Extraversion predicts individual differences in face recognition

Jingguang Li,†1 Moqian Tian,†1 Huizhen Fang,1 Miao Xu,† He Li1 and Jia Liu1,2,*

†State Key Laboratory of Cognitive Neuroscience and Learning; Beijing Normal University; and *Graduate University of Chinese Academy of Sciences; Beijing, China

These authors contributed equally to this work.

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Abbreviations: NEO PI-R, NEO personality inventory, revised; Raven APM, Raven’s advanced progressive matrices; FRA, face-specific recognition ability

In daily life, one of the most common social tasks we perform is to recognize faces. However, the relation between face recognition ability and social activities is largely unknown. Here we ask whether individuals with better social skills are also better at recognizing faces. We found that extraverts who have better social skills correctly recognized more faces than introverts. However, this advantage was absent when extraverts were asked to recognize non-social stimuli (e.g., flowers). In particular, the underlying facet that makes extraverts better face recognizers is the gregariousness facet that measures the degree of inter-personal interaction. In addition, the link between extraversion and face recognition ability was independent of general cognitive abilities. These findings provide the first evidence that links face recognition ability to our daily activity in social communication, supporting the hypothesis that extraverts are better at decoding social information than introverts.

Introduction

The ability to interact effectively in social environments is essential to success in everyday life. Because faces are arguably the most important social stimuli, the ability to correctly recognize faces is vital for social interaction. Individuals with better social skills may spend more time on people, which helps get better at recognizing faces. Consistent with this hypothesis, a recent behavioral genetic study has demonstrated substantial environmental influence on face recognition along with the genetic factor.1 On the other hand, deficits in face recognition, such as prosopagnosia (i.e., face blindness23), may lead individuals to suffer from psychosocial difficulties such as fear and avoidance of social situations.2 However, little effort has been dedicated to directly testing the relation between social activities and face recognition ability. Here, we ask whether individuals with better social skills have better face recognition ability.

Extraversion is chosen as a measure of one’s social skills. As one of the fundamental dimensions of personality, extraversion is often thought of as implying sociability that involves sensitivity to reward, positive emotions, sociability, assertiveness and high energy.3 Consistent with this hypothesis, a study using a portable recording device reveals that extraverts are more talkative and social than introverts.6 In fact, extraversion predicts effective cognitive-social functioning across a variety of domains from cognitive performance and social endeavors to social economic status. For example, extraverts are better at decoding nonverbal social information than introverts. In addition, extraversion reliably predicts social activities, such as alcohol consumption, popularity, parties attended, dating variety, exercise,9 social support seeking,9 marital satisfaction,10 and job performance in sales and management positions.11 Finally, extraversion is negatively correlated with social phobia12 and suicidality.13 In sum, extraverts are more socially skilled than introverts.

In this study, we examined whether extraversion predicts individual differences in face recognition. The accuracy in an immediate recognition memory task (i.e., the old/new task) on faces and flowers was used to calculate face-specific recognition ability, whereas the self-report score on extraversion dimension from the NEO Personality Inventory, Revised (NEO PI-R14) was used to measure social skills. General cognitive abilities (i.e., general intelligence or IQ) were measured by Raven’s advanced progressive matrices (Raven APM15). Using both extreme selection analysis16 and correlational analysis, we found that extraverts were better at recognizing faces than introverts, but not at recognizing non-social stimuli. Furthermore, the link between extraversion and face recognition ability was independent from IQ.

Results

The self-report scores on extraversion are shown in Figure 1A. The scores were normally distributed and there was no clear cut
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Facets would better predict the FRA than other extraversion facets. For example, the gregariousness facet of extraversion reflects the inter-personal interaction (e.g., “I like to have a lot of people around me”), whereas the excitement-seeking facet reflects the energy level of activity (e.g., “I like to be where the action is”). We predicted that only facets that are involved in inter-personal interaction could predict the FRA. Consistent with this prediction, we found a positive correlation between the gregariousness facet and the FRA ($r = 0.10$, $p = 0.03$) (Fig. 2A), with a positive correlation between the gregariousness and face recognition ability ($r = 0.10$, $p = 0.04$), but not between the gregariousness and flower recognition ability ($r = -0.03$, $p = 0.63$). In addition, other extraversion facets such as warmth, excitement-seeking, assertiveness, activity and positive emotion, were not correlated with the FRA (all $rs < 0.07$, all $ps > 0.1$). Therefore, it is apparently the inter-personal interaction, but not the extraversion in general, that links to face-specific processing.

Previous studies have shown that extraverts are better at decoding non-verbal communication information than introverts, and therefore the link between the gregariousness facet and the FRA may simply be derived from subjects’ general ability in discriminating socially interesting stimuli. In other words, might the link be due to the possibility that they were both correlated with the general intelligence? As shown in our previous study, there was no positive correlation between the FRA and IQ (measured by Raven’s APM) (Fig. 2B). Moreover, although the extraversion score was positively correlated with IQ ($r = 0.11$, $p = 0.03$), consistent with previous findings, the gregariousness facet was not ($r = 0.07$, $p = 0.11$) (Fig. 2B). The lack of a correlation of gregariousness facet with IQ is not a result of insufficient power, because other facets of extraversion, such as positive emotion facet, were positively correlated with IQ ($r = 0.15$, $p < 0.005$). Furthermore, with IQ controlled (i.e., regressed out), the partial correlation between gregariousness facet and the FRA remained.

