

The Ability to Recognize Microexpression and Detect Deception in the Elderly

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Abstract—The ability to read other people's emotions among older people decline with age, which may result in weakened ability to detect deception. Microexpression is closely related to deception; and microexpression can be a valid cue to deception. Therefore, we hypothesized that there existed a positive correlation between microexpression recognition and deception detection in the older adults. To test the hypothesis, twenty-eight older adults (14 females, mean age = 70 years, SD = 6.2 years) were recruited for this study. They completed the tasks of the microexpression recognition and deception detection. The results showed that: (1) there was a positive correlation between fear macroexpression recognition and deception detection in the elderly ($r = 0.416, p = .028$); (2) the ability of the elderly to detect truth (i.e., truth detection, mean accuracy = 0.53) was significantly higher than the ability to detect deception (lie detection), $t(27) = 2.856, p = 0.008$; (3) there was significant main effect of type of emotional expressions ($F(2,25) = 11.721, p < .001$), specifically the accuracy of recognizing happiness was superior to every other emotions' accuracies of recognition; and (4) there were also significant differences between macroexpressions and microexpressions recognitions among the elderly ($F(1,26) = 113.918, p < .001$). The results suggested that, to some degree, there was a positive correlation between the ability to recognize expressions and detecting deception in the elderly, and some factors will modulate the relationship.

I. INTRODUCTION

Deception is defined as the deliberate attempting to mislead others [1]. Currently, research on deception detection mostly focus on the population of middle-aged and young people. However, studies of deception detection in the elderly is needed to understand the cause why the elderly is prone to be the victim of lies. With the inevitable advent of the aging society in China, the problem of elderly people being deceived is getting worse and it attracted more and more attention. Gao and Xu's study on the deception among the elderly [2] showed that 37.88% in the elderly had been cheated; and according to the survey, *The Status Quo of Legal Concepts and Rights Protection Consciousness of The Elderly*, which released by the Jinan Center for The Protection of The Elderly Against Fraud (<http://news.sina.com.cn/o/2018-01-09/docifyqinzt0741520.shtml>), 32.6% in the elderly had experienced fraud. The ability to read other people's emotions among older people declined with age, which may lead to weakened performance in detecting deception. From a practical perspective, understanding the underlying reasons why the older people are vulnerable to fraud may help older people to avoid scams. In addition, the deception detection provides a theoretical test to

explore the changes of higher cognitive functions such as detecting deception. The previous literatures have shown an age-related decline in detecting deception [1], we hypothesized the decline might be due to their poor recognition of emotional expressions and inability to use facial (micro)expressions as an effective cue to deception detection. Emotional expressions are important non-verbal behavior channel to express their inner feeling of emotions. There are two kinds of emotional expressions, i.e., macroexpressions (usually last for more than 0.5 second) and microexpressions (which often hard to be perceived by people, last for from 1/25 second to 1/5 second, some believed it lasting less than 1/2 second [3]), Microexpression indicated people's repressed real emotions, especially in the situation of high stakes, therefore, it is closely related to deception [4].

Previous studies showed that the accuracy of detecting deception for ordinary people is 54%, which is close to the chance probability of guessing [5, 6]. Some researchers speculated that the poor performance of deception detection was due to the incorrect utilizing of cues to deception detection (e.g., eye gaze avoidance). Researchers have kept trying to find effective clues to detect deception. Observing the non-verbal behaviors that people cannot control voluntarily is a way to find that kind of cues to deception. Microexpression is considered as one of the effective clues of deception for it can't be controlled voluntarily. While people deceiving others, especially in the high-stake situations, they will have higher stress and arousal, and feel fear of being discovered or guilt. These intensive inner emotional experiences will leak various emotional signals in the face. Cheaters will try to suppress these emotional signals reflecting deception, but they cannot completely suppress them, leading to the leakage of emotional signals (i.e., microexpressions) [7, 8], which make them appear to be dubious [5, 7].

