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BRIEF REPORT

What's in a Kiss? Spatial Experience Shapes Directional Bias During Kissing

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Abstract One of the less-known functional asymmetries in humans is the rightward head-turning bias, in which infants spend more time turning their head to the right, rather than to the left. Observational studies showed that this asymmetry disappears around the age of 3 months. Recently, an intriguing observation found a similar rightward head-turning bias during kissing, apparently indicating that the early head-motor bias persists into adulthood. Here we challenge the theory of the innate head-turning bias in adults during lip kissing, showing by means of behavioral and observational studies that the direction of the bias is culturally dependent. Moreover, we suggest that the head-turning bias during kissing is an acquired behavioral asymmetry, probably shaped by spatial experience within cultural habits (i.e., reading direction), rather than reflecting pre-wired hemispherical lateral asymmetry.

Keywords Head-turning bias · Kissing · Reading direction · Cross-cultural

Introduction

Although external human anatomy is basically symmetric, we are all familiar with instances of functional asymmetries, such as the lateral preferences for hand, foot, and eye or even a less-known preference for turning the head to the right, rather than to the left, close to the time of birth (Ververs et al. 1994). This last asymmetry, a rightward head-turning bias, has been considered one of the earliest functional asymmetries in humans (Hopkins et al. 1987; Rönnqvist and Hopkins 1998; Rönnqvist et al. 1998) and even a possible predictor for handedness (Konishi et al. 1986; Michel 1981; For review see Previc 1991). However, with the gradual improvement of postural stabilization, at around the age of 3 months, the infant's preference for rightward head turning is changed to an increase in the maintenance of a midline head position (Coryell and Michel 1978; Harris and

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Fitzgerald 1983). Does this final finding mean that a rightward head-turning bias is only a transient asymmetry rather than being a fundamental product of our asymmetrical brain?

Indeed, while other asymmetries are perceptible in our daily life (such as being right- or left-handed), evidences for asymmetry of head turning in adults are surprisingly sparse. The rightward head-turning bias was revealed in several comprehensive surveys of painted portraits that found a tendency to paint the left cheek rather than the right one (Gordon 1974; McManus and Humphrey 1973; for review see Powell and Schirillo 2009). On the other hand, some gender differences were found in the original studies (Schirillo 2007) while other studies found that the bias changed over the years (Costa et al. 2001; Grusser et al. 1988). In addition, recent studies found that when posing for a portrait, participants tend to turn their head to the right in an emotional context only. All in all, the above findings indicate against a simple explanation such as innate asymmetry of hemisphere dominance in emotional processing or a head-turning bias (Lindell and Savill 2010; Nicholls et al. 1999, 2002; Roether et al. 2008).

Interestingly, when people were asked to choose between mirror images of geometric objects or facing objects, a clear rightward bias was found in which most people prefer the right-facing objects rather than left-facing ones (Christman and Pinger 1997; Palmer et al. 2008). This aesthetic preference goes against the above-described artist's tendency to paint the left cheek rather the right one. When asked to rate the expressiveness of images of animals, the images that scored higher were those seen in the original orientation (as chosen by the artist), and not on the basis of whether they faced left or right (Bennett et al. 2010; but see Bertamini et al. 2011). Despite all of the above, a controlled study (Chokron and De Agostini 2000) found that reading habits influence aesthetic preference, so that left-to-right readers preferred objects with a rightward directionality while right-to-left readers preferred left-facing objects. Although speculative, it may be the case that aesthetic preferences of portrait directionality are also influenced (at least partially) by cultural factors, such as reading direction.

