Can You See What I See? Culture Influencing Psychophysical Processes

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Abstract

It has become increasingly apparent that subjective reality, which consists of our sensations and perceptions, deviates from our physical reality. While our process of sensation may be inaccurate due to biological factors, researchers posit that the process of transduction (which produces our perceptions) may be corrupted by cultural influences. The current study will examine two studies that focus on the impact of culture on sensory-perceptual experiences, particularly visual ones. In one cross-cultural study, Japanese and Americans' visual context incorporation or neglect was assessed using the framed-line test. It was found that Japanese are more capable of incorporating visual contextual information, whereas Americans were better at ignoring this information. Additionally, like the Americans living in the US, the Japanese living in the US tended to ignore contextual information, and like the Japanese living in Japan, the Americans living in Japan tended to incorporate contextual information. In another study, size contrast judgments in the Ebbinghaus illusion were compared between a Himba and English-speaking sample. It was found that this visual illusion is experienced more strongly by the English than the Himba. These findings support the researchers' hypotheses, in that it is evident that different aspects of our visual perception are influenced by our culture.

Keywords: sensation, perception, vision, culture, subjective reality

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Just as linguistic translations are never an exact reflection of the original language, our sensations and perceptions are imperfect reflections of our physical reality. To review this misalignment between sensation, perception, and the physical world, it is important to first understand the psychophysical process: our body detects physical stimuli via our sensory organs, and this process is known as sensation; these sensations are then transduced, or organized and interpreted into meaningful events and objects known as perceptions (Schwartz & Krantz, 2018). Our sensory organs have limitations as is— for instance, our optic disc in the retina of the eye creates a blind spot in our visual field (Saito et al., 2018)— and when this process is additionally interfered with during transduction, our subjective reality further deviates from our physical realities. Beyond our biological limitations, increasing literature has found that cultural factors seem to also interfere with the sensory-perceptual process (Ferdenzi et al., 2019; Gotow et al., 2021). Certain sensory-perceptual patterns have been found within cultural groups that differ from that of other cultural groups, thereby indicating that culture influences our sensation and perception. The mechanism in which culture influences this process is unclear, although research has indicated that participation in different social practices contributes to these chronic and temporary shifts in perception (Nisbett & Myamotto, 2005). Culture seems to have such a prominent impact that some researchers posit the processes of perception are not universal across all people at all times (Nisbett & Myamotto, 2005).

Culturally-dependent perceptual shifts have been detected in numerous facets of sensory perceptions, including: visual, auditory, olfactory, and gustatory perceptions (Jacoby et. al, 2019; Andrews et al., 2013; Gotow et al., 2021; Liu et al., 2021; Torrico et al., 2019; Yang et al., 2020).

Yet, this literature is limited. A majority of cultural-psychophysics literature is pursued in the context of consumer research and primarily examines differences in perceived pleasantness of foods and scents (Herk & Torelli, 2017). This paper will instead focus on the gap in the literature, examining the limited research that analyzes culturally influenced visual sensory perceptions, beyond mere preferences. Discoveries by Kitayama et al. (2003) and de Fockert et al. (2007) will be reviewed and discussed.

Method

Experiment 1

Participants. The sample for study 1 consisted of $N = 40$ undergraduate students: $n = 20$ students were native to Japan and $n = 20$ students were of European descent. The sample for study 2 consisted of $N = 111$ undergraduate students; $n = 32$ students were Japanese living in Japan; $n = 40$ students were Americans living in the US; $n = 18$ students were Americans who lived in Japan for up to four months; $n = 21$ students were Japanese who lived in the US for at least two months and up to four years. For both studies, participants were recruited from Kyoto University, Japan and the University of Chicago, US.

