Perception, 2006, volume 35, pages 411 – 414

DOI:10.1068/p5452

Last but not least

The Mona Lisa effect: is 'our' Lisa fame or fake?

Abstract. This demonstration uses one of the most famous human faces, the portrait of Mona Lisa, La Gioconda, by Leonardo da Vinci. Usually, we have a very accurate and stable representation of the exact configuration of such a familiar face. Typically, we are able to rapidly recognise even subtle configural changes. However, here we show that an exposure to specific alterations performed on a familiar face substantially reduces this ability even over a time period as long as 80 min. This demonstration illustrates the flexibility of the perceptual system and adaptation to new information.

Humans are face experts (Carey 1992). Not only do they process faces extremely fast and accurately (Carbon and Leder 2005b; Yamamoto and Kashikura 1999), but representations of familiar faces are also stored in human memory for an extended period of time (Bahrick et al 1975). Perceivers are able to discriminate rather subtle aspects of differences between highly similar faces (Leder and Carbon 2004). Relational changes of facial features in unfamiliar faces are detected at the threshold level of visual acuity (Haig 1984; Hosie et al 1988). Beyond the perceptual level, Bruce et al (1991) confirmed this sensitivity for configural information even for memory processes. Participants remembered rather subtle aspects of the configuration of facial features to which they had been exposed earlier. Leder and Carbon (2006) found similar results using faces, but not for houses that were constructed in the same way. Thus, configural information appears to be indeed crucial for human face expertise (Leder and Bruce 2000; Leder and Carbon 2004).

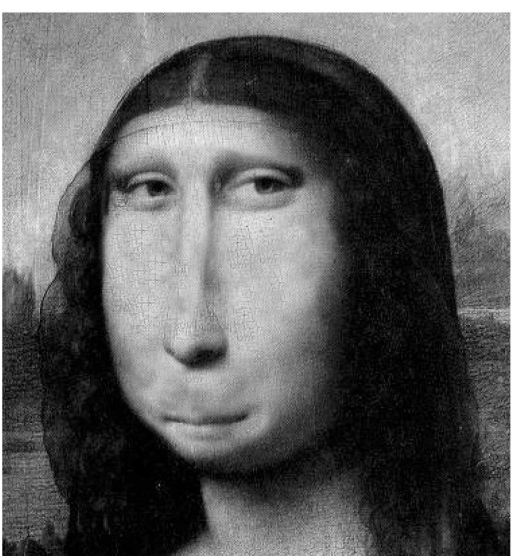

Figure 1. A distorted Mona Lisa: The eye region was shifted up, the nose was elongated, and the mouth was shifted towards the chin, just like the interpretation by Faulkner et al (2002). Look at this picture (for approximately 20 – 30 s), take a short break, and then evaluate figure 2 concerning the veridical La Gioconda. Figures 1 and 2 can be viewed in colour on the *Perception* website, at http://www.perceptionweb.com/misc/p5452/.

The capability of discriminating facial changes is even superior to those with other geometrical patterns (Bruce et al 1991; Haig 1984). This is presumably related to the biological and social importance of faces, because it enables us to detect accurately even the slightest nuances of differences in a face (Bruce 1994).

Although this high performance in perceiving facial differences, as well as retrieving them, is rather impressive, it is also highly vulnerable in respect to recent visual inputs. For example, recent evidence from the field of neuropsychology demonstrated that a prominent candidate brain area for face expertise is in fact very adaptive to new visual information in general (Tarr and Gauthier 2000). Moreover, other researchers have shown that face perception is highly adaptive to previously inspected faces (Carbon and Leder 2005a; Clifford and Rhodes 2005; Leopold et al 2001; Webster and MacLin 1999).

Here we demonstrate such an adapting ability using a very famous face: for most perceivers it is easy to identify the original Mona Lisa shown in figure 2. But this competence can be easily confused. After exposure to a highly altered version (figure 1), a subsequent unerring identification of the original Mona Lisa is much harder.