The most striking and direct evidence of head-turning bias in adults was an intriguing observation which found a rightward head-turning bias during kissing (Güntürkün 2003). Roughly two-thirds of couples kissing in public places turned their heads to the right in order to make lip contact, and only one-third turned their heads to the left (see Fig. 1). This spontaneous head-turning preference apparently indicates that the early head-motor bias persists into adulthood. A strong rightward bias was also found in less emotional situations, such as when participants were asked to kiss a doll (Barrett et al. 2006), suggesting that head-turning bias is not due to an emotive bias. Supporting the inherent lateral asymmetry assumption, right-turning kissers showed more consistent head-turning behavior than left turners (Van der Kamp and Canal-Bruland 2011). Surprisingly, no clear correspondence was found between the head-turning bias and other lateral preferences (i.e., handedness, footedness, and eye preference), as was expected (Barrett et al. 2006; Ocklenburg and Güntürkün 2009; Van der Kamp and Canal-Bruland 2011).

Given that all previous studies demonstrated a rightward head -turning bias during kissing among Western participants, the main goal of this study was to extend the findings to other societies (i.e., the Middle East). Looking for the spatial bias of head-turning during kissing within cultures that have a right-to-left reading habit is especially important, due to previous findings of opposite perceptual and behavioral spatial biases and effects with right-to-left readers in other domains (Shaki and Fischer 2008; Shaki et al. 2012). The acquired behavior of kissing has many different customs (e.g., lip kissing, cheek kissing, air kissing, etc.), depending on the situation and the culture. Some kissing habits are, apparently, more culturally dependent, such as cheek kissing (how many kisses? which

Fig. 1 *Leftward* and *rightward* biases in Rodin's sculptures (*left* The eternal spring; *right* The kiss)

cheek to begin with, etc.). We are specifically interested in the case of lip kissing (kiss of love), because it happens as a spontaneous decision in an emotional moment. Arguably, the direction of turning depends on situational comfort and is not dictated by cultural habits. However, previous studies found the aforementioned rightward head-turning bias during the (apparently spontaneous) act of kissing. Does this spatial bias originate from a phylogenetic hemispherical asymmetry, or it is a culturally acquired nonverbal custom?

Taking into account that previous studies yielded ambiguous results concerning the association between head-turning bias and handedness, the second aim of the current study was to clarify this possible association between head and hand biases.

Method

Participants

Ninety-two Hebrew speaking students (18 left-handed, 11 males, age range 20–46, mean age 24.5 years) from Ariel University Center, twenty-eight Arabic speaking students and young adults (3 left-handed, 13 males, age-range 18–35, mean age 22.4 years), and thirty-five Western students (3 left-handed, 7 males, age-range 19–28, mean age 22 years) volunteered to participate in a single experimental session. The Hebrew speakers were born in Israel, and their mother tongue is Hebrew. The Arabic speakers were born in Israel or the Palestinian Authority and reported minimal exposure to any left-to-right written language. The Western participants were born in the former USSR (twenty-two) or North America (thirteen) and were in Israel up to 3 months for an international students exchange program. The participants had normal or corrected-to-normal vision and were unaware of the purpose of the experiment.

In addition, we observed 117 couples kissing in public places in Italy, Russia, and Canada, as well as 203 couples kissing in public places in Israel and the Palestinian Authority. The public places included sites near high-schools, central bus-stations, malls, parks, clubs, and house parties. Although the country of birth and the cultural environment in which the people were raised could not be ascertained, we assumed that most people in those local places are locals. Hence, we defined them as "Western" or "Middle-Eastern" couples. Subjects' ages ranged from approximately 16–50 years.

Design and Procedure

The volunteer students were asked to kiss a life-sized symmetrical plastic mannequin's head that was mounted on a height-adjustable tripod and positioned in front of a plain white wall of the laboratory (Van der Kamp and Canal-Bruland 2011). The height of the plastic head was adjusted so that its nose was at the same height as the individual participant's nose. We instructed the participants to stand directly in front of the doll's head and to kiss the head's face on its lips. Upon completing the task, participants filled out a Hebrew version of the Edinburgh Handedness Inventory (Oldfield 1971) and the Waterloo Footedness Questionnaire Revisited (Elias et al. 1998). We used a hole-in-the-hand test (Miles 1930) to determine eye dominance.

We then observed naturally-occurring adult lip-to-lip kissing by couples in public places. Maintaining the procedure of previous studies, we recorded only the first kiss on the lips of couples who had no handheld objects, and who show a clear head-turning direction during kissing.

