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Original Research Report

What's good for the goose is not good for the gander: Age and gender differences in scanning emotion faces

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Abstract

Objectives: Research indicates that older adults' (≥60 years) emotion recognition is worse than that of young adults, young and older men's emotion recognition is worse than that of young and older women (respectively), older adults' looking at mouths compared with eyes is greater than that of young adults. Nevertheless, previous research has not compared older men's and women's looking at emotion faces so the present study had two aims: (a) to examine whether the tendency to look at mouths is stronger amongst older men compared with older women and (b) to examine whether men's mouth looking correlates with better emotion recognition.
Method: We examined the emotion recognition abilities and spontaneous gaze patterns of young (n = 60) and older (n = 58) males and females as they labelled emotion faces.
Results: Older men spontaneously looked more to mouths than older women, and older men's looking at mouths correlated with their emotion recognition, whereas women's looking at eyes correlated with their emotion recognition.
Discussion: The findings are discussed in relation to a growing body of research suggesting both age and gender differences in response to emotional stimuli and the differential efficacy of mouth and eyes looking for men and women.

Keywords: Emotion recognition—Gender differences—Visual scanning

Normal aging is known to negatively impact on the recognition of some emotions (e.g., Calder et al., 2003; Keightley, Winocur, Burianova, Hongwanishkul, & Grady, 2006; Orgeta & Phillips, 2008; Phillips, MacLean, and Allen, 2002; Sullivan & Ruffman, 2004; Wong, Cronin-Golomb, & Neargarder, 2005) and difficulties in emotion recognition are associated with reduced social competence, inappropriate social behavior, poor interpersonal functioning, and reduced quality of life (Carton, Kessler, & Pape, 1999; Ciarrochi, Chan, & Caputi, 2000; Shimokawa et al., 2001; Spell & Frank, 2000). As such, it is important to understand the basis of emotion recognition deficits. In their meta-analysis, Ruffman, Henry, Livingstone and Phillips (2008) found that accurate recognition of facial expressions of anger, sadness, and fear showed the most consistent age-related declines, and that older adults were also worse when recognizing facial expressions of surprise and happiness (although effect sizes were substantially smaller). In contrast, there was a non-significant trend for older adults to be better when recognizing facial expressions of disgust.

A number of studies have also examined links between emotion recognition skills and the way we view emotion faces. For instance, Calder, Young, Keane, and Dean (2000) found that identification of anger, sadness, and fear is better when visually scanning the top half of faces, identification of disgust and happiness is better when viewing the bottom half of faces, and accurate identification of surprise

can be made from viewing either the top or bottom half of faces. Indeed, five other studies have arrived at similar conclusions (Bassili, 1979; Ebner, He, & Johnson, 2011; Eisenbarth & Alpers, 2011; Sullivan, Ruffman, & Hutton, 2007; Wong, Cronin-Golomb, & Neargarder, 2005). However, research indicates that, compared with young adults, older adults focus less on the eye region of people's faces and more on the mouth region when attempting to label emotional expressions (Firestone, Turk-Browne, & Ryan, 2007; Murphy & Isaacowitz, 2010; Sullivan et al., 2007; Wong et al., 2005; although see Ebner et al., 2011), leading to the suggestion that this tendency in older adults might underpin age-related declines in recognizing anger, sadness, and fear.

However, it remains unclear whether older adults' looking tendencies correlate with their emotion recognition performance. Wong and colleagues (2005) found that a greater number of visual fixations to the upper portion of faces was correlated with better recognition of anger, fear, and sadness in both young and older adults, whereas two other studies found that older adults' eye looking and mouth looking did not correlate with their emotion recognition (Murphy & Isaacowitz, 2010; Sullivan et al. 2007). Further, there are also findings indicating that older adults continue to have difficulty recognizing emotions such as anger, sadness, and fear even when compelled to look at the eyes by presenting just this portion of the face (Sullivan et al., 2007).