The ability to recognize emotions is important to detect microexpressions (shame, fear, etc.). Nevertheless, older adult's ability to perceive other people's emotions decreases; meanwhile, their social cognitive abilities decline with age. Comparing the performance of expressions recognition of old adults with that of the young and middle-aged, the elderly performed much worse in the tasks of decoding facial expressions of discrete emotions [9], identifying mixed emotional expression of emotion [10]. Even controlled for visual perception, intelligence, researchers still found age-related decline in emotional expression recognition, which

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suggested that emotional expressions processing capability was influenced by aging [11].

The ability to recognize (micro)expressions is an important part of deception detection, and there exists age-related decline in emotion recognition. Consequently, the ability of older people to detect deception may be impaired. In this case, the older person will be unable to recognize the emotional cues in facial (micro)expressions that could be effective cues to deception [12]. Therefore, the relationship between microexpression recognition and deception detection in the elderly remains to be explored. In the current study, we aimed to find out: a) whether there exists a positive correlation between microexpression recognition and deception detection in the old people; b) whether the ability to detect truth (truth detection) is superior to detect deception (lie detection) in older adults, i.e., are old people also truth biased. If the ability of microexpression recognition and deception detection in older adults are positively correlated, the improvement of deception detection ability could be promoted by training them to recognize microexpressions, which will be exploring in the future.

II. METHOD

A. Participants

In this experiment, the recruited elderly people are over 60 years old, and can understand Chinese and recognize Chinese characters. Twenty-eight elderly participants (M=70 years, SD=6.2 years) were recruited, among them there were 14 females and 14 males, each participant received 20 RMB as payment for their participation. All participants in this study signed the informed consent form.

B. Materials

The experimental materials were presented by E-Prime 2.0 (Psychology Software Tools, Pittsburgh, PA, USA) and it was used as a data acquisition tool. The experimental program was used to investigate the microexpression recognition ability and deception detection ability of the participants, and was divided into four sub-parts, namely macroexpression recognition, dynamic microexpression recognition, the apex of microexpression recognition and deception detection (see Figure 1). In the part of macroexpressions recognition, there were 36 pictures of emotional expression selected from different racial and ethnic groups (Black, Asian, Caucasian); and 12 video clips of microexpressions, each of them lasting about 10 seconds (a fleeting microexpression lasting for less than 500ms was sandwiched between two same 5 seconds neutral expressions of the model in the microexpression), were presented in the part of microexpressions recognition; next, 6 pictures of the apex of the microexpressions showed; following by 16 videos without audio were presented and the participants were asked to judge that the characters lied or not. The Montreal cognitive assessment (MOCA) was administered to all participants at the end of the session.

C. Procedure

The participants completed the task on a computer using mouse response. Before the beginning of the experiment, the experimenter explained the policy of privacy, demonstrated

how to do the task, and told them that they had the right to terminate and quit the experiment anytime if they will.

A Sony computer with a 17-inch LED monitor running at a refresh rate of 60 Hz and the software package E-Prime was used for presenting stimuli and collecting data.

The collected data were output to Microsoft EXCEL software, and output to SPSS for further statistical analysis.

The procedure would take for approximately 40 minutes. The flow chart of the tasks can be seen in Fig. 1. First of all, the basic information was collected, secondly, the participants took tasks of macroexpressions recognition, dynamic microexpressions recognition, the apex of microexpressions recognition, and deception detection. There was a 5-minute break, followed by the MOCA test (See figure 1). In the parts of macroexpression recognition, dynamic micro expression recognition and apex of microexpressions recognition, the participants were asked to choose the appropriate answer in four options of happiness, fear, other and neutral by clicking mouse. In the part of deception detection, the participants were asked to watch 12 one-minute video clips (without audios), and judged whether the characters in videos lied or not by choosing the appropriate answer among three options of lied, honest and uncertain.

