, beyond the work of Gardner (1970) and Carothers & Gardner (1979), little research has been completed related to aesthetic perception in child development. In this context, it is surprising that the youngest children performed as well as they did in our study.

In considering the development of aesthetic perception, one could also invoke the role of novelty and familiarity. Human preference for novelty versus familiarity has prompted debate in psychology, which could play a role in our study. Park et al. (2010) conducted a study involving visual exposure to a variety of stimuli including faces, natural scenes, and geometric figures. They found that participants preferred familiarity for stimuli involving faces as opposed to stimuli involving natural scenes – where novelty was preferred. In the second session of our study, subjects were tested on the explicit memory task prior to the second preference task because if the two were reversed, the memory task would be biased and thus ineffective. Therefore, the possibility remains that because the subjects were primed with 4 image pairs per category before the preference task, paintings and photos of faces that were shown in the memory task might have been given a higher ranking due to familiarity and paintings and photos of natural scenes may have been given a lower ranking due to human tendency towards novelty in this case. However, the effects observed by Park et al. (2010) have not been confirmed in children. And moreover in our study, all participants would be expected to have the same biases with regard to novelty and familiarity since they all viewed the same images. In any case, novelty and familiarity are certainly salient to aesthetic development if for no other reason than the fact that younger children have presumably seen fewer images than older children. We therefore encourage further work in this vein.

It is also entirely possible that the aesthetic sense is its own distinct cognitive system in the brain (Leder et al. 2004). This notion could imply that the aesthetic sense has its own developmental trajectory. If this is the case, we would expect results similar to those observed here in tests performed in other modalities (e.g., music).

The area of aesthetic stability is one that can illuminate diverse questions in aesthetics, but there are many populations in which the level of aesthetic stability is still unknown. While the present study focuses on aesthetic stability in development, and previous studies have focused on stability in both healthy and impaired elderly populations, we recommend that future studies employ populations including adolescents and adults.

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