We tested this by presenting participants (thirty-eight undergraduates, mean age 21.6 years, thirty-two female; all familiar with the painting of Mona Lisa) the two versions of Mona Lisa shown in figure 2. Participants were asked to select the veridical version (the original that they knew from the press, TV, art books, etc, or the original work). Although the versions differed only in a rather subtle way, participants ranked clearly above chance in selecting the original (72.4%; tested against chance criterion of 50%: $p = 0.0009$, $\eta_p^2 = 0.267$). However, after a presentation of the extreme version (figure 1) for 30 s, this discriminatory performance was lost. Selection rates reduced to 47.4% ($p_{chance} = 0.71$, ns). Importantly, this reduction of discriminatory performance was not short lasting, but could be observed for at least an hour or more, as revealed by a re-test 80 min later. At that point participants' discriminatory performance was still near change (59.2%, $p_{chance} = 0.21$, ns), although it slightly recovered, which is indicated by a significant increase between the two test-phases after inspection of the extreme face ($p = 0.0481$, $\eta_p^2 = 0.104$).

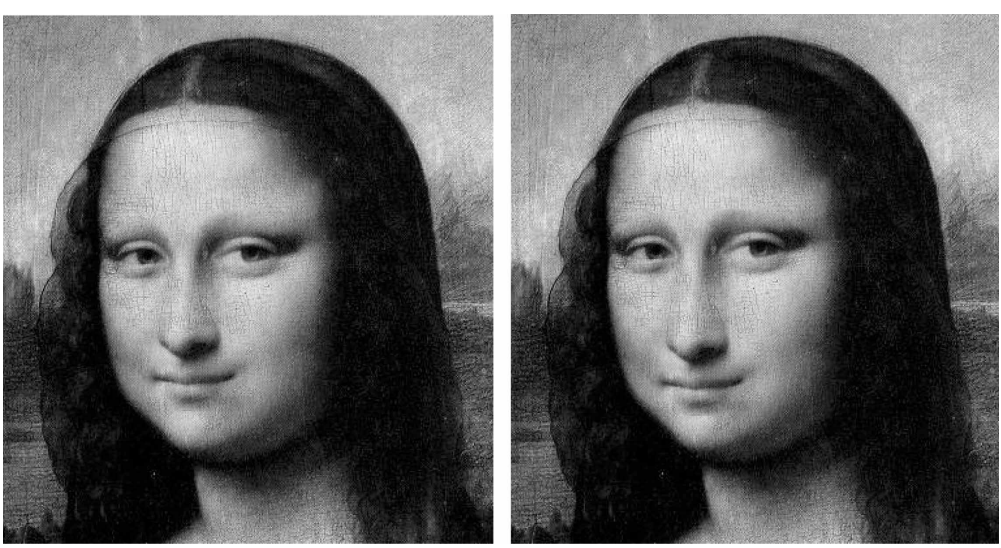

Figure 2. Two alternative versions of the Mona Lisa. On the left, the original from 1503 – 1506, painted by Leonardo da Vinci. On the right, the cardinal facial features (eyes, nose, and mouth) are shifted in direction of the manipulation shown in figure 1.

These results demonstrate that the adaptation effect reported earlier for unfamiliar faces (eg Leopold et al 2001; Moradi et al 2005; Rhodes et al 2003; Webster and MacLin 1999) can also be observed for highly familiar face presentations. Moreover, the adaptation, as demonstrated above, appears not to be a short-term effect, but lasts for a surprisingly long period of time.

What causes could underlie this effect? Two alternatives need to be considered. Figural aftereffects might be particularly strong with materials to which we are particularly sensitive, such as familiar faces (Webster and MacLin 1999). Exposure to a distorted face produces a perceptual aftereffect. Under the influence of this aftereffect the famous face looks distorted. Therefore, it does not match the representation of the veridical face.

An alternative explanation would be an adaptation of the representation as such. According to this explanation, the effect would be a result of an integration of the new, distorted information, into the current representation of a familiar face. This would be reasonable in order to adapt our representation when the new information is distinctive, relevant, and clearly identified as an instance of the familiar face.

The first explanation seems to be more plausible; it is sparser and in accordance with our everyday experience that our representations of highly familiar faces are usually stable and thus relatively inflexible.

