FlashReport

Smiling and sad wrinkles: Age-related changes in the face and the perception of emotions and intentions ☆

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ABSTRACT

There is a common belief that wrinkles in the aging face reflect frequently experienced emotions and hence resemble these affective displays. This implies that the wrinkles and folds in elderly faces interfere with the perception of other emotions currently experienced by the elderly as well as with the inferences perceivers draw from these expressions. Whereas there is ample research on the impact of aging on emotion recognition, almost no research has focused on how emotions expressed by the elderly are perceived by others. The present research addresses this latter question. Young participants rated the emotion expressions and behavioral intentions of old and young faces displaying identical expressions. The findings suggest that emotions shown on older faces have reduced signal clarity and may consequently have less impact on inferences regarding behavioral intentions. Both effects can be expected to have negative consequences for rapport achieved in everyday interactions involving the elderly.

Introduction

Your wrinkles either show that you're nasty, cranky, and senile, or that you're always smiling. Carlos Santana.

If indeed, as the above quote suggests, the wrinkles and folds that are characteristic of the aging face are interpreted as an emotional signal, this could have important consequences for how the emotional lives of the elderly are perceived. Specifically, wrinkles that appear to "imitate" emotions can reinforce or obscure certain expressions by adding information to the face. As a result, this additional information could render an overt expression less "pure" and more mixed in regard to the emotions being experienced. Thus, an anger expression, on a face with "sad wrinkles" would be perceived as signaling a mix of sadness and anger. The aim of the present study was to assess this proposed effect of wrinkles and folds on the perception of emotions displayed by the elderly as well as on their perceived behavioral tendencies.

Emotion recognition and the elderly

To our knowledge, only two studies have considered this issue. Malatesta, Izard, Culver, and Nicolich (1987) asked young, middle-aged and older women to rate the video-taped emotion expressions of young, middle-aged and older women. Emotion perception was found to vary with age-congruence between sender and receiver. Further, affective expressions of older individuals appeared harder to decode, owing to age-related structural changes in the face. In support of the notion that the wrinkles and folds in older faces actually resemble emotions, Malatesta, Fiore, and Messina (1987) found more misattributions of emotions to the objectively neutral faces of older individuals. Importantly these misattributions were significantly correlated with the individuals' self-reported trait emotions supporting further the notion that the expressions in the neutral face have developed from habitual emotional expressivity.

Emotion expressions and behavior tendencies

It is important to note that facial expressions of emotions have signal value in addition to indicating the current emotional state of the expresser (Hareli & Hess, 2012). In particular, emotion expressions signal behavioral intentions. Thus, Knutson (1996) as well as Hess, Blairy, and Kleck (2000) found that perceived high dominance and affiliation were associated with happiness expressions, high dominance and low affiliation were associated with anger and disgust expressions, and low dominance was associated with sadness and fear expressions. Other characteristics that can be inferred from facial expressive reactions include status (Tiedens, 2001) and credibility (Hareli et al., 2009).

This suggests that any process that interferes with emotion recognition should also interfere with the inference of such behavioral

intentions from emotion expressions. This leads to the hypothesis that the perception of dominance and affiliation in the old face will be impacted as well when emotional signals are less clear. Specifically, if, due to emotion resembling wrinkles, emotion expressions are less clearly decoded in the faces of the old, their impact on person perception should be affected.

The present study aimed to address the question of whether the wrinkles and folds typical of old faces reduce the signal clarity of emotion expressions shown by the elderly, making their expressions appear to reflect more mixed emotional states. More specifically, we predict that the expressions of older individuals will be inaccurately perceived as showing mixed emotions even when "pure" prototypical emotional expressions are presented, because the stable wrinkles and folds in the older face – which do not correspond to an actual signal transmitted by the expresser – will nonetheless be treated as such by the observer.

A second question addressed was whether these more mixed emotional inferences influence the perception of dominance and affiliation in an old face. In order to be able to exclude potential confounds due to age differences in expressive style, identical facial expressions were applied to both young (19 to 21 years) and old (76 to 83 years) faces using digital image processing.