Irrespective of age, there are also gender differences in emotion recognition. A number of studies find that young women's emotion recognition exceeds that of men (e.g., Hall & Matsumoto, 2004; McClure, 2000; Montagne, Kessels, Frigerio, de Haan, & Perrett, 2005; Proverbio, Matarazzo, Brignone, Del Zotto, & Zani, 2007; Rotter & Rotter, 1988; Williams et al., 2009). Only recently have researchers begun to examine whether this gender bias extends into later adulthood, with studies indicating that older men have worse emotion recognition relative to older women (e.g., Campbell, Ruffman, Murray, & Glue, 2014; Demenescu, Mathiak, & Mathiak, 2014; Ruffman, Murray, Halberstadt, & Taumoepeau, 2010), and older men's worse emotion recognition linked to worse recognition of social gaffes (Halberstadt, Ruffman, Murray, Taumoepeau, & Ryan, 2011).

Interestingly, gender differences also exist in the way men and women look at faces during face-to-face social interactions. For instance, girls and young women are more likely than boys and young men to engage in mutual eye contact with another person for longer periods of time (e.g., Argyle & Ingham, 1972; Mulac, Studley, Wiemann, & Bradac, 1987), with this gender difference apparent from infancy through to mid-adulthood (e.g., Leeb & Rejskind, 2004; Levine & Sutton-Smith, 1973). Eye-tracking studies provide more specific information regarding looking patterns and find that young females spend more time looking at eyes compared with mouths relative to young males (e.g., Hall, Hutton, & Morgan, 2010; Watanabe, Matsuda, Nishioka, & Namatame, 2011).

To summarize this previous research, young women have better emotion recognition than young men, and recent eye-tracking research suggests that they look more at eyes than young men, with their eyes looking correlating with better emotion recognition. Likewise, older women have better emotion recognition than older men, and so a logical assumption is that akin to young women, they look more at the eyes compared with older men, potentially explaining their better emotion recognition. However, previous studies have not examined gender differences in older adults' looking at faces, or gender differences in correlations between gaze and emotion recognition. For instance, Watanabe and colleagues (2011) studied young adults but did not examine gaze-recognition correlations. Hall and colleagues (2010) studied young adults, and Wong and colleagues (2005) studied older adults. Both collapsed across gender, finding that eye looking is generally associated with better recognition. Murphy and Isaacowitz (2010) and Sullivan and colleagues (2007) studied older adults and collapsed across gender, finding no correlations between eye gaze and recognition. As men and women were examined together in these studies, it leaves open the question of whether eyes looking might be beneficial for women whereas mouth looking might be beneficial for men. Indeed, it is possible that the analytic strategy of previous studies has resulted in a cancelling out of effects. For instance, if the two genders are combined (as in previous research), it might seem like there is no relation between looking and emotion recognition, yet there could be if the genders are examined separately. As such, it remains unclear how looking at the eyes versus mouth might relate to emotion recognition for both men and women.

The present study examined emotion recognition and looking to the eyes and mouth in young versus older adults, and in men versus women. There were two aims. The first was to examine whether older women look more to the eyes than older men. To reiterate, research indicates that young females look more to the eyes than young men and so it is plausible that older women also do so. The second aim was to examine correlations between looking and emotion recognition. Women might look more to the eyes than men because eyes looking is conducive to their emotion recognition, whereas men might look more to mouths than women because mouth looking is conducive to their emotion recognition. More specifically, young and older women's looking at eyes might correlate with their recognition of anger, fear, and sadness, the three emotions best recognized from the eyes. Likewise, young and older men's looking at mouths might correlate with their recognition of disgust and happiness, the two emotions best recognized from the mouth.

Method

Participants

Older adults

There were 58 older adults (28 males, 30 females; M = 70 years (SD = 5.81); range = 60–85 years), who were

recruited through university participant databases. All were screened for depression using the Geriatric Depression scale (GDS: Brink, Yesavage, Lum, Heersema, Adey, & Rose, 1982), with a cutoff point of 10, and signs of dementia (using a cutoff point of 26) on the Mini-Mental State Exam (MMSE: Folstein, Folstein, & McHugh, 1975). All participants' eyesight was also assessed, using a cutoff point of 20/30 vision on Snellen's Three Metre Visual Acuity Chart. No participants were excluded on the basis of GDS, MMSE, or eyesight scores. All had no history of strokes or head injury and spoke English as their first language.

Younger adults

There were 60 younger adults (30 male, 30 female, M = 20 years, SD = 1.31, range = 17–24 years), who were recruited through university participant databases. Again, no participants were excluded on the basis of Snellen's Eye Chart scores, and none had a history of strokes or head injury. All spoke English as their first language.

