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Impact of age on the facial expression of pain

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Abstract

Objective: Old age has traditionally been viewed as being associated with a decline in emotional expressivity. Interestingly, empirical evidence based on analyses of facial expressions contradicts this traditionally view and points to absence of (or only very slight) age-related changes in emotional expressivity. However, this research on emotional expressivity in older persons has neglected one important emotionally colored state—expression of pain. In order to close this gap, we aimed to investigate the influence of age on the facial expression of pain. **Methods:** Forty young (mean age, 24.1 years) and 61 elderly (mean age, 72.3 years) subjects were investigated for their facial (Facial Action Coding System) and subjective responses to noxious mechanical and electrical stimuli of various intensities. **Results:** Young and elderly subjects did not differ with respect to the frequency of facial responses during noxious mechanical and electrical stimulations. Moreover, age had no significant impact on the pain specificity of these facial responses. Furthermore, we found no significant age differences in self-report ratings of pressure and electrical pain, thus indicating that both age groups experienced comparable amounts of pain intensities. **Conclusion:** These findings suggest that the facial expression of pain, like facial expressions of other affective states, remains unchanged in older persons. Consequently, elderly individuals seem to communicate pain through their facial expression as validly as younger individuals do.

Keywords: Age; Emotional expressivity; Facial expression; Pain

Introduction

Old age has traditionally been viewed as being associated with a decline in emotion-expressive behavior [1,2], with elderly individuals being believed to show less frequent and less intense emotional expressions.

In accordance with this traditional view, the majority of findings of studies based on self-evaluation suggest a decline in emotional expressivity with age [3–5]. Elderly subjects were more likely to endorse statements such as "Whether I am happy or sad inside, I look pretty much the same" than were younger subjects. The interpretation of these results, however, is limited in so far as these studies relied mainly on self-evaluation measures of emotional expressivity. Since emotional expressivity has been defined as behavioral change that usually accompanies emotion [6], research including behavioral measures of emotional responses may provide more objective and valid measures of emotional expressivity than those research involving only self-evaluation.

As a behavioral measure of emotional response, facial expressions during elicited emotions (happiness, sadness, anger, and so on) were assessed in the majority of studies on age-related changes in emotional expressivity. Emotions were typically elicited by a relived emotions task or by using a film-based emotion induction. In most of these cross-sectional studies, no significant age effects on elicited facial responses were found [7–10]. The frequency and intensity of facial expressions of various emotions were comparable in young and elderly subjects. Only the findings of one study,

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where facial expressions of married couples were analyzed during a discussion of marital problems, pointed to an age-related decrease in facial expressions, with elderly subjects displaying less anger and disgust compared to younger subjects [11]. However, the age differences found were only small. Thus, the majority of empirical evidence based on behavioral measures of facial expression suggests that emotion-expressive behavior does not seem to decline in older persons, but that elderly individuals show the same capacity to express their emotions through facial responses.

Although the abovementioned studies have yielded important results regarding the impact of age on the expression of various emotions, the facial expression of pain, which is thought to have a strong emotional component, has not been investigated so far for age-related differences. Since there are several reasons for being interested in this topic, the neglect might appear surprising.

First of all, it seems very likely that age has an effect on the facial expression of pain. Pain is strongly associated with age, with pain prevalence increasing among elderly individuals [12]. This age-related increase in pain prevalence could suggest, on one hand, more practice and more reasons to signal pain by behavioral expressions. On the other hand, pain is considered an inevitable accompanist of advanced age, which does not seem worth mentioning and showing [13]. Accordingly, it can be expected that the facial expression of pain will be affected by the age-related increase in pain prevalence, although the direction of change is unclear. Another reason for studying the influence of age on the facial expression of pain is the great practical importance of facial expressions in the assessment of pain. It has been shown that the facial expression of pain is a reliable nonverbal pain indicator that plays a decisive role when judging another person's pain [14,15]. However, it is not known whether this is also applicable to the facial expression of pain in elderly individuals. Do elderly individuals communicate pain through their facial expression as validly and reliably as younger individuals do?

So far, empirical evidence on age-related changes in behavioral expressions of pain has been very scarce. Yong et al. [16], who investigated age differences in pain attitude (stoicism), reported that elderly subjects rated themselves as being more reluctant to show their pain to others compared to younger subjects (e.g., "I keep a 'stiff upper lip' when I am in pain"). However, these findings are only based on self-evaluation, and no behavioral measures of pain expressivity were taken. Moreover, research has been conducted on observers' impressions of pain severity when looking at the faces of young and elderly patients who were undergoing painful medical procedures [17,18]. Hadjistavropoulos et al. [17] reported that elderly patients (compared to younger patients) were perceived as experiencing more pain. However, it remains unclear whether the perception of more pain in elderly patients was due to objective changes in facial expressions or to stereotypes held by the observers. Thus, although some tentative findings regarding the relationship between age and the expression of pain have been reported, a systematic investigation of the behavioral expression of pain in older persons is still lacking.

In order to close this gap in the present cross-sectional study, we aimed to investigate the association of age with the facial expression of pain. Facial expression was quantified with the use of the Facial Action Coding System (FACS), which anatomizes facial action into single muscle movements. Specific clusters of these muscle movements have been repeatedly observed in situations associated with pain [19]. We were interested in two aspects: (a) whether there are age-related differences in the frequency and intensity of occurrence of these clusters of muscle movement during noxious stimulation (expressivity), and (b) whether age influences the specificity of activation of these clusters (specificity). Specificity of facial expression can be assumed if these clusters of muscle movement, but not the entire repertoire of muscle movements, are selectively activated during pain. Since empirical evidence on the influence of age on the facial expression of pain is scarce, it was not possible to deduce directed hypotheses. We assessed facial responses during noxious stimulation (electrical current and pressure) in young and elderly subjects. Additionally, we assessed self-report ratings of pain intensity.

Materials and methods

Subjects

Forty (♀, 20; ♂, 20) young subjects between the ages of 20 and 38 years (mean age, 24.1±3.2 years) and 61 (♀, 48; ♂, 13) elderly subjects[1] between the ages of 65 and 85 years (mean age, 72.3±5.6 years) participated in this study. The young subjects were recruited via advertisements posted in university buildings, whereas the elderly subjects were recruited among students of the Senior University at the University of Marburg. None had taken any analgesic medication for at least 24 h prior to the test session. Participants with any condition that could affect pain perception and pain report, such as diabetes, hypertension, peripheral and central neuropathy, and neurological and psychiatric disorders, were excluded from the study. A special focus was the reliable exclusion of elderly individuals with dementia. Prior to the experiment, a thorough neuropsychological and neurological examination [including testing of the cognitive (Mini Mental State Examination, Trail Making) and affective status (Geriatric Depression Scale), screening for psychiatric disorders (Short Interview for Psychiatric Disorders, MINI-DIPS), examination of the somatosensory system, testing of deep-tendon reflexes, autonomic testing, sural neurography, and so on] was

[1] All 61 elderly subjects completed the first block of pressure stimulation, whereas this number dropped to 51 during the second block of electrical stimulation.