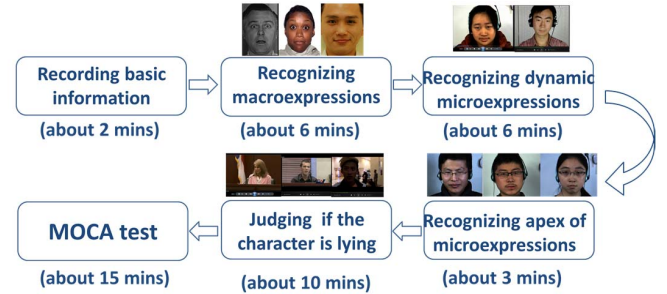


Fig. 1. Experimental procedures and samples of materials. The facial macroexpressions photos were selected from POFA (Caucasian models), NimStim (black models), and TFEID (Asian models) [13]; Microexpressions chosen from CASME II [14], and the video clips for detecting deception were selected from the real-life trial data [15].

III. RESULTS

In order to test the hypothesis, t-test and correlation analysis were employed, the results showed that: (1) there was no significant correlation between overall microexpression recognition (mean accuracy= 0.37) and deception detection (mean accuracy=0.33) of the elderly ($r=-0.081$). However, there was a positive correlation between fear macroexpression recognition and deception detection in the elderly ($r=0.416$, $p=0.028$); (2) the ability of the elderly to detect truth (truth detection, mean accuracy=0.53) was significantly higher than the ability to detect deception (lie detection), $t(27)=2.856$, $p=0.008$, the mean accuracies of the two conditions were shown in Fig.2; (3) there were significant main effects of type of emotional expressions ($F(2,25)=11.721$, $p<0.001$), specifically the ability to recognize happiness was higher than the ability to recognize other emotional expressions, the mean accuracies of this two conditions were shown in Fig.3; (4) There were also significant differences between macroexpressions and

microexpressions recognitions among the elderly ($F(1,26)=113.918, p<0.001$), the mean accuracies of the two conditions were shown in Fig.4. No significant correlation between the cognitive test (MOCA) scores and deception detection ability was found in the elderly.

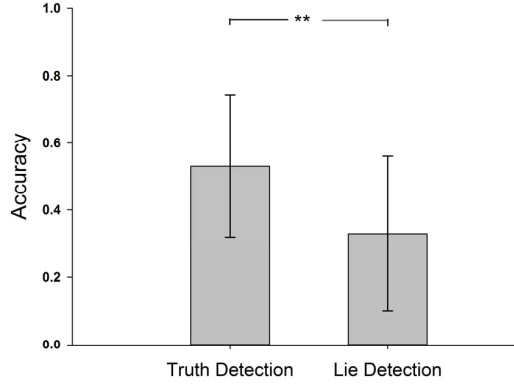


Fig. 2. Accuracies of truth detection and lie detection. Error bars represent ± 1 standard deviation (** $p<0.01$).

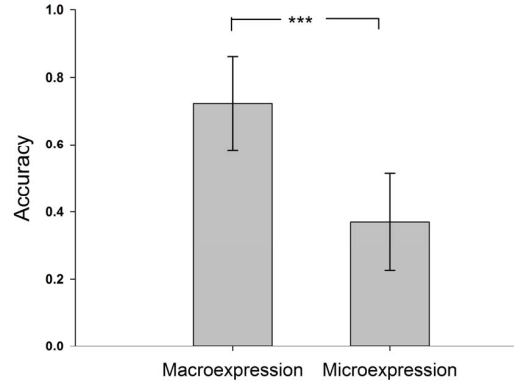


Fig. 3. Accuracies of macroexpressions and microexpressions recognition. Error bars represent ± 1 standard deviation (*** $p<0.001$).