Method

Participants

A total of 65 (31 women) participants with a mean age of 21 years (SD = 4) were recruited individually either at the University of Quebec at Montreal or The Pennsylvania State University.

Stimuli

To create stimuli with identical facial expressions on young and old faces, faces from three men and three women between 19 and 21 years and of three men and three women between 76 and 83 years were selected from a lifespan database of adult facial stimuli (Minear & Park, 2004). All faces showed a neutral expression and were available as both full face and profile shots, which are required when importing faces into FaceGenModeller (2007). FaceGen, a commercial tool for creating and modifying facial identities, was then used to apply the identical facial expression settings to create facial expressions of happiness, anger and sadness. Because the import into FaceGen removes the hair, the faces were then modified with

Photoshop to add back the original hair (see Fig. 1 for examples). The stimuli were printed in black and white (6.5 in. × 6.5 in.) and assembled into booklets in one of two random orders.

Procedure and dependent variables

Participants who gave informed consent received a booklet with the stimuli as well as the relevant answer sheets. The participants' task was to rate all stimuli on (a) emotional expression, (b) sociability (the term sociability was used as participants were not sufficiently familiar with the term affiliative), and (c) dominance. The order of these ratings was counter-balanced between subjects. In regard to (a) participants rated the emotion expression of the person on each of the following 7-point scales anchored with 1 — *not at all intense* and 6 *very intense*: anger, sadness, happiness and fear. The rating on the scale corresponding to the emotion actually displayed by the person (i.e., anger for a person showing an angry expression) was considered the accurate rating. The mean of the ratings on all other emotion scales (representing emotions not shown by the person) represented the level of inaccurately perceived emotions.

In separate runs through the stimuli, participants rated two aspects of the behavioral intentions of the person in the photo, sociability and dominance. These ratings were made on 7-point Likert scales anchored with 1 — *very socially aloof* and 7 — *very sociable* or 1 — *very submissive* and 7 — *very dominant*. Participants rated all of the stimuli on one scale before proceeding to the next and did not have access to the ratings they had made on the previous scales once they moved on to new scales.

Results

Emotion ratings

To test the hypothesis that participants perceived emotions less accurately and more inaccurately when shown in an old face, a 2 (young, old face) × 3 emotion (happy, angry, sad) analysis of variance was conducted on the accurate and inaccurate ratings respectively. A main effect of emotion (accurate: $F(2,63) = 13.61$, $p<.001$; inaccurate: $F(2,63) = 4.61$, $p = .014$) and an emotion by age interaction (accurate: $F(2,63) = 58.46$, $p<.00$; inaccurate: $F(2,63) = 92.63$, $p<.001$) emerged for both variables. For inaccurate ratings, a main effect of age emerged as well, $F(1,64) = 14.67$, $p<.001$, which was qualified by the interaction. Overall, inaccurate ratings were lowest for happy expressions, and accurate ratings were highest for anger expressions.

| Anger | Happy | Sad | Neutral |

Fig. 1. Examples of experimental stimuli.

Follow-up paired t-tests on the accurate and the inaccurate ratings for the three emotion expressions (happy, sad, angry; see Fig. 2 for means) revealed that participants rated the sad, t(64) = 2.45, p = .017, angry, t(64) = 2.76, p = .007, and happy, t(64) = 5.83, p < .001, expressions of older individuals less intensely on the target scale. That is, they perceived the *accurate* emotion as less intense, when the model was old. Conversely, they rated the average level of the *inaccurate* emotions as more intense in the older faces [sad: t(64) = 8.85, p < .001, angry: t(64) = 4.96, p < .001, happy: t(64) = 7.70, p < .001]. Interestingly, a post-hoc analyses on the summed intensities across accurate and inaccurate ratings revealed that only happy faces by older models were perceived as showing less overall emotion, t(64) = 3.09, p = .003, whereas sad t(64) = 0.31, p = .755 and angry, t(64) = 1.04, p = .304, showed no overall differences in aggregated intensity. Thus, the faces of younger and older models were rated as about equally emotional. However, in the older faces a wider range of emotions was perceived.

