

Context

Many studies have examined the role of spatial frequencies (SFs) in facial expression perception. Although their detection and recognition have been proposed to rely on different perceptual mechanisms (Sweeny et al., 2013; Smith & Rossit, 2018), the SFs underlying these two tasks have never been compared. The present study aimed to compare the SFs underlying the detection and recognition of facial expressions of basic emotions and pain.

Method and analysis

We asked 10 participants (1400 trials per participant) to decide if a stimulus randomly sampled with SF Bubbles (Willenbockel et al., 2010) corresponded to an emotion or a neutral face (i.e. expressive or not _{b.} expressive). Classification vectors for each emotion were computed using a weighted sum of SFs sampled on each trial, with accuracies transformed in z-scores as weights. We then compared the SFs used in this task to those obtained in a previous study using the same stimuli and method but during a recognition task (Charbonneau et al., 2018).



the SF Bubbles method.

Spatial frequencies underlying the detection of basic emotions and pain

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Classification vectors



Figure 2. Spatial frequencies correlated with subjects' accuracy for the categorization task (red line) and for the discrimination task (blue line) for the six basic emotions (e.g. anger, disgust, fear, happiness, sadness, and surprise). The difference observed between the two tasks is shown by the black dotted line.



Figure 3. Spatial frequencies correlated with subjects' accuracy for the categorization (red line) and the detection (blue line) of pain and for the detection of the six basic emotions mean (black line). (e.g. anger, disgust, fear, happiness, sadness, and surprise).

Results

Overall, accurate categorisation of These results are consistent with emotions was significantly associated with the use of higher SFs than for the detection (ranging from 3.33 to 6 cycles per face (cpf); Zcrit=3.45, p < 0.05). Happiness was the only emotion relying on similar low-SFs for both tasks. The detection of fear and surprise was associated with the lowest SF information.

References

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Conclusion

the idea that low-SF represent potent information for the detection of basic emotions and pain, especially those with a survival value such as fear. However, the contribution of higher SFs is needed to discriminate between emotions for their accurate recognition.

