Gender’s effect on the hemispheric laterality of Rembrandt’s portraits

JAMES A. SCHIRILLO *

Psychology Department, Wake Forest University, Winston-Salem, NC 27109, USA

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Abstract—In 64% of Rembrandt’s female portraits the poser’s left-cheek faces the viewer. However, this occurs in only 33% of his male portraits. This asymmetry is consistent with viewers rating Rembrandt’s left-cheeked male portraits as likely to be avoided, which may reflect that aggressive displays of dominance are governed by the contralateral right-hemisphere, while rating left-cheeked female faces as likely to be approached may indicate sexual attractiveness.

Rembrandt’s exposed-cheek gender difference paints both sexual selection and dominance as being governed by the right cerebral hemisphere.

Keywords: Rembrandt; portraits; hemispheric laterality; gender differences.

INTRODUCTION

A comprehensive survey of 1474 portraits (of both genders) painted in Western Europe from the sixteenth to the twentieth century revealed that \(\sim 68\%\) of the women were painted with their left-cheek exposed while only \(\sim 56\%\) of the men exposed their left-cheek (Grusser et al., 1988; McManus, 1983; McManus and Humphrey, 1973; Schirillo, 2000). Interestingly, in 64% of Rembrandt’s female portraits the left-cheek faces the viewer while this is the case for only 33% of his male portraits (Bredius, 1969). This exaggerated portrait gender difference makes studying Rembrandt’s works especially enticing.

Researchers have postulated that humans’ more intense emotions are controlled by their right hemisphere (Davidson, 1995; Nestor and Safer, 1990) which fMRI evidence concurs is specialized for social and emotional functions (Tabert et al., 2001). This has resulted in having greater emotional expression displayed predominantly on the left-side of the face, which researchers have demonstrated repeatedly (Moscovitch and Olds, 1982; Sackeim et al., 1978). Yet Davidson’s

*E-mail: schirija@wfu.edu
J. A. Schirillo (1984) seminal work has spearheaded the hypothesis that the left and right cerebral hemispheres govern approach and avoidance behavior, respectively (Coan et al., 2001; Davidson, 1984; Grusser et al., 1988; Reuter-Lorenz and Davison, 1981; Schirillo, 2000). If this is the case, in humans, the lower two-thirds of the right-side of the face (which includes the lower eyelid, nose, cheek, lips and neck because of innervations by the left-hemisphere), should display positive emotions while the comparable left-side of the face (innervated by the right-hemisphere) should display negative emotions (Rinn, 1984). It has now been shown that while both sides of the face show different emotions (i.e. left-side negative emotions and right-side positive emotions), the preponderance of emotional expression is on the left side of the face (Demaree et al., 2005; Nicholls et al., 2004). This makes it particularly interesting to better understand just why emotions are being differentially displayed.

We show here that these facial asymmetries produce approach/avoidance responses toward portraits painted by Rembrandt that depend on the gender of the person being portrayed. This is significant because in 64% of Rembrandt’s female portraits the left-cheek faces the viewer (Fig. 1c) while, conversely, the right-cheek faces the viewer in 67% of his male portraits (Fig. 1b). Our finding suggests that the social constraints exhibited during facial displays are asymmetrical by portrait gender, resulting in differential approach/avoidance behavior.

METHODS

Seventy-three experimentally naive undergraduates (23 males; age range 18–21 yrs) performed the experiment in exchange for introductory psychology course credit. Their age, gender and handedness did not contribute significantly to the results. All procedures were approved by the Institutional Review Board of Wake Forest University and were performed in accordance with the ethical standards established by the 1964 Declaration of Helsinki. All subjects were debriefed after performing the task.

Three-hundred and seventy-three of Rembrandt’s portraits (Bredius, 1969) were scanned in black and white, then cropped to include as little background/clothing information as possible, and scaled to a uniform size. Given that subjects viewing distance from the screen on which the portraits were displayed varied, the images ranged from $\sim 11^\circ \times 11^\circ$ to $\sim 17^\circ \times 17^\circ$ of visual angle. Each image appeared for five seconds and responses were recorded manually during a three-second blank gray screen inter-trial interval. All the pictures were viewed as Rembrandt painted them (i.e. not mirror-reversed). The subjects’ task was to rate whether they would rather approach or avoid each individual portrait on a 5-point scale, with 1 indicating a rating of ‘strongly approach’, 2 ‘mildy approach’, 3 ‘neutral’, 4 ‘mildy avoid’ and 5 ‘strongly avoid’. All subjects judged all portraits. The angle at which each portrait faced the viewer was measured with $-90^\circ$ and $+90^\circ$ equaling full-left and full right profile, respectively, while $0^\circ$ represents full-frontal view. The orientation estimates were made by the two judges (the experimenter being one) who rotated a sculpted...
head pivoted on a protractor with a stick pointing straight out from its nose to match the angle of each portrait as seen by the viewer. The angle was determined by reading the location of the stick from the protractor located beneath the base of the three-dimensional head, i.e. the angle displayed on the protractor was used as the angle of orientation for each portrait (i.e. the mean value of the two judges, where the inter-rater reliability correlation was $r = 0.97$).
RESULTS