For neutral faces, a mean rating of 0 across all emotion scales signifies that participants did not see any emotion in the face. A one sample t-test showed that for both old, t(64) = 16.01, p < .001, and young faces, t(64) = 13.23, p < .001, the mean ratings were significantly different from 1. As expected, for old models, the mean ratings across all emotion scales were higher (M = 1.47, SD = 0.74) than for young models (M = 1.22, SD = 0.74), t(64) = 6.94, p < .001). Thus, even though neither young nor old faces were rated as perfectly neutral, more emotion was seen in the neutral older faces, replicating the finding by Malatesta, Fiore, et al. (1987). Follow-up tests on the individual emotion ratings revealed that participants saw more anger and fear in older (anger: M = 1.22, SD = 1.13; fear: M = 1.21, SD = 1.08) than in younger faces (M = .73, SD = .86; M = 1.70, SD = .96), t(64) = 5.52, p < .001 and t(64) = 4.47, p < .001, respectively. No significant difference emerged for happiness ratings of young (M = .82, SD = .89) and old (M = .69, SD = .62) neutral faces, t(64) = 1.59, p = .116.

Behavioral intention ratings

Two (young, old face) × 4 expression (neutral, happy, sad, angry) analyses of variance were conducted on the dominance and affiliation ratings, see Fig. 3 for means. Main effects of age of model (dominance: F(1, 64) = 17.54, p < .001, affiliation: F(1, 64) = 47.31, p < .001) and of emotion expression (dominance: F(3,62) = 23.50, p < .001, affiliation: F(3,62) = 74.79, p < .001) emerged. These were qualified by age of model × emotion expression interactions. Specifically, whereas for both old and young models happy expressions were rated as most dominant and sad expressions were rated as least dominant, neutral and angry expressions of young models were intermediate in dominance, and the neutral expressions of older models were as low in
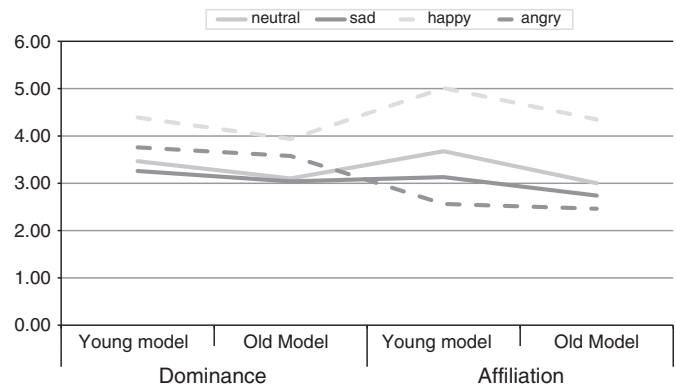

Fig. 2. Summed mean ratings for target (accurate) and non-target (inaccurate) emotions as a function of expresser emotion and age.

Fig. 3. Mean ratings of dominance and affiliation as a function of expresser emotion and age.

dominance as in sadness, F(3,62) = 3.23, p = .028. With regard to affiliation, overall younger models were rated as more affiliative than older models, but this was not the case for models showing anger, F(3,62) = 8.70, p < .001.

Fig. 3 also shows that, even though for both young and old models' happy faces were rated as most dominant and affiliative, sad faces as least dominant, and angry faces as least affiliative, the overall impact of emotion expressions on ratings of behavior intentions appears weaker for older faces than younger faces, as the variation in function of emotion expression is smaller. Fig. 3 suggests that this is mainly due to the effect of ratings of happy expressions, which were rated as less emotionally intense overall when shown in the older face.

Discussion

The present study showed that a facial expression shown on an old face is perceived differently than is the very same expression when displayed by a young person. Specifically, when displayed on an old face a specific expression is seen as involving more different emotions, as being less intense with regard to the emotion the expresser is actually displaying, and as being more intense with regard to the emotions inaccurately attributed to the expression. Accordingly, the overall modulating effect of emotion expression on perceived behavioral intentions appears reduced for old faces. These findings suggest that the wrinkles and folds in the old face do indeed impact on emotion communication. Wrinkles and folds degraded the clarity of the message conveyed, both with regard to the specific emotions communicated and with regard to the behavioral inferences that others draw from the emotion expression.

