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Brief article

Exposure to an urban environment alters the local bias of a remote culture

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ABSTRACT

There is substantial evidence that populations in the Western world exhibit a local bias compared to East Asian populations that is widely ascribed to a difference between individualistic and collectivist societies. However, we report that traditional Himba – a remote interdependent society – exhibit a strong local bias compared to both Japanese and British participants in the Ebbinghaus illusion and in a similarity-matching task with hierarchical figures. Critically, we measured the effect of exposure to an urban environment on local bias in the Himba. Even a brief exposure to an urban environment caused a shift in processing style: the local bias was reduced in traditional Himba who had visited a local town and even more reduced in urbanised Himba who had moved to that town on a permanent basis. We therefore propose that exposure to an urban environment contributes to the global bias found in Western and Japanese populations.

1. Introduction

There is a substantial history of demonstrations showing cultural differences in the processing of information in visual displays (e.g., Davidoff, Fonteneau, & Fagot, 2008; Deregowski, 1989; Miyamoto, Nisbett, & Masuda, 2006; Rivers, 1905; Segall, Campbell, & Herskovits, 1966). In recent research, particular interest has been shown in the discovery that Japanese observers show more global (holistic) than local (analytic) perceptual precedence compared to Westerners (Nisbett, Peng, Choi, & Norenzayan, 2001; Miyamoto et al., 2006; Doherty, Tsuji, & Phillips, 2008). One explanatory account for these findings attributes the more global processing found in the Japanese to the greater clutter of their visual environment and the consequent demands made on visual scene parsing (Miyamoto et al., 2006). A second, and more popular, account (Kühnen & Oyserman, 2002; Markus & Kitayama, 1991; Nisbett et al., 2001; Uskul, Kitayama, & Nisbett, 2008; Varnum, Grossmann, Kitayama, & Nisbett, 2010) suggests that differences in social organisation (individualistic vs. collectivist) promote profound variations in the ways information is integrated within scenes/displays. Indeed, Nisbett (2007) and Uskul et al. (2008) have argued that the influence of social organisation on local/global processing is not specific to the contrast between Westerners and Japanese but also applies to contrasts between other groups where there is a relevant distinction between individualism and collectivism (e.g., that found between capitalist and communist countries, between North and South Italy, between herders and farmers/fishermen).

The present study examines visual processing in a remote people, the Himba of Northern Namibia. Their society is structured around large family compounds and social position is allocated rather than achieved; such society promotes interdependent, rather than independent, behaviours (Gluckman, 1965). Thus, according to the 'social-organisation' account, the Himba society ought to promote global processing similar to the Japanese. However, our previous findings (Davidoff, Fonteneau, & Fagot, 2008; De Fockert, Davidoff, Fagot, Parron, & Goldstein, 2007; Roberson, Davidoff, & Shapiro, 2002) have shown that the Himba do not conform to the latter account as they show more local processing than Westerners. In contrast, as the Himba visual environment is distinctly non-urban,

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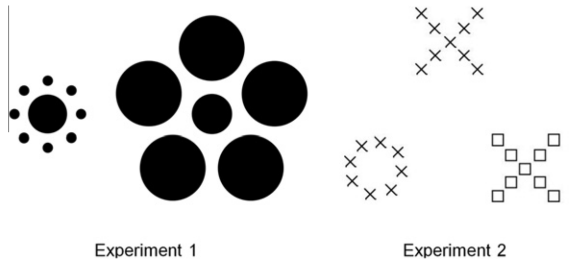

Fig. 1. Examples of stimuli used in Experiments 1 and 2. Experiment 1: the target circle surrounded by large inducers (on the right) measures 103.5% of the size of the target circle surrounded by small inducers (on the left). Experiment 2: the left comparison figure matches the local shapes of the top target figure and the right comparison figure matches the global shape of the top target figure.

the 'visual-clutter' account would suggest that the Himba should show even more local processing than a Western population. Here we assess the visual-clutter account by examining whether exposure to an urban environment can make the Himba process visual information less locally.