There were approximately twice as many females as males in the introductory psychology subject pool; the fact that we had more female than male subjects reflects this bias, yet it does not seem to be a factor in this study. A three-way interaction between the gender of the observer (male or female subject), the gender of the portrait (male or female) and the orientation (left- or right-cheek) was analyzed. Gender of the observer was not found to be a factor.

Figure 2 shows scatterplots of the distribution of each portrait angle (i.e. orientation) as a function of subjects’ ratings of approach/avoidance.

Figure 3 indicates subjects reported they would rather approach Rembrandt’s female portraits (−45° striped bars; $M = 2.79$; Fig. 1c, d) and avoid his male portraits (+45° striped bars, $M = 3.22$; $t(72) = 8.97$, $p = 0.001$; Fig. 1a, b). Along with Fig. 2, Fig. 3 shows that subjects were more likely to approach left-cheeked females ($M = 2.70$, $R = 0.10$; Fig. 1c) than right-cheeked females ($M = 2.88$, $R = 0.07$; Fig. 1d); ($t(72) = 7.50$, $p = 0.001$).

This trend is reflected in Fig. 2’s linear regression where, as portraits of female’s exposed-cheek turned from the most-rightward (+90°) to the most-leftward (−90°) profile they were rated increasingly more likely to be approached (Fig. 2 — lower graphs). This is remarkable in that male portraits produced the exact opposite pattern of results. The most-leftward facing male portraits (−90°, Fig. 1a) were rated most likely to be avoided ($R = 0.23$), and became increasingly less likely to be avoided as they shifted rightward (+90°, Fig. 1b) ($R = 0.02$) (Fig. 2 — upper graphs).

The 19 portraits with 0° lateralization were excluded from this plot, allowing separate linear fits to Fig. 2’s left- and right-cheek portraits. Figure 3’s stippled bars report these few cases. Surprisingly, subjects reported they would rather avoid the female portraits that directly face the viewer, in stark contrast to reports of approaching females when their cheek is turned in either direction ($M = 3.32$, $t(72) = 10.58$, $p = 0.001$). Males facing front were also judged as likely to be avoided ($M = 3.14$), though there were no statistical differences between any of the three male groups.

Staring directly at a person is often considered threatening (and is certainly used that way by animals). This might explain why females painted facing directly forward were considered by the raters as likely to be avoided, just as the men facing forward were rated. For example, it may be argued that women, when looking at a man, often look out the side of their eyes and are often painted that way, or are painted looking away from the viewer. This is what we found in Rembrandt’s portraits as well. We measured eye gaze by viewing the images and extending a ruler from their eye outward in its direction of gaze, and measuring that angle with a protractor. The eyes were turned, on average, 90 degrees toward the viewer’s left for all the portraits painted facing directly front (i.e. both male and female portraits). All the front-facing female eyes were turned up or down by only a few degrees, and only one male’s eyes were turned significantly downward
Figure 2. Scatterplots of the distribution of each of 373 Rembrandt portrait angles as a function of ratings of approach/avoidance (collapsed over 73 subjects’ ratings). Upper left (closed squares) — shows left-cheeked males (−90° to −1° orientation), upper right (open squares) — shows right-cheeked males (+1° to +90° orientation), lower left (closed diamonds) — shows left-cheeked females (−90° to −1° orientation), lower right (open diamonds) — shows right-cheeked females (+1° to +90° orientation). Linear regressions are plotted for each graph. 2 indicates a rating of ‘mildly approach’, 3 indicates ‘neutral’ and 4 indicates ‘mildly avoid’.

(by −26 degrees). Thus, none of the front-facing individuals stared directly at the viewer. Kampe et al. (2001) found similar results in their fMRI study of direct and non-direct gaze: that is, non-direct gaze images were found to be less attractive than direct gaze images. On average, for the other paintings (with turned heads), the eyes were turned 4.15 degrees toward the viewers left and 3.47 degrees downward. Thus, it was more likely that heads that were turned had their eyes turned to almost face the viewer (yet this did not produce the threatening aversion one might expect).