Results

Kissing a Doll

As can be seen in Fig. 2, the direction of head-turning bias during kissing is culturally dependent. Sixty-one Hebrew speakers (66.3 %) turned their head to the left in order to kiss the doll, compare to thirty-one (33.7 %) who prefer to turn rightward ($\chi^2(1) = 9.8$, $p < .002$). Similarly, twenty Arabic speakers (71.4 %) preferred to tilt their head to the left, compare to only eight (28.8 %) who kiss to the right ($\chi^2(1) = 5.14$, $p < .023$). This finding of left-turning bias during kissing is opposed to all previous studies that used a similar experimental method (Barrett et al. 2006; Ocklenburg and Güntürkün 2009; Van der Kamp and Canal-Bruland 2011). However, similarly to the right-head turning bias during kissing found in previous studies, twenty-three of our Western participants (65.7 %) preferred to turn their heads to the right, compared to twelve (34.3 %) who turned to the left ($\chi^2(1) = 3.46$, $p = .063$). The differences in prevalence of head-turning direction between groups was significant ($\chi^2(2) = 12.7$, $p < .002$).

In order to check if this surprising left bias in the Hebrew- and Arabic- speaking groups relates to a unique ratio of other lateral preferences, we analyzed participants' handedness, footedness, and eye preferences. Overall, the prevalence of the lateral asymmetries were similar to the world's known ratio (right handed: 80.4, 85.7, and 82.9 %; Right footers: 70.7, 75, and 68.6 %; Right eye dominancy: 61.2, 57.7, and 72.7 % for Hebrew speakers, Arabic speakers and Western participants, respectively). No dependence on head-turning directionality was found (All $p > 0.05$).

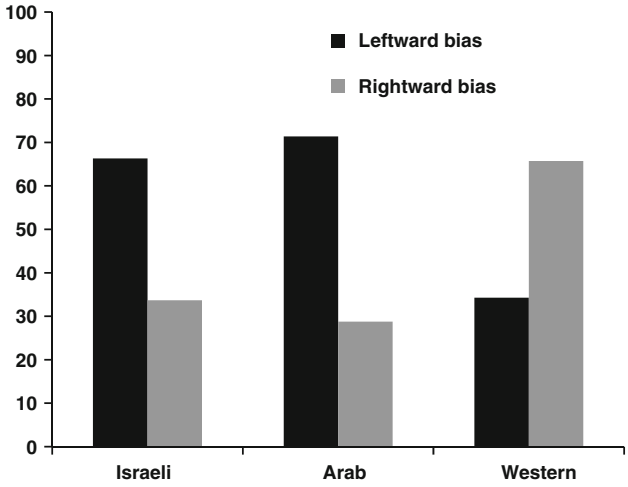

Fig. 2 *Kissing a doll* experiment: Percentage of Israeli (Hebrew speakers), Arab (Arabic speakers) and Western (English and Russian speakers) participants who showed *leftward* (*black bars*) or *rightward* (*gray bars*) head-turning bias during kissing

Couples Kissing

Twelve Western couples (10.25 %) and seventeen Middle-Eastern couples (8.4 %) did not show a clear head-turning direction during kissing, and their data were not used in the following analyses. Similarly to previous observations, most of the Western couples (67.6 %) turned their heads to the right while only 32.4 % turned to the left ($\chi^2(1) = 13.04$, $p < .00$). However, as opposed to all preceding studies, the majority of the Middle-Eastern couples (77.9 %) turned their heads to the left ($\chi^2(1) = 58.15$, $p < .00$). This opposite pattern of head- turning bias between the two cultures (see Fig. 3) was significant ($\chi^2(1) = 58.88$, $p < .00$).

Discussion

Previous studies suggested that the rightward head-turning bias during kissing found in Western countries is innate. The current study demonstrates that the right-facing lateral asymmetry found in Western countries contrasts with a left-facing lateral asymmetry found in Middle Eastern countries. Hence, there is no plausible explanation other than culture. Indeed, Israel is an immigrant nation with many individuals from the West, so there is no plausible biological explanation.