It is possible to examine whether visual environment influences visual processing in the Himba by conducting a naturalistic experiment. Opuwo, the only permanent settlement nearby the Himba, provides an urban environment for its 12,000 inhabitants (www.opuwo.org). Some of its inhabitants are Himba who have spent their early life in a traditional village before moving to Opuwo on a permanent basis in early adulthood. In our study, these urbanised Himba were compared to traditional Himba, urban British, and urban Japanese on their performance at two tasks that index global/local processing preferences, namely, (1) the Ebbinghaus illusion (an illusion of size which is generated by contrast between surrounding irrelevant stimuli),[1] and (2) a global/local similarity-matching task with hierarchical figures (see Fig. 1). We used both these tasks because, although they have both previously revealed global/local differences between Himba and Western observers (Davidoff, Fonteneau, & Fagot, 2008; De Fockert et al., 2007), they are rather different in terms of their task demands and so may be differentially sensitive to the factors underpinning cultural effects.

Using the Ebbinghaus illusion (Experiment 1) and similarity-matching task (Experiment 2), we investigated whether the urbanised Himba would maintain their local processing bias or whether living in an urban environment would cause them to process more globally like British and Japanese observers. In addition, we investigated the degree of exposure to an urban environment required to affect the local bias in traditional Himba, by recording the change in their local bias as a function of their number of visits to Opuwo. In the absence of reliable data concerning the duration of exposure to an urban environment, we deemed number of visits to be a good objective measure of exposure. Indeed, number of exposures rather than duration of exposure is perhaps more likely to have an impact (Cain & Willey, 1939). The majority of the traditional Himba that we tested had visited Opuwo between 0 and 3 times for reasons most often related to health and family matters rather than out of individual choice. In sum, this study tested the hypothesis that the local bias in traditional Himba would decrease with increasing exposure to an urban environment.

2. Experiment 1

Experiment 1 employed the Ebbinghaus illusion (Titchener's circles) that has been shown to be stronger in Japanese than Western observers (Doherty et al., 2008) and stronger in Western than Himba observers (De Fockert et al., 2007). In this illusion (Fig. 1, left), the perceived size of a central target object is affected by the size of surrounding inducers. We compared the illusion across Western and Japanese groups, and groups of Himba who have had varying degrees of contact with an urban environment.

2.1. Method

2.1.1. Participants

Four populations were tested: (1) 63 Japanese (31 females, mean age 20 years, range 18–23), (2) 62 British (35 females, mean age 24 years, range 18–37), (3) 70 urbanised Himba (31 females, mean estimated age 27 years, range 17–46) and, (4) 241 traditional Himba (107 females, mean estimated age 27 years, range 16–45). The traditional Himba were separated into four subgroups: those who had been to Opuwo once (82 individuals), twice (63 individuals), three times or more (62 individuals), or those who had never been to Opuwo (34 individuals). All these groups had a mean estimated age of 27 years (range 16–45) except the group of those who had never been to Opuwo who had a mean estimated age of 25 years (range 16–45).

All traditional Himba tested were monolinguals (in Otjiherero) and had had little contact with Western artefacts. The urbanised Himba had grown up in a traditional Himba village with traditional Himba parents and had moved to Opuwo at an average age of 21 years, range 9–36 (they had been living in Opuwo for an average of 6 years). None of the Himba had ever been involved in experimental research. Twenty-seven of the urbanised Himba could speak some English. The British and Japanese participants were undergraduate native speakers from, respectively, Goldsmiths University of London and Kyoto University. Participants were paid, received course credits or, for the Himba, were rewarded in kind.

2.1.2. Stimuli

The stimuli (Fig. 1, left) were similar to those used by De Fockert et al. (2007). On each trial, two target circles were presented along the horizontal midline of the display, at equal distance (4.2° of visual angle) from its centre. The two targets were surrounded by inducers, one target (mea-

[1] The Ebbinghaus illusion is generated by the processing of surrounding or contextual stimuli, and it has been known for more than a century that remote peoples from all over the world are less sensitive to such illusions (Segall et al., 1966; Rivers, 1905). In contrast, remote peoples are just as sensitive as Western observers to non-contextual illusions, such as the horizontal-vertical illusion (Segall et al., 1966); indeed, we have replicated this in unpublished findings with the Himba.