Materials

Thirty-six photographs from Ekman and Friesen (1976) were randomly selected, with six pictures (three males, three females) for each of the six basic emotions (anger, sadness, fear, disgust, surprise, and happiness). As previous findings suggest that young adults exhibit an age-bias, showing an advantage for processing gaze cues from the faces of young adults (Slessor, Laird, Phillips, Bull, & Filippou, 2010), we chose photographs from the original Ekman and Friesen (1976) series, where the "actors" in the photographs fall roughly mid-way between the mean ages for the two age groups (i.e., were middle-aged), thereby negating age-biases that may exist in decoding facial information from same-aged peers.

Procedure

Participants were told that they were about to see 36 photographs of different people and that their task was to decide how the person in each photograph was feeling using one of six emotion labels, which were always placed at the bottom of each photograph. Participants were told to take as long as they wanted to respond, but to go with their initial reaction as much as possible. They were also instructed to verbalize their response to the experimenter.

Eye movements were recorded using an Eyelink II eye tracker, which uses two miniature video cameras mounted on a lightweight headset. A third camera simultaneously records the position of the head, allowing gaze position to be computed without the need to restrain head movements. Participants were tested in a quiet room and sat in a height-adjustable chair that had been modified to prevent any rotation about the vertical axis. They viewed a 21-inch ViewSonic monitor from a distance of 60 cm, which subtended at a visual angle of approximately 40 degrees horizontally and 30 degrees vertically. The face stimuli were high-resolution photos, 23-cm high and 15-cm wide, and were presented in the center of the screen. The six emotion labels were printed at the bottom of each picture, and the experimenter instructed participants to decide how the person in each photograph was feeling.

For the scan path analysis, regions were defined using Data Viewer software supplied by SR-Research. Two rectangular areas of interest were individually positioned on each face. The rectangle defining the eye region included both eyes and eyebrows. The rectangle defining the mouth region was positioned so that it contained all of the mouth including the lips. The position of the eyes was sampled automatically by the eye-tracker, 500 times per second, and all samples that were not classed as occurring during a saccade were considered to have occurred during a fixation. Three thresholds were used to detect saccade onset: a change in eye position of greater than 0.1 degree, an eye velocity above 30 degrees per second, and an eye acceleration above 8,000 degrees per second squared. A sustained gaze on a particular spot for 50 ms or more was classed as a fixation. Dwell times from the left and right eye regions were summed to provide a single figure for both eyes.

Results

Much of the looking time and emotion recognition data were highly skewed. Therefore, we carried out three transformations recommended for such data using a log transform, an inverse transform, and a square root transform. All transformations still ended up in highly non-normal data with p values always <.002, indicating highly significant deviations from normality. For this reason, non-parametric analyses were used in all cases, except where assumptions of normality were not violated.

Emotion Recognition

Total emotion recognition, summed over the six emotions was calculated (total = 36) and compared using Mann–Whitney U tests (Table 1). As expected, young adults' emotion recognition (M = 30.35) was significantly better than that of older adults (M = 28.69), p = .01. In addition,

Table 1. Number of Emotion Items Recognized Correctly (*SD*) for Both Age Groups and Both Genders

	Young women	Young men	Older women	Older men
Anger	4.73 (1.08)	4.70 (1.18)	4.53 (1.48)	4.21 (1.23)
Sadness	4.83 (1.37)	4.50 (1.17)	4.50 (1.08)	4.14 (1.33)
Fear	4.40 (1.30)	4.57 (1.43)	3.77 (1.46)	3.36 (1.42)
Disgust	5.27 (0.98)	4.53 (1.38)	5.33 (1.09)	5.14 (1.08)
Surprise	5.43 (0.86)	5.73 (0.45)	5.33 (0.92)	5.21 (0.88)
Happiness	6.00 (0)	6.00 (0)	5.90 (0.31)	5.89 (0.42)
Total Emotion	30.67 (3.20)	30.03 (3.05)	29.37 (3.73)	27.96 (3.19)

Note: Maximum for each emotion category = 6 and for total emotion = 36.

women's emotion recognition (M = 30.02) was significantly better than that of men (M = 29.03), $p < .05$.

