Essential information for face matching tasks

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Introduction

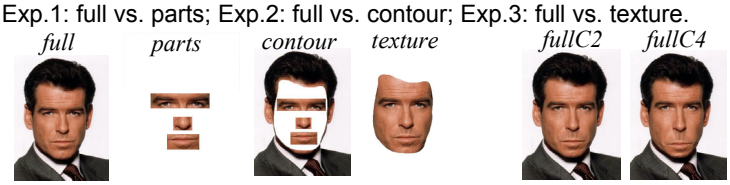
There is an ongoing debate about the format of face representation. Main theories pronounce the importance of featural (local) information in faces (Rakover, 2002), configural (relational) information (Leder & Bruce, 2000) and holistic information (Tanaka & Farah, 1993). Researchers who focused on the processing of configural information demonstrated that humans detect rather subtle configural changes (e.g., Bruce et al, 1991). We have investigated on which facial information this high discriminatory performance is based on. Prominent candidates might be the simple relation among cardinal features, the relation between the cardinal features and the outline context of the face, or the relation between the features and the intermediate texture between the features. Therefore, we have systematically manipulated the information load by presenting whole faces (*full*), cardinal features only (condition *parts*), cardinal features plus the contextual outline (*contour*), or the inner region of a face by omitting the contour (*texture*).

Method (Exp.1: *parts*, Exp.2: *contour*, Exp.3: *texture*)

Participants: 3 experiments with 16 undergraduates each

Stimuli: 8 celebrities; each in 2 orientations (upright, inverted), 3 sizes (C0=original, C2=slightly configurally shifted, C4=obviously shifted), and 2 *contexts* (full vs. reduced); Factor *context* was defined as:

Exp.1: full vs. parts; Exp.2: full vs. contour; Exp.3: full vs. texture.



Procedure:

Are the configurations veridical...?

simultaneous veridicality matching task

Question	Fixation	Reference + Target	Masking	Decision (yes-no)	Blank screen
1700 ms	300 ms	4000 ms	500 ms	no limit	100 ms

Hypotheses

Percentage correct

• If only the distances and bearings among the cardinal features are necessary to determine the veridical configuration then the information from the condition *parts* is sufficient: ➔ *parts = full;*
• If additional contextual information is needed, for instance as reference system for the inner configuration: ➔ *contour = full;*
• If not the outer but the inner context is necessary (in terms of the texture as the „glue" for the features): ➔ *texture = full.*

Face inversion effect (FIE)

The face inversion effect is the performance for upright faces minus the performance for inverted faces. The FIE is commonly used as an indicator for the amount of configural processing (Le Grand et al., 2001). The higher the FIE the more essential information for configural processing was involved in processing.

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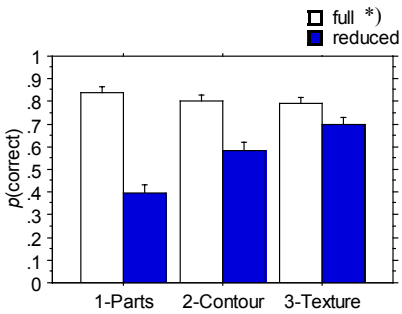
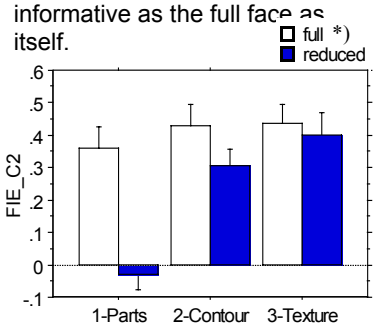
Results

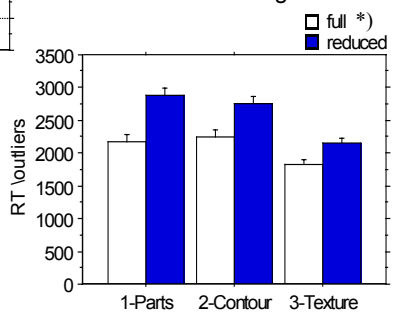
Accuracy of matching veridical configurations was worst for *parts*, followed by *contour*. The condition *texture* was almost at the level of *full* faces (Fig. 1). Thus, for a matching task about the veridicality of configuration, the *texture* condition is nearly as informative as the full face as itself.





Moreover, the FIEs (here shown for the C2 faces) revealed similar effects: the *part* condition did not show any FIE, whereas *contour* showed medium and *texture* strong FIEs.

Analogous to the accuracy data, the RT data indicated nearly identical RTs for *texture* and *full* faces, greater differences between *contour* and *full* faces and the greatest difference between *parts* and *full* faces.



*) full shows data full faces; reduced shows the specific face manipulation

Discussion

In sum, the accuracy data reveal that participants performed on a rather high level when asked for the veridical configuration of highly familiar *full* faces. When the facial information was reduced by presenting (cardinal) face *parts* only, this performance dropped drastically. Adding *contour* information significantly improved the capability of accurately matching the veridical configuration. However, the most important facial information for this matching task was *texture*. Therefore, we conclude that faces are not represented as simple templates which contain the positions of the cardinal features. Otherwise, the information given by the *parts* presentation would have been sufficient to solve the task on the level of *full* presentation. The spatial relation between the cardinal features within the reference frame of the *contour* information is not sufficient either. It is rather the *texture* information that holds the configural information of a face. Presumably, texture operates similar to a glue which holds the cardinal features together (Leder, 1996). These results make it unlikely that configural information of a face is coded metrically or as spatial relations in reference to outer contextual information.

References
•Bruce, V., Doyle, T., Dench, N., & Burton, M. (1991). *Cognition, 38*(2), 109-144.
•Leder, H., & Bruce, V. (2000). *Quarterly Journal of Experimental Psychology, 53A*(2), 513-536.
•Leder, H. (1996). Line drawings of faces reduce configural processing. *Perception, 25*, 355-366.
•Le Grand, R., Mondloch, C. J., Maurer, D., & Brent, H. P. (2001). *Nature, 410*(6831), 890.
•Rakover, S. S. (2002). *British Journal of Psychology, 93*(1), 1-30.
•Tanaka, J. W., & Farah, M. J. (1993). *Quarterly Journal of Experimental Psychology, 46A*(2), 225-245.

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