Discrimination of pain facial expression intensity is modulated by the observer's culture

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Theoretical Background –

The ability to help people living with pain is a vital human need. To do this, the pain of others must be properly recognized and interpreted. Of the many ways to express pain, facial expression is one of the most effective[1]. Research has revealed that the ability to recognize basic facial emotions (i.e. anger, fear, disgust, sad, happy, surprise) expressed by individuals of another ethnic group is reduced compared with when they are expressed by the own ethnic group[2], and that culture modulates the visual strategies underlying the recognition of these basic facial expressions[3-5]. In spite of these findings, the impact of culture on the ability to recognize and decode facial expressions of pain is still underexplored.

Thus, the goal of the present project is to study the impact of culture on the decoding of facial expressions of pain.

Method –

Participants : 28 Canadians (13 males), 21 years old on average and 30 Chineses (15 males), 21 years old on average.

Stimuli : 16 face avatars (2 identities [male and female] x 2 ethnicities [Caucasian and Asian] x 4 levels of intensity) created with FACEGen and FACSGen.

Task : Participants were asked to decide which of two faces avatars expressed the most pain. The two faces differed in terms of expression intensity from either 33%, 66% or 100%. On a given trial, both faces were of same ethnicity, but the ethnicity varied randomly across trials. The faces were sampled through space and spatial frequencies using the Bubbles method[6]. Each participant completed 3024 trials (1512 per ethnicity). The number of bubbles was adjusted separately for the three intensity conditions using QUEST[7] in order to maintain an average performance of 75% per intensity condition.

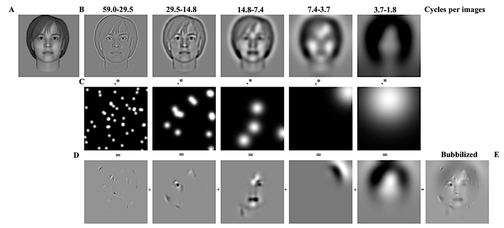

Figure 1. Procedure to create a stimulus with the Bubbles method.

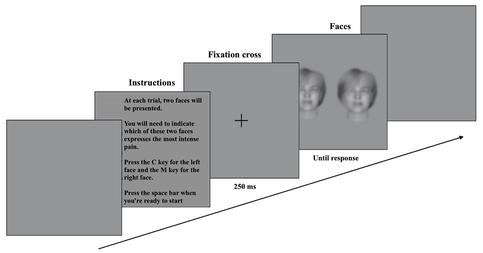

Figure 2. Sequence of events on each trial.

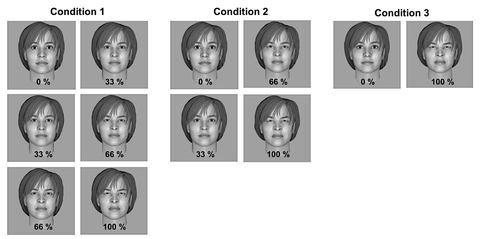

Figure 3. Representations of the three possible levels of difficulty.

Analysis & Results –

A mixed ANOVA 2 (cultures) x 3 (levels of difficulty) on the number of bubbles revealed significant main effects of the level of difficulty [F (1,56) 239.888, $p < 0.001$] and of culture [F (1,56) = 20.618, $p < 0.001$]. The interaction between culture and level of difficulty was also significant [F (1,56) = 15.807, $p < 0.001$]. Paired t-tests on the levels of difficulty were conducted separately for each culture and indicated that all three conditions differed significantly from one another, and this for both cultures ($p<0.001$). Independent sample t-tests were also conducted separately for each condition, and indicated significant differences between the cultures on all three levels of difficulty ($p < 0.001$).

Classification images. The visual information used to judge facial expressions of pain was determined by computing classification images (CIs) for each condition and face ethnicity. CIs consist of weighted sums of the bubble masks presented during the experiment, using the accuracy transformed into z-scores as weights. The CIs were then transformed into z-scores using a permutation method to estimate the mean and SD of the null hypothesis, and a Cluster test (Stat4CI[8]) was applied to determine the statistically significant regions (Z_{crit}= 3.0; k = 667; $p < 0.05$).

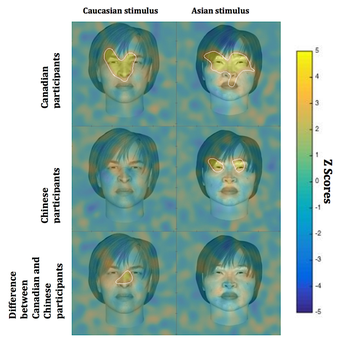

Figure 4. Visual information used by Canadian and Chinese participants to correctly discriminate among two intensities of pain. Significant regions are delimited by a white contour.

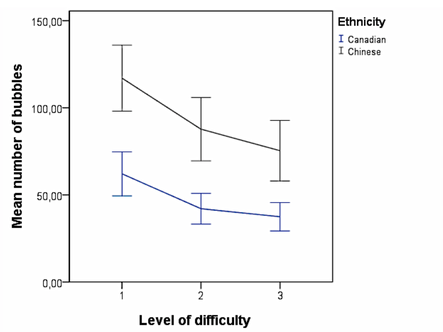

Figure 5. Mean number of bubbles for each level of difficulty for both ethnicity. The error bars represent confidence intervals at 95%

Conclusion –

So far, the results indicate that it is harder for Chinese to discriminate between two intensities of pain. These results also suggest that culture impacts on the visual decoding of pain expressions; namely, Canadians rely more than Chinese on the nasolabial folds and nose wrinkles to discriminate pain intensities.

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