In order to determine the cause of this effect, further research is needed on the distinctiveness of stimuli, the delay between inspection and test phase, and with different pictorial versions of familiar faces. Nonetheless, the Mona Lisa allows the perceiver to experience the interplay between perception and memory representation. Last but not least, it illustrates the intergradation between 'famous originals' and 'original fakes'.

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Acknowledgments. This research was supported by a grant to HL from the Deutsche Forschungsgemeinschaft (DFG, Le-1286). We would like to thank Steve Langton for comments on an earlier version of this manuscript and two anonymous reviewers for their very valuable comments. We also thank Andrea Lyman for proofreading the text. Furthermore, we thank *The Yorck Project* for the permission to reproduce da Vinci's Mona Lisa. And—not to forget—this paper would have never been written without Orson Welles's masterwork *F for Fake.*

References

Bahrick H P, Bahrick P O, Wittlinger R P, 1975 "Fifty years of memory for names and faces: a cross-sectional approach" *Journal of Experimental Psychology: General* **104** 54 – 75

Bruce V, 1994 "Stability from variation: the case of face recognition. The M.D.Vernon memorial lecture" *Quarterly Journal of Experimental Psychology: Human Experimental Psychology A* **47** 5 – 28

Bruce V, Doyle T, Dench N, Burton M, 1991 "Remembering facial configurations" *Cognition* **38** 109 – 144

Carbon C C, Leder H, 2005a "Face adaptation: Changing stable representations of familiar faces within minutes?" *Advances in Experimental Psychology* **1** 1 – 7

Carbon C C, Leder H, 2005b "When feature information comes first! Early processing of inverted faces" *Perception* **34** 1117 – 1134

Carey S, 1992 "Becoming a face expert" *Philosophical Transactions of the Royal Society of London* **335** 95 – 103

Clifford C W G, Rhodes G, 2005 *Fitting the Mind to the World: Adaptation and Aftereffects in High Level Vision* (Oxford: Oxford University Press)

Faulkner T F, Rhodes G, Palermo R, Pellicano E, Ferguson D, 2002 "Recognizing the un-real McCoy: priming and the modularity of face recognition" *Psychonomic Bulletin and Review* **9** 327 – 334

Haig N D, 1984 "The effect of feature displacement on face recognition" *Perception* **13** 505 – 512

Hosie J A, Ellis H D, Haig N D, 1988 "The effect of feature displacement on the perception of well-known faces" *Perception* **17** 461 – 474

Leder H, Bruce V, 2000 "When inverted faces are recognized: the role of configural information in face recognition" *Quarterly Journal of Experimental Psychology: Human Experimental Psychology A* **53** 513 – 536

Leder H, Carbon C C, 2004 "Part-to-whole effects and configural processing in faces" *Psychology and Science* **46** 531 – 543

Leder H, Carbon C C, 2006 "Face-specific configural processing of relational information" *British Journal of Psychology* **97** 19 – 29

Leopold D A, O'Toole A J, Vetter T, Blanz V, 2001 "Prototype-referenced shape encoding revealed by high-level aftereffects" *Nature Neuroscience* **4** 89 – 94

Moradi F, Koch C, Shimojo S, 2005 "Face adaptation depends on seeing the face" *Neuron* **45** 169 – 175

Rhodes G, Jeffery L, Watson T L, Clifford C W G, Nakayama K, 2003 "Fitting the mind to the world: Face adaptation and attractiveness aftereffects" *Psychological Science* **14** 558 – 566

Tarr M J, Gauthier I, 2000 "FFA: A flexible fusiform area for subordinate-level visual processing automatized by expertise" *Nature Neuroscience* **3** 764 – 769

Webster M A, MacLin O H, 1999 "Figural aftereffects in the perception of faces" *Psychonomic Bulletin and Review* **6** 647 – 653

Yamamoto S, Kashikura K, 1999 "Speed of face recognition in humans: an event-related potentials study" *NeuroReport* **10** 3531 – 3534

ISSN 0301-0066 (print) ISSN 1468-4233 (electronic)

PERCEPTION
VOLUME 35 2006

www.perceptionweb.com