Materials. The researchers developed a new test called the framed-line test (FLT). In this test, participants are shown a square frame that contains a vertical line extending downward from the top of the square. They are then shown a second square frame of a different or same size, and are asked to draw a line inside, of either the same size (absolute task) or proportional size (relative task) as the line of the first frame. This is used to test one's ability to incorporate or ignore visual contextual information. There were five combinations: in two combinations, the first frame was larger than the second; in two other combinations, the first frame was smaller

than the second. In half of these cases, the first line was shorter than one half the height of the first square; in the other half, the first line was longer than half the height of the first square. In the fifth combination, the first and second frames were identical in size, meaning the line size would be identical in the relative and absolute tasks, if performed correctly.

Procedure. In study 1, participants were shown an initial square frame with a vertical line (from the FLT). To ensure that iconic memory did not affect the results, participants were then moved to another table, in which they were shown a second square frame of a different or same size. Participants were asked to draw a line inside, of either the same size (absolute task) or proportional size (relative task) as the line of the first frame. In study 2, participants underwent the same procedure, except some of the combinations differed: some of the ratios of both frames were somewhat altered, and the identically-sized two frames were run in two variations.

Experiment 2

Participants. The sample for this data consisted of $N = 16$: $n = 8$ monolingual Hinba with a mean age of 30.83 years and $n = 8$ English speakers with a mean age of 31.25 years. The English participants were students or staff from Goldsmiths College and the Himba participants were from an isolated region in Northern Namibia.

Materials. The researchers prepared two conditions of the Ebinghaus illusion: in one condition, the inducers were similar to the target, in the other condition, the inducers were dissimilar to the target. Within these conditions, the target slightly varied or remained constant in size in its small/large inducers set.

Procedure. Participants underwent practice trials for identifying the larger target in the Ebbinghaus illusion, until they reached 75% accuracy. After this training, participants were given

40 test trials for both conditions, and asked to point at the target circle they thought was larger. The experimenter noted their answer down after every trial, and the participants did not receive feedback on their accuracy.

Results

Experiment 1

In study 1, the mean error scores for the two tasks were submitted to an analysis of variance (ANOVA). In study 2, the means were submitted to a 2x2x2x6 ANOVA. There was significant interaction between culture and task: $F(1, 38) = 24.41$, $p < .0001$. In both study 1 and 2, the Japanese performed the relative task significantly more accurately than the absolute task (study 1: (*M*s = 6.05 vs. 4.52), $t(38) = 2.56$, $p < .02$; study 2: $t(105) = 9.90$, $p < .01$), and Americans performed the absolute task more accurately than the relative task (study 1: (*M*s = 6.35 vs. 3.71), $t(38) = 4.57$, $p < .01$; $t(105) = 2.15$, $p < .05$). The Japanese in the US and the Americans in Japan showed an effect that strongly resembled the effect of the host culture.

Experiment 2

The frequency of choosing the target with large inducers was entered into a 2x2x8 (culture, inducer shape, large inducers target size, respectively) mixed analysis of variance. There was a significant main effect for culture: $F(1, 14) = 9.88$, $p < .01$. The Himba participants experienced less illusion than the English participants: for the Himba, mean frequency of choosing the target with large inducers = 3.11; for the English, mean frequency of choosing the target with large inducers = 2.43.

Discussion

The results from these experiments primarily support the researchers' central hypothesis that culture influences our visual sensation and perception. There were significant differences found between cultures, particularly in visual context integration/neglect and visual illusion susceptibility. These findings imply that culture may determine our visual tendencies, such as using context or local details. Additionally, in Experiment 1, it was found that participants had the same visual tendencies as the natives of their new host country, not their previous home country. This indicates that living in a new culture can modify sensation and cognitive processes, substantiating that culture impacts sensation and perception. While culture may not physically alter one's sensory organs and processors, it seems to interfere with our transduction process by establishing what sensations are most salient or unique to us (i.e., context and local details). It thereby informs the sensations we consciously process (what becomes our perception). Yet, the extent of culture's influence and our subsequent sensory-perceptual differences remains unknown. We are left to wonder: *how well do our realities align? Can you see what I see*?

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