What are the likely consequences if, as demonstrated here, the facial expressions of the elderly are perceived less clearly? Hess and Kafestsios (submitted for publication) found that individuals who perceive the emotions of others as mixed also report more negative reactions to their daily interactions. This raises the possibility that "mixed" emotions are perceived as negative in an interaction or more generally as less affiliative. In line with this notion, we found that overall, the facial expressions of the elderly were rated as less affiliative, yet, this was the case for neutral faces as well. However, the neutral faces were also rated as showing more (mixed) emotion, replicating the finding by Malatesta, Fiore, et al. (1987) that the wrinkles and folds in the older faces were more suggestive of emotion by themselves.

The finding that the same emotional facial expressions on older faces are perceived less clearly, may also explain why in a recent study expressions by older individuals were mimicked less by younger individuals (Lasalle, Simard, & Hess, 2009). If facial expressions in older faces are less clear, mimicry would be more difficult to achieve. Mimicry is often referred to as "social glue" (Chartrand &
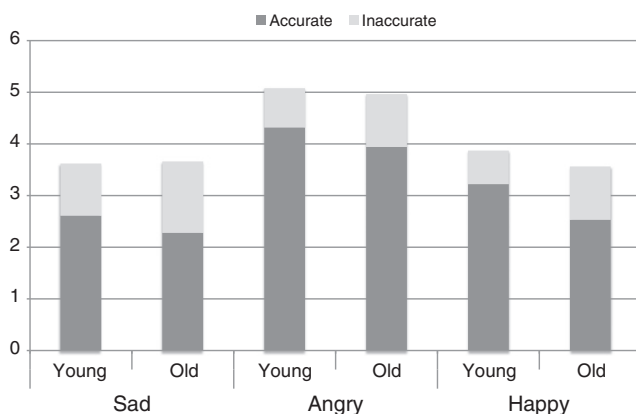
Bargh, 1999; Chartrand & Dalton, 2009) because it increases the felt rapport in an interaction. If older people's expressions are less mimicked then they would feel less rapport in their interactions with younger individuals.

In addition, we found that the impact of facial expressions on the perceived dominance and affiliation of older individuals appears reduced. Again, if facial expressions are perceived as less intense, their social signal value should be correspondingly reduced. In fact, models of person perception based on emotion (e.g., Hareli & Hess, 2011; Trope, 1986), underscore the importance of the proper identification of the emotion signal prior to the inference regarding the person. If this first step is not successful, later steps will suffer as well.

One alternative explanation for some of our findings is that emotion decoding of facial expressions by the elderly is systematically biased through stereotypes. However, even though ageist attitudes are well documented (Nelson, 2002), a closer look specifically at social and emotional stereotypes does not reveal differences in positivity between younger and older adults (Boduroglu, Yoon, Luo, & Park, 2006). Hence it seems premature to consider stereotypes the only or even the most likely source of possible bias in emotion perception when it comes to older faces.

The fact that Malatesta, Fiore, et al. (1987); Malatesta, Izard, et al. (1987b) found that individuals are better at recognizing expressions by those closer in age than those farther removed in age, opens the possibility that there may be age related expressive dialects just like there are culture related nonverbal dialects (Elfenbein & Ambady, 2002; Elfenbein, Beaupré, Levesque, & Hess, 2007). Such nonverbal dialects would result in subtle differences in expressions between young and old adults which would then make it more difficult for someone from a different age cohort to decode the expressions of another cohort. Given that we used identical expressions in both older and younger faces, this possibility cannot be assessed with the present stimuli. This should be a relevant question for future research.

In sum, the present study provides evidence for the notion that the wrinkles and folds in the older face interfere with emotion perception. Although this interference is subtle, as emotions are still generally recognized as intended, the interference is sufficient to be potentially problematic for everyday interactions, where subtle social signals are usually of most importance. Hence as we get older, the sad or smiling wrinkles we show will indeed be perceived as such and impact on others' views of us, rightly or wrongly.

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