The decision of how to turn the head during kissing is apparently spontaneous and depends on situational comfort. However, it is possible that people unconsciously mimic other kissers' habits within the culture. Alternatively, head-turning bias is influenced by cultural spatial habits, such as reading direction (which was previously found to play a role in spatial perception, visuo-spatial performance, and even aesthetic preferences, see Kazandjian et al. 2009; Morikawa and McBeath 1992; Zivotofsky 2004; but see Nicholls and Roberts 2002).

Surprisingly, we found a rightward bias in countries with left-to-right reading habits and a leftward bias in countries with right-to-left reading habits. Previous studies have found

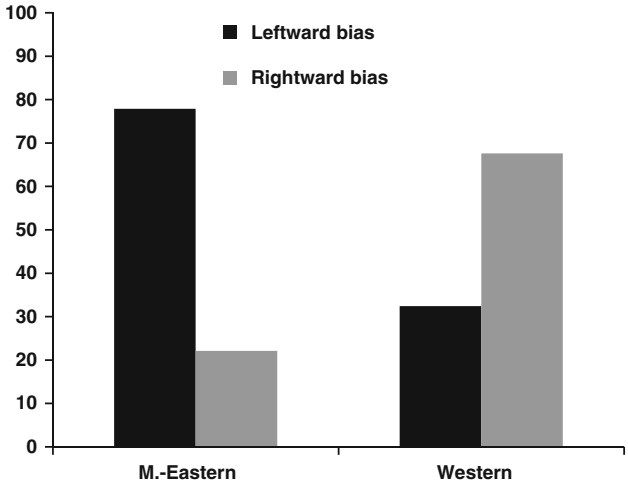

Fig. 3 *Couple kissing* observation: Percentage of Middle-Eastern and Western adults who showed *leftward* (*black bars*) or *rightward* (*gray bars*) head-turning bias during kissing

that left-to-right readers usually scan objects from left to right, and the general direction of gaze is towards the right (Beaumont 1985), while right-to-left readers show the opposite tendency (Tversky et al. 1991). Similarly, after fixating on content, people's eyes tend to move in a direction consistent with their reading direction (Heath et al. 2005). If so, after fixating on their partner's face, left-to-right readers may look rightward and, respectively, show a right bias when kissing. In contrast, right-to-left readers tend to move their eyes leftward and, as a result, will show a left head-turning bias during kissing. Our participants in the 'kissing the doll' experiment included right-to-left readers and left-to-right readers, with each group showing head-turning patterns consistent with their reading direction. Assuming that most participants in the previous studies (Barrett et al. 2006; Ocklenburg and Güntürkün 2009; Van der Kamp and Canal-Bruland 2011) were left-to-right readers, since the participants were recruited in European universities, the above hypothesis about the influence of habitual gaze direction may explain why the Western participants in this study showed the same head-turning bias as the participants in the previous studies, and the Middle Eastern participants showed the opposite head-turning bias.

This exploratory study clearly indicates that the head-turning bias during kissing has, at least in part, a cultural bias. Further work might test bilingual speakers or immigrants from a Western country to a Mid-Eastern culture. Does it matter how long they have lived in the other culture? An even stronger follow-up study could use an experimental manipulation that primes one language versus the other (see Shaki and Fischer 2008), such as reading a long text just before the doll kissing task.

Overall, our findings may also challenge the popular congenital asymmetric theories (as the functional hemispheric specialization) suggested for some other adult behaviors that are laterally asymmetric, such as a right-embracing bias (Turnbull et al. 1995), head-turning while being sketched or painted (McManus and Humphrey 1973; Nicholls et al. 2004) or even the long-established discovery of a right-turning bias as visitors enter a gallery (Robinson 1933). Instead, we argue that the option of behavioral biases shaped by spatial experience within culture should be taken into account, before reasoning about any innate laterality, such as cerebral dominance.

Conflict of interest None.

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