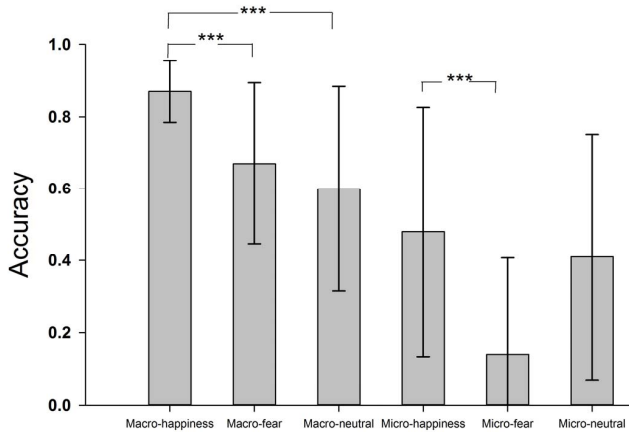


Fig. 4. Accuracies of recognition of different emotional expressions. Error bars represent ± 1 standard deviation (*** $p<0.001$).

IV. DISCUSSION

The aim of the current study was to determine if there existed a positive correlation between microexpression recognition and deception detection in the old people. The results indicated that there was no significant correlation between the microexpression recognition and deception detection, which did not supported the aforementioned claim that the ability to recognize microexpression was positively related to detect deception[8, 16]. Collapsing across all the accuracies of microexpressions recognition showed in Fig. 4, the results showed the mean accuracy of microexpression recognition of the elderly was 0.37, which is significantly lower than that of macroexpression recognition (mean accuracy = 0.72). There were some possible causes leading to this result. On the one hand, a floor effect might exist, we can see that the averaged accuracy of microexpressions recognition of the elderly was relatively poor. In the follow-up study, we should increase the sample size to confirm the result. On the other hand, because of the decline of capacity of emotion perception and attention in the elderly; moreover, the duration of microexpression (usually less than 200ms) was transient [8, 12, 16]; take them together, these factors make it difficult for the elderly in recognizing microexpression. Besides, the judging of whether the models in the video clips lied or not often required careful and patient observation, in the absence of enough motivation, the participants might invest not enough efforts on the judgment tasks, which could result in a low accuracy while making judgements. In the future study, we have to increase participants' patience and attention to the experiment task, for example, in the deception detection task, participants were rewarded for each correct answer.

The result showed that the fear macroexpression recognition ability of the elderly was positively correlated with their deception detection ability. When people lying, especially in high-stakes situations, they often had high levels of stress and arousal, felt fear (the fear of being discovered), joy (the pleasure of fooling someone else), and sometimes guilt. These intense inner emotional experiences would lead to various emotional signals in the body indicating the existence of deception [5, 7]. Fear, as a signal indicating the presence of deception, received better recognition in the older people could lead to better deception detection.

The result showed that the elderly's ability to detect truth was significantly better than their ability to detect deception, which was consistent with the previous studies. Old people had higher level of interpersonal trust which make them incline to believe other people[2], i.e., the truth bias existed in the old people who were more likely to trust others and make truth-biased judgments. In addition, several participants reported in their self-reports after the experiment that they made judgments not only based on the facial expressions of the models in the video clips, but also relied on the situations in which the models were. For example, when the models appeared in a trial, the participants didn't think they would lie on such a serious occasion, and they thought the models in such occasions were telling the truth.

The results showed that the happiness was the easiest to be recognized. The expressing and recognizing of happiness might

be the most developed ability. Researchers found that the earliest expressions in children was happiness [17]. These might be the cause that the mean accuracy of happiness recognition in both microexpression and macroexpression recognition is higher than that of other expressions recognition.

While analyzing the relationship between cognitive function (measured by the Montreal Cognitive Assessment) and the ability to detect deception, we found that there was no significant correlation between them. The not enough number of participants may partly explain this result.

This current study explored the relationship between the ability of microexpression recognition and the ability of deception detection in the elderly. The results found they had truth-biased while detecting deception, and they were better at recognizing happiness than other expressions. According to our results, we can conclude that older people who are good at recognizing fearful macroexpressions are less likely to be deceived. However, due to the incline of cognitive function and short duration of microexpression, the elderly may not notice the existence of microexpression, which make them cannot use it, consequently, it weakens their ability to recognize microexpression and detect deception. In the future, we will carry out more experiments to determine whether the processing speed will affect our results, which declined with age[18]. Much more studies are needed to explore the relationship between microexpressions recognition and deception detection.

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