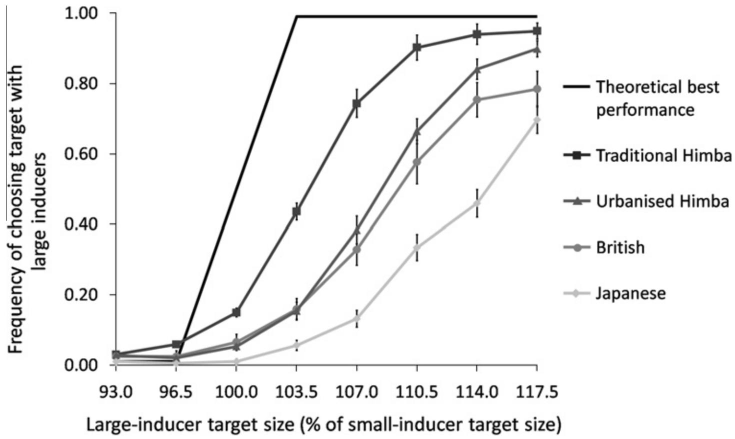

Fig. 2. Experiment 1. Mean frequency of choosing the large-inducer target is presented as a function of large-inducer target size and group of participants (traditional Himba, urbanised Himba, British and Japanese). Error bars represent one standard error of the mean.

suring 2°) by small inducers (each measuring 0.5°) and the other target (ranging from 1.86° to 2.35° in 0.07° steps) by large inducers (each measuring 3.35°). Small- and large-inducer targets occurred equally often on each side of the display. There were two conditions where the large-inducer target was smaller than the small-inducer target, one condition where both targets had the same size and five conditions where the large-inducer target was larger than the small-inducer target. This asymmetry of target differences in the stimulus set was implemented to avoid a large number of redundant conditions (large inducers never produce the illusion of a larger target), and also meant that the median condition in the range did not present veridically equal targets. Thus, neither random performance nor any strategy based on the range of target sizes in the large-inducer condition could present as veridical performance.

2.1.3. Procedure

Testing with traditional Himba took place in traditional villages, inside a testing tent placed in a shaded area. Testing with urbanised Himba, British, and Japanese took place inside a moderately lit testing room in, respectively, Opuwo, London, and Kyoto. The experiment was run using E-Prime software (Schneider, Eschman, & Zuccolotto, 2002). Stimuli were presented on a 20-in CRT screen at a viewing distance of 70 cm. The same set-up was used for all groups. Previous research has found that the Himba are not perturbed by the use of a screen (Biederman, Yue, & Davidoff, 2009) and produce identical outcomes in paper and screen presentations (De Fockert et al., 2007; Davidoff, Fonteneau, & Goldstein, 2008).

Blocks of eight practice trials were first administered where two targets were not surrounded by inducers. Participants were instructed to decide which target (left or right) was the largest by pressing the relevant (left or right) button on the response box. After training, participants were presented with a block of 40 test trials consisting of five trials for each of the eight possible target-size configurations (from 1.86° to 2.35°). Participants were instructed to ignore inducers, compare the two targets and decide which one was larger by pressing the relevant button on the response box. Traditional Himba, urbanised Himba and Japanese received instructions via an interpreter who was naïve to the purposes of the study.

2.2. Results and discussion

The data of eight participants (one British, two Japanese, three urbanised Himba and two traditional Himba) were excluded from analysis as they had chosen the small-inducer target 100% of the time. For each of the remaining participants, we computed the point of subjective equality (PSE), that is, the threshold for deciding that the large-inducer target was the larger one.[2] A significant effect of Population was found, $X^2 = 194.7$, df = 3, $p < 0.001$, $\eta_p^2 = 0.464$ (Fig. 2). The PSE was higher in Japanese than British (respectively 0.27°, SEM = 0.010, and 0.21°, SEM = 0.012; a PSE of 0° means no illusion), $X^2 = 11.0$, df = 1, $p < 0.005$, higher in British than traditional Himba (respectively 0.21°, SEM = 0.012, and 0.09°, SEM = 0.004), $X^2 = 74.9$, df = 1, $p < 0.001$, but equivalent in urbanised Himba and British (respectively 0.18°, SEM = 0.0092 and 0.21°, SEM = 0.01), $X^2 = 3.2$, df = 1, $p > 0.1$ (p values for multiple comparisons are Bonferroni-corrected). Our results were not confounded with age or education. Correlation analyses showed no effect of age on PSEs; also, excluding the 10% of participants who had been to school from the analyses did not change the outcomes. These data confirmed the previous finding of a local bias in the Himba but importantly showed that the Himba local bias is sensitive to environment as it substantially decreased in urbanised Himba.

[2] We fitted the data with the model: $p = \varphi([k - d]/\sigma)$, where p is the probability of choosing the target with large inducers, $\varphi(z)$ is the inverse cumulative distribution function for a standard normal distribution, k is the required threshold for deciding that the target with large inducers is the larger one, d is the difference between the radius of the two circles (in degrees of visual angle), and σ is the standard deviation of the normally distributed noise from all sources. The effect of Population (traditional Himba, urbanised Himba, British, or Japanese) on PSEs was tested using the non-parametric Kruskal-Wallis test due to group-wise heterogeneity of variance (there was less variance in the traditional Himba and Japanese presumably due to the fact that these groups were closer, respectively, to ceiling and floor performance).