The accuracy in recognizing faces was significantly higher in the extraverts than introverts [$t(41) = 2.37$, $p = 0.01$; effect size: Cohen’s $d = 0.26$] (Fig. 1B). However, there was no significant difference in recognizing flowers between the two groups [$t(41) = 0.26$, $p = 0.40$, Cohen’s $d = 0.03$]. The dissociation of extraverts versus introverts in recognizing faces versus non-face objects suggests that only the processing of socially important stimuli (i.e., faces) is associated with individuals’ social skills. In addition, the mean accuracy in recognizing faces of the whole subject population was between that of the introverts and the extraverts (population mean: 78%; introverts: 73%; extraverts: 79%), suggesting that the face recognition ability increases monotonically along the extraversion dimension. In fact, the extraversion score of the whole subject population was positively correlated with the face-specific recognition ability (FRA), indexed by the difference score between accuracy in recognizing faces versus flowers. This positive correlation was only found in the extraversion dimension ($r = 0.09$, $p = 0.06$), but not in other dimensions such as Conscientiousness, Neuroticism, Agreeableness and Openness to new experience (all $rs < 0.05$, all $ps > 0.2$).

Just as the FRA was more strongly associated with extraversion than other dimensions, it is likely that specific extraversion facets would better predict the FRA than other extraversion facets. For example, the gregariousness facet of extraversion reflects the inter-personal interaction (e.g., “I like to have a lot of people around me”), whereas the excitement-seeking facet reflects the energy level of activity (e.g., “I like to be where the action is”). We predicted that only facets that are involved in inter-personal interaction could predict the FRA. Consistent with this prediction, we found a positive correlation between the gregariousness facet and the FRA ($r = 0.10$, $p = 0.03$) (Fig. 2A), with a positive correlation between the gregariousness and face recognition ability ($r = 0.10$, $p = 0.04$), but not between the gregariousness and flower recognition ability ($r = -0.03$, $p = 0.63$). In addition, other extraversion facets such as warmth, excitement-seeking, assertiveness, activity and positive emotion, were not correlated with the FRA (all $rs < 0.07$, all $ps > 0.1$). Therefore, it is apparently the inter-personal interaction, but not the extraversion in general, that links to face-specific processing.

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the extraversion in general but the interpersonal interaction in particular that makes extraverts a better face recognizer. However, the link between extraversion and face-specific recognition ability does not specify the causal relation between these two variables. It is possible that individuals who spend more time on interpersonal interaction have more experiences with faces and/or are motivated to recognize faces. Therefore, the face recognition ability is improved because of the environmental influences. This hypothesis is consistent with our previous genetic study where we have demonstrated substantial environmental influence on face recognition. On the other hand, individuals with poor face recognition ability (e.g., individuals with prosopagnosia or Autism) may become introverts after recurrent and sometimes traumatic social interaction difficulties caused by face recognition problems. Finally, the link between extraversion and face recognition ability might be due to a third factor that modulates both of them. For example, the intranasal administration of a neuropeptide oxytocin not only improves the recognition of faces, but also increases trustworthy behaviors. In other words, because face recognition is highly interacted with daily social functions, it is possible that they might be evolutionarily co-developed and may have a shared neural and/or genetic basis. Future studies are needed to address causal link between extraversion and face recognition ability.

Method

Subjects. Three hundred and thirty-nine Chinese college students from Beijing Normal University participated in this study.
(139 males, 200 females; age = 20.4 years, SD = 0.9). All subjects had normal or corrected-to-normal visual acuity and received monetary compensation. Two subjects who did not participate in the Raven APM test were excluded from further analysis. The study was approved by the IRB of Beijing Normal University. Prior to testing, written informed consent was obtained from the subjects.

Procedure. The recognition task was conducted in computers with Matlab and the psychophysics toolbox.21 The NEO PI-R scale and Raven APM test were paper-based. Each subject completed the NEO PI-R scale and Raven APM on the same day, and then the recognition task on a separate day.

NEO PI-R. NEO Personality Inventory Revised is a 240-item self-report inventory which permits differentiated measurement of each Big Five dimension along with six more specific facets per dimension.14 The inventory has substantial internal consistency, temporal stability, and convergent and discriminant validity. One hundred and twenty items were used in this study to reduce the length of testing while maintaining the reliability and validity of the inventory. The items were translated into Chinese for the ease of comprehension. Although the Chinese language does not clearly reproduce the English Big Five and several differences remain, previous studies have shown that the indigenous Chinese personality dimensions overlap considerably with the Big Five dimensions.24 The internal consistency (Cronbach’s alpha) for each subscale ranged from 0.75 to 0.89. The extraversion dimension is based on 24 items scored from 1 (least agreeable) to 5 (most agreeable).

Raven APM. Raven advanced progressive matrices contains 48 multiple-choice items of abstract reasoning where subjects are asked to identify the missing segment required to complete a larger pattern.21 Because the subjects were highly homogeneous, the raw score of the test was used as a measure for general cognitive abilities.

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