Looking Patterns

Next, we examined looking at the eyes and mouth (Table 2). As described previously, anger, sadness, and fear are best recognized from the eyes, and disgust and happiness from the mouth (Bassili, 1979; Calder et al., 2000; Ebner et al., 2011; Eisenbarth & Alpers, 2011; Sullivan et al., 2007; Wong et al., 2005). Because the predictions were the same for each group of emotions (i.e., anger/sadness/fear recognized from eyes versus disgust/happiness recognized from the mouth), and in an effort to maximize experimental power while minimizing the number of statistical tests, we followed Sullivan and colleagues (2007) in creating two composite variables (i.e., eye emotions vs. mouth emotions) for use in our analyses.

We first examined looking times for both young and older, and male and female participants, using Holm's correction to ensure the family-wise error was $p < .05$. We considered only eyes looking and mouth looking. Young men and women's looking was similar, with young men spending 63.6% of their time looking at the eyes (and 36.4% of the time at the mouth) and young women spending 63.0% of the time looking at the eyes: $t(58) = 0.10$, $p = .92$. In contrast, older men and women differed in their looking patterns, with older men spending 56.9% of their time looking at the eyes and older women spending 70.7% of their time looking at the eyes: $t(56) = 2.35$, $p = .02$.

Correlations Between Looking Patterns and Emotion Recognition

We used non-parametric correlations to examine whether looking was related to emotion recognition (Table 3). The four groups (young men, young women, older men, and older women) were examined separately, with the four correlations within each group constituting a family of analyses. The correlations revealed a pattern; young and older women's looking at eyes tended to correlate with their emotion recognition on the anger/sadness/fear composite, whereas young and older men's looking at mouths tended to relate to emotion recognition on the happiness/disgust composite.

Because older adults generally looked longer at stimuli than young adults, we calculated rank orders for looking times at eyes and mouths within each age group separately. Given the consistent pattern of correlations described previously, we then collapsed across age group to examine correlations within men and women separately. For men, the correlation between mouth looking and anger/sadness/fear recognition was not significant, $r = -.10$, $p = .44$, and neither were the correlations between eyes looking and either emotion composite, both rs < .18, both ps > .19. In contrast, the correlation between mouth looking and recognition of happiness/disgust was significant, $r = .36$, $p = .006$, even after controlling for the four correlations in this family of analyses using Holm's correction. For women, the correlation between eyes looking and happiness/disgust was not significant, $r = .07$, $p = .58$, and neither were the correlations between mouth looking and either emotion composite, both rs < .02, both ps > .81. In contrast, the correlation between eyes looking and anger/fear/sadness recognition was significant, $r = .37$, $p = .004$, even after controlling for the four correlations in this family of analyses.

Discussion

Previous research demonstrates that older adults are worse when recognizing facial emotions, particularly anger, sadness, and fear, and that these three emotions are best recognized from the eyes. There are also findings that women have better emotion recognition than men, that young women look more to the eyes than young men, and that young adults' eyes looking correlates with their emotion recognition. We replicated previous findings of superior emotion recognition by young adults compared with older adults, and by women compared with men. Having

Table 2. Number of Miliseconds (*SD*) Spent Looking at Eyes and Mouth for Both Age Groups and Both Genders

	Young women	Young men	Older women	Older men
Anger: eye	121.88 (63.16)	95.33 (57.74)	1109.80 (781.68)	591.11 (667.17)
Anger: mouth	63.51 (34.22)	50.57 (33.07)	403.69 (300.08)	357.99 (439.62)
Sadness: eye	113.14 (57.44)	86.10 (55.10)	1327.96 (908.06)	621.03 (728.66)
Sadness: mouth	61.35 (33.88)	44.98 (28.82)	283.92 (251.17)	275.96 (362.89)
Fear: eye	125.36 (67.21)	93.87 (55.86)	1137.41 (828.76)	656.62 (788.32)
Fear: mouth	62.35 (29.62)	41.59 (28.10)	394.72 (325.70)	356.13 (397.93)
Disgust: eye	111.85 (53.65)	89.62 (58.98)	1075.21 (755.41)	528.25 (600.27)
Disgust: mouth	64.62 (40.11)	46.98 (32.93)	353.12 (229.05)	355.60 (400.77)
Surprise: eye	113.52 (57.29)	85.74 (52.49)	1032.99 (717.68)	546.18 (653.44)
Surprise: mouth	50.77 (26.20)	35.42 (20.54)	335.49 (265.98)	243.74 (264.43)
Happiness: eye	79.98 (46.73)	66.99 (45.23)	839.85 (677.82)	448.78 (502.67)
Happiness: mouth	45.64 (24.06)	31.24 (20.44)	298.75 (244.71)	244.01 (313.32)

