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Mini-review

What Causes Age-Related Emotion Recognition Decline?

Ted Ruffman*

Department of Psychology, University of Otago, Dunedin, New Zealand

ABSTRACT

Older adults (≥ 60 years) are worse than young adults (< 30 years) recognizing facial, bodily, auditory and musical emotion expressions. I ask what causes these difficulties and run through five theories: (1) a positivity bias, (2) general cognitive decline, (3) a failure to look at the eyes, (4) stimuli with low ecological validity, and (5) brain change. I argue that brain change is the most likely cause, although currently there have still been only a few studies to examine this idea, and further, it is not clear what pattern of brain activation might be examined to differentiate young and older adults.

Keywords: Mental health; Geriatric care; Cognitive decline; Aging

DESCRIPTION

Older adults (60+ years) tend to be worse than young adults (<30 years) when recognizing emotion in faces, bodies, and voices [1], as well as music [2]. We proposed that brain change likely accounted for these differences [1]. Below, I examine four other explanations of older adults' difficulties, before re-considering brain change.

Positivity bias

Older adults are biased to look at positive stimuli and avoid negative stimuli [3]. This led some [4,5] to suggest that older adults' emotion recognition difficulties stem from a positivity bias. However, our meta-analysis [1] indicated that older adults don't always have difficulty on negative stimuli (e.g., no age differences on vocal expressions of fear or disgust; older adults marginally better on facial expressions of disgust). Nor were older adults always better on positive stimuli (e.g., significantly worse on facial and vocal expressions of happiness).

General cognitive decline

Some claim that deterioration of frontal brain areas leads to reductions in fluid intelligence and executive functions, and subsequent emotion recognition difficulties. Although one study found a relation between older adults' emotion recognition and general cognition [6] usually recognition difficulties are largely independent of fluid IQ [7-14].

Gaze patterns

Older adults' have particular difficulty with facial expressions of anger, sadness and fear [1]. Identification of anger, sadness, and fear is better when people look at the top half of faces [15-19]. In addition, older adults focus less on the eye region and more on the mouth region compared to young adults [17,19-22]. Thus, Mather concluded that older adults' failure to look at eyes explains their worse recognition of facial expressions of anger, sadness, and fear [23]. However, this argument doesn't explain older adults' difficulties recognizing auditory, bodily or musical expressions [1], matching auditory to bodily expressions [24] or recognizing emotion in music [2]. Second, older adults 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 [22].

Ecological validity

Isaacowitz and Stanley argued that older adults are worse on emotion recognition tasks because the stimuli lack ecological validity [4,21,25]. For instance, emotion recognition studies use static single-modality images (e.g., still images of faces or bodies), whereas in real life people see dynamic, multimodal displays. Yet, again, several findings are inconsistent with this idea. Ruffman et al., used dynamic bodily expressions, and Sullivan, et al. used dynamic facial expressions (videos of changing facial expressions), yet both studies found age-related difficulties [13,24]. Further, although Grainger et al., found that dynamic expressions provided some benefit to middle-aged and older

Correspondence to: Dr. Ted Ruffman, Department of Psychology, University of Otago, PO Box 56, Dunedin, New Zealand, Tel : +64 3479 7670; Fax: +64 03 479 8335; E-mail: ted.ruffman@otago.ac.nz

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adults when expressions were subtle, older adults still had worse emotion recognition than younger adults when judging such stimuli [26]. Studies examining empathic accuracy also bear on claims about ecological validity. Empathic accuracy refers to "the ability to accurately infer the specific content of another person's thoughts and feelings" [27] and involves comparing a perceiver's judgment of emotion to an emoter's rating of his or her own feelings. Unlike standard tests of emotion recognition, empathic accuracy has high ecological validity in that the expressions are dynamic (videos) and genuine, with accuracy gauged as what a perceiver believes an individual is feeling compared to what the individual actually reports he or she is feeling. Some studies have examined empathic accuracy while giving semantic information that would affect recognition (e.g., a man would obviously feel sad if his wife and daughter were killed in a car accident) but these don't require actual recognition of an emotional expression. However, three studies required participants to assess emotion based on the expression alone [25,28,29]. All three indicated generally worse understanding by older adults. In sum, even using stimuli with heightened ecological validity, older adults have worse emotion recognition.

Brain change

In our view, this remains the most plausible explanation because no other explanation can explain the wide array of older adult difficulties when recognizing emotion in faces, bodies, voices and music. Further, contrary to the claims of Mather, there are notable volume reductions in frontal brain areas in the medial prefrontal cortex (mPFC) such as the orbitofrontal cortex (OFC) and the Anterior Cingulate Cortex (ACC) [23,30]. Crucially, these areas are centrally involved in recognition of anger, sadness and fear, for which older adults have particular difficulty.

Nevertheless, there are still only seven studies that have examined this idea directly, and direct support from these studies is mixed. Different levels of activation during emotion recognition tasks in young and older brains were found in two of these studies in the OFC [5,31], three studies in the ACC [5,31,32] and four studies in the mPFC generally [5,32-34]. Such studies can also be difficult to interpret because of extraneous task demands that can create activation, and the fact that although reduced brain volume might lead to a reduction in older adult activation, increased activation is thought to stem from compensation for subjective task difficulty in older adults [35]. These two outcomes might cancel each other out such that brain changes cause older adults' emotion recognition difficulties, but it won't be evident as either reduced or increased brain activation.

Thus, although I view brain change as the most likely explanation of older adults' emotion recognition difficulties, there is still a need for further research to examine this question, and such research will need to clearly specify what pattern of brain activation will most convincingly differentiate young and older adults to provide evidence for the brain change view.

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