We then analysed whether the number of visits to Opuwo of traditional Himba (i.e., 0, 1, 2 or 3+) affected their PSE; this was not the case ($p > 0.1$). Experiment 2 re-examined that issue using a task of similarity matching with hierarchical or Navon figures (Navon, 1977; Davidoff, Fonteneau, & Fagot, 2008). Since similarity matching has no objectively correct answer (see Goodman, 1972) it is arguably more sensitive to changes in perceptual bias (than size comparison in the Ebbinghaus task) and, thereby, to an effect of the number of visits to Opuwo on the local bias in traditional Himba.

3. Experiment 2

Participants compared two hierarchical Navon figures (Navon, 1977; Davidoff, Fonteneau, & Fagot, 2008), one of which matched a target figure at the local level and the other at the global level. They decided which of the two figures more resembled the target (Fig. 1, right). In line with the findings of Experiment 1, we predicted that Japanese, British, and urbanised Himba would make global-similarity matches more often than traditional Himba. We again examined the effect of the number of visits to Opuwo in the traditional Himba group.

3.1. Method

3.1.1. Participants

Experiment 2 was performed after Experiment 1. The same participants and testing conditions were used as in Experiment 1.

3.1.2. Stimuli and procedure

The stimuli and procedure were similar to those used by Davidoff, Fonteneau, and Fagot (2008). The stimuli were hierarchical Navon-like global/local figures. The figures were made of three geometrical shapes (circles, squares and crosses) at both global and local levels. At a viewing distance of 70 cm, each global figure subtended 3.0° and each local element 0.5°.

On each trial, three global figures were presented simultaneously at equal distances from each other, 4.2° away from the centre of the display. The figure presented at the top of the display was the target figure and the two figures presented at the bottom of the display were the comparison figures. The task consisted of indicating which of the two comparison figures "looks most like" the target figure by pressing the left or right button for the left or right figure respectively. On 36 test trials there was no objectively correct response as the left comparison figure randomly shared one level of similarity with the target and the right comparison figure randomly shared the other level. On another six control trials (intermixed with the test trials) there was a correct response as one comparison figure shared both (global and local) levels of similarity with the target (i.e., it was identical to the target) while the other figure shared no level of similarity with the target. Participants (21 traditional Himba and two urbanised Himba) with more than one error across the six control trials were excluded from analyses.

3.2. Results and discussion

The percentages of global choices in the test trials were compared using the Kruskal–Wallis non-parametric test. A significant difference was found between the four population groups, $X^2 = 187.9$, df = 3, $p < 0.001$, $\eta_p^2 = 0.456$; this difference was investigated using pairwise (Bonferroni-corrected) comparisons. It was found that: (1) Japanese and British showed a similar percentage of global choices (Fig. 3), $X^2 = 0.5$, df = 1, $p > 0.1$, though we note the possibility of a ceiling effect, (2) British made more global choices than urbanised Himba, $X^2 = 25.5$, df = 1, $p < 0.001$, and, (3) urbanised Himba made more global choices than traditional Himba, $X^2 = 22.5$, df = 1, $p < 0.001$. Again, our results were not confounded with age or education. Correlation

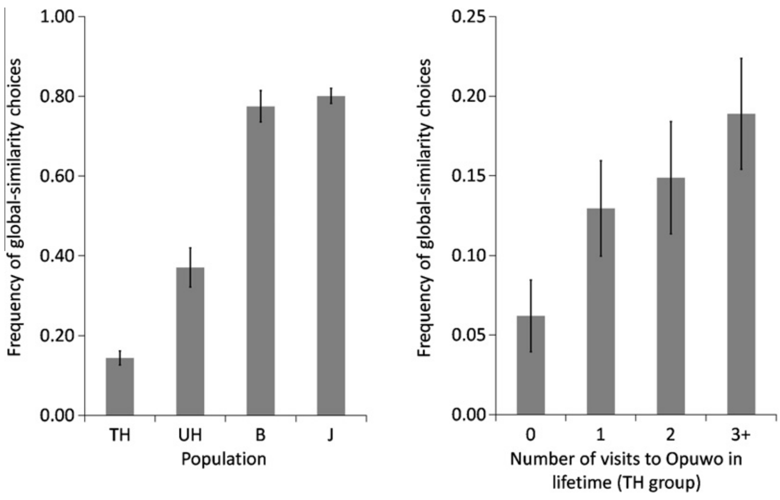

Fig. 3. Experiment 2. Mean frequency of choosing the comparison figure with global similarity to the target as a function of (1) group of participants (TH = traditional Himba; UH = urbanised Himba; B = British; J = Japanese) and (2) number of visits to Opuwo (0, 1, 2 or 3 + visits, in the traditional Himba group). Error bars represent one standard error of the mean.

analyses showed no effect of age; also, excluding the 10% of participants who had been to school from the analyses did not change the outcomes.