Table 3. Spearman's Correlations Between Looking at Eyes or Mouth and Emotion Recognition

Emotion labeling	Eyes looking	Mouth looking
Young men		
Anger/sadness/fear composite	.14	.13
Happiness/disgust composite	–.25	.37**
Older men		
Anger/sadness/fear composite	.02	–.03
Happiness/disgust composite	.13	.36*
Young women		
Anger/sadness/fear composite	.35*	.07
Happiness/disgust composite	.15	.16
Older women		
Anger/sadness/fear composite	.41**	.01
Happiness/disgust composite	–.19	–.14

Note: *$p < .06$. **$p < .05$.

obtained these expected findings, the present study had two purposes. First, we examined whether older women look more to the eyes than older men. Second, we examined correlations between looking and emotion recognition. The rationale for examining these topics and the implications of our findings are now discussed in more detail.

Studies with young adults indicate that young women look more at eyes than young men (Hall et al., 2010; Watanabe et al., 2011). Although previous researchers have argued that older adults tend to look more at the mouth and less at the eyes compared with young adults (Firestone et al., 2007; Murphy & Isaacowitz, 2010; Sullivan et al., 2007; Wong et al., 2005), they had not examined older men's and women's eye gaze separately. For this reason, we examined older men's and women's looking separately. Unlike Watanabe and colleagues, we did not find that younger women looked more at the eyes compared with younger men, yet the participants in that study were Asian, and there is evidence to suggest differences in the way Asian and Western individuals examine face regions (Blais, Jack, Scheepers, Fiset, & Caldara, 2008). Although our findings for the gaze of young men and women were also contrary to Hall and colleagues (2010), we did obtain the expected (and novel) finding in older adults: older men spent 57% of their time looking at the eye region of emotion faces (and the rest at mouths), whereas older women spent 71% of their time looking at the eyes.

Looking patterns could reflect either conscious or unconscious tendencies. Females' tendency to look at the eyes could be innate (e.g., Hittelman & Dickes, 1979), or due to early socialization processes (Leeb & Rejskind, 2004). Either way, it is a tendency that is present from infancy through to mid-adulthood (e.g., Leeb & Rejskind, 2004; Levine & Sutton-Smith, 1973). Our findings add to this picture in two ways, first, by demonstrating that older females also look more to the eyes than older males, and second, by demonstrating that eyes looking benefits females whereas mouth looking benefits males.

It is possible that such male and female tendencies are initially employed because they result in optimal emotion recognition (with male infants better at decoding emotions in mouths and female infants better at decoding emotions in eyes). Further, it is possible that there is a biological cause of men's tendency to look at mouths. Men tend to have less of the hormone oxytocin than women (Carter, 2007), and oxytocin increases looking to the eyes, and may facilitate face processing by virtue of increased eyes looking (Guastella, Mitchell, & Dadds, 2008). Indeed, Campbell and colleagues (2014) found that oxytocin benefitted the emotion recognition of older men but not older women. It might be, then, that males' tendency to engage in less eyes looking and more mouth looking than women is a result of lower levels of oxytocin, but that men's mouth looking nevertheless facilitates their emotion recognition. In favor of this idea, individuals with autism also tend to look more at mouths than eyes, but more mouth looking (relative to object looking) correlates with better social functioning and less severe autistic symptoms (Klin, Jones, Schultz, Volkmar, & Cohen, 2002).

Alternatively, it may be that women are socialized to look at the eyes and that subsequent tendencies to look at the eyes (in females) or the mouth (in males) have been so often employed that they have subsequently become the best strategy for each gender to use when decoding emotional expressions. These ideas help to make sense of the different patterns of male and female looking, and are consistent with the idea that a tendency to look at a particular facial region would not persist unless it helped an individual to decipher the emotional information that region expressed.

In sum, our findings add to a growing literature documenting differences in men's and women's face processing and emotion recognition. Women's emotion recognition is better than men's, women tend to look more at the eyes than men, and women's eyes looking correlates with their emotion recognition whereas men's mouth looking correlates with their emotion recognition. Evidently, there are differences in the ways in which men and women process emotion stimuli indicating that what's good for the goose, isn't always what's good for the gander.

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