DISCUSSION
Rembrandt’s extreme left-facing portraits provide the best cue of females to approach (Fig. 1c) and males to avoid (Fig. 1a), providing supporting evidence that the right-hemisphere (innervating the left-side of the face) is a sexually selective attribute. It is important to recognize that Rembrandt’s bias may be a 15th century
bias, in that this bias has diminished over time (Grusser et al., 1988). Yet these findings may still account for why a comprehensive survey of 1474 portraits (of both genders) painted in Western Europe from the sixteenth to the twentieth century revealed that ≈60% were posed with their left-cheek facing the viewer. More importantly, within this collection ≈68% of the women were painted with their left-cheek exposed (i.e. their approachable side) while only ≈56% of the men exposed their left-cheek (i.e. their avoidable side) (Grusser et al., 1988; McManus, 1983; McManus and Humphrey, 1973; Schirillo, 2000).

The expectation of a linear relationship between approach/avoidance and sidedness comes from how much of the face is displayed to the viewer: for example, the more leftward a face appears, the less of the right side of the face is in view. We argue that each side of the face has features that show a different complex of emotions, so that showing just one side (or primarily one side and only part of the other side), limits what the viewer can extract from such an image. The correlations we found are low primarily because these are real world data, and not what readers of *Spatial Vision* are used to: that is, stimuli generated in a laboratory that vary parametrically on one or two dimensions (e.g. gabor filters at different orientations or spatial frequencies). These data are not even as systematic as in studies where thousands of pictures of natural scenes are taken and then some statistic is generated (e.g. $1/f$). Instead they are the works of a single artist over a lifetime, which were...
not painted for their ‘approach/avoidance’ reactions, but were painted to be artistic (and possibly pleasing). Thus, there is no reason to expect these correlations would be high, but are merely trends, which need to be followed up with a more full scale measure of, say, thousands of portraits painted over several centuries by multiple artists. This short report is meant only to suggest a trend in one artist, not establish a fact for the discipline.

However, our findings dovetail nicely with those of Nicholls et al. (1999) who argue that the overrepresentation of exposed left-cheek portraits is determined by the sitters’ intention to display their left-cheek because it is controlled by the more emotive right cerebral hemisphere. The fact that portraits of male Royal Society scientists show no leftward bias (Nicholls et al., 1999) suggests a motivation to conceal negative emotions, while our data go further to imply they may desire to ensure that they display closer to neutral emotional states (e.g. in Fig. 3, 3.0 is neutral).

Other theories for a left-cheek bias (especially of females) include cultural norms, maternal imprinting resulting from a tendency to see a mothers’ left-cheek as they typically hold their babies in their left arm, and the right-handedness of most artists making left-cheeks easier to paint (Freimuth and Wapner, 1979; Grusser et al., 1988; Schirillo, 2000). It is also possible that portraits follow an ‘agency hypothesis’ (Chatterjee, 2002): that is, right-handed subjects tend to conceptualize agents of actions to the left of where they conceptualize recipients of actions. Thus, if asked to draw a picture of ‘the circle pushes the square’, most subjects draw the circle on the left. Chatterjee (2002) suggest that the left hemisphere is more likely to represent spatial action, and is likely to encode a left-to-right spatial vector. This may be why subjects on the left show more of their right-cheek (e.g. this would be ‘active’ male portraits). This may also be why Rembrandt painted close-kin with their right-cheek showing. It may also be a more parsimonious hypothesis than Humphrey and McManus (1973) ‘social distance’ theory. Likewise, subjects on the right show more of their left-cheek (e.g. this would be the many more ‘passive’ female portraits). The reason left-cheek females have decreased since the 15th century (Grusser et al., 1988) may be due to the less passive role of females.

As found in the seminal work of Sackeim et al. (1978) and Davidson (1984, 1995) our findings suggest that hemispheric emotional lateralization is represented in human facial features, and we find that these features differ along the stereotypic gender roles of approaching females for sex, nurturance, and friendship, and avoiding aggression in males. This difference may provide a rationale for why Rembrandt lateralized his portraits by gender. As an artist, Rembrandt perhaps instinctively saw these differences in facial features, although he certainly did not know about hemispheric asymmetry. This theory agrees with a related ‘social distance’ argument by Humphrey and McManus (1973) that Rembrandt’s pictures of kin are more likely to show the right cheek (e.g. Fig. 1b is a self-portrait), irrespective of whether they are male or female kin. However, we claim that this asymmetry also reflects males’ preferable (i.e. approachable) side, which is their non-aggressive side, and females less preferable (but also less sexual) side.
REFERENCES