We then analysed, in the traditional Himba group, whether the number of visits to Opuwo affected their percentage of global choices; it did (Fig. 3; Jonckheere-Terpstra Statistic = 2.1, $p = 0.037$). The sensitivity of this measure of global processing to the number of visits to an urban environment (just two visits corresponded to a greater than 10% increase in global responding) suggests that the effects of exposure to the urban environment are profound.

Given that the same participants had taken part in Experiments 1 and 2, we compared performance in Experiment 1 (indexed in PSEs) with that in Experiment 2 (indexed in global-choice percentages). We found a strong positive correlation between the results of the two experiments at the group level ($r = 0.454$, $p < 0.001$) but no correlation at the participant level (i.e., within groups; all p values > 0.1).

4. General discussion

The current results extend, in two important ways, previous cross-cultural findings by showing that the strength of the Himba local bias is sensitive to situational changes. First, the Ebbinghaus illusion increased in urbanised Himba to reach a level similar to that observed in urban British observers. Second, the frequency of global choices in global/local matching increased in the traditional Himba with increasing number of visits to the urban environment and increased even more in the urbanised Himba (Figs. 2 and 3).

Our proposal is that exposure to the urban environment investigated here introduced visual clutter with consequent changes in global/local processing (Miyamoto et al., 2006). We now consider alternatives to our urbanisation account. It would be difficult to explain our findings from an increase in independent social orientation resulting from urban living as suggested by Uskul et al. (2008) and Varnum et al. (2010), among others. Such a proposal would predict that the Himba should have become more local with exposure to urban environments, though it is just possible that both accounts hold but exposure to the urban environment brings much larger changes in visual clutter than in social organisation. A further alternative to our urbanisation account is that surprise or bewilderment in the traditional Himba caused by initial exposure to an urban environment could have caused some change in visual processing. However, recent data on the effects of cognitive change on local/global processing suggest that the effect of surprise would make the Himba more local (Elliot & Maier, 2007; Förster & Higgins, 2005). In addition, surprise should not increase with number of visits to an urban environment. A further possibility is that differences in familiarity with geometric shapes could contribute to our findings but Davidoff, Fonteneau, and Goldstein (2008) have shown little effect of stimulus familiarity on the local bias of traditional Himba. Thus, our preferred interpretation is that the more cluttered visual environment in Opuwo caused a shift towards more global visual processing in the Himba (Miyamoto et al., 2006).

It is worthy of note that urbanisation does not appear to influence performance in the two tasks reported here according to the same 'dose–response' schedule. In the similarity-matching task, global choices increased in traditional Himba after visiting an urban environment but urbanised Himba remained at a level well below that of British and Japanese observers. In contrast, with the Ebbinghaus illusion, urbanisation generated no effect of visits in traditional Himba, but exerted a stronger effect over a long duration such that urbanised Himba were indistinguishable from urban British. While we maintain that both tasks tap global/local processing biases, there are numerous differences between them which might explain their different pattern of sensitivities to urbanisation and the consequent lack of correlation in performance at an individual level. Not least of these is that participants are requested to make objectively accurate responses in the Ebbinghaus illusion, but to respond on the basis of subjective preference in the similarity-matching task. Further research will be necessary to shed light on the differences between these tasks.

In conclusion, our study showed that the Himba process visual information more locally than the British and Japanese. However, the Himba local bias is dramatically reduced by exposure to the environment of a town. Indeed, even relatively brief exposures exert long-lasting and incremental effects. In a similar way, briefly exposing urbanites to the natural environment results in a bias towards local details (Berman, Jonides, & Kaplan, 2008). Future research will need to determine the processes by which cluttered visual input and/or other aspects of the urban environment come to change perceptual foci of interest in the dramatic way observed here. However, it is easy to conjecture that the urban environment also contributes to the global bias in Japanese and British populations.

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