The Effects of Psychiatric Traits on Face Perception

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Abstract

Psychiatric disorders like depression and anxiety can always lower patients' life quality and affect their cognition. Moreover, different degrees of depression and anxiety may also affect people from normal population on their perception of different stimuli in social life. Here we use face, containing high dimensional social information, to measure how depression and anxiety states can affect people's perception of the social information conveyed by faces. We asked participants to view and rate faces on social traits, rate faces in different social scenarios and participated in economic games. While more research still needs to be done, we have found that a rater's degree of depression and anxiety are significantly negatively correlated with their perception on trustworthiness and intelligence of faces, and different degree of depression and anxiety are also negatively correlated with how people perform in prisoner dilemma and trust game. More analysis combining with models still needs to be done, but the current results suggest anxiety and depression probably affect not only cognition, but also how people perceive social stimuli.

Introduction

As a type of complex stimuli with high dimensional social information, face has been widely studied in the field of computational modeling. Face has been found to contain attribute memorability (Bainbridge et al., 2013). Face are important for social interaction (Zebrowitz & Montepare, 2008). We see faces every day, and face can always give us the first impression for a person.

Some researchers have been studying the effects of depression and anxiety on face perception. For example, Langenecker and his colleagues (2015) at University of Michigan have found that non-depressed women more often incorrectly rate emotional faces as happy faces compared to depressed women. Chen and his colleagues (2017) in China have found that teenagers with addiction to the Internet tend to have deficits in recognizing disgust. Moreover, psychiatric traits have been found to affect not only perception of emotion, but also judgement of social traits. For example, Willis and his colleagues (2013) from universities in Australia have shown people with trait anxiety tend to rate faces as untrustworthy when the face stimuli involve ambiguity. Adolphs and his colleagues (2001) found that autism patients tend to rate unfamiliar faces as more trustworthy and approachable compared to the normal population. While these studies are significant and supporting each other, most

of the current research in this field has been focusing only on perception of emotion and trustworthiness. And most of them have been focusing on effects from depression and anxiety, excluding other important psychiatric traits and mental states, such as PTSD, stress, anger, etc.

In this project, we try to explore how different psychiatric traits and mental states affect the perception of face-based social traits, and how psychiatry and different states can affect people's behavior in different scenarios and economic games.

Method

Participants participated in three major tasks involving face perception and completed a PHQ-4 questionnaire, which is a standard questionnaire for state anxiety and depression (Lowe et al., 2010). We also collected basic demographical information from each subject, including age, gender, and ethics.

Stimuli

We used 120 facing-forward face images selected from 10k US Adult Dataset (BainBridge, 2013). 52 of the images were used for main experiment A, B and C. The rest were used as practice images. Practice images did not overlap with any main experiment images.

Participants

Participants were recruited from the SONA system, a volunteer system at University of California, San Diego. They received course credits. 471 students participated in the experiment.

Experimental Design

Participants were seated in a quiet room in front of a computer. Experiment was held on MATLAB. Each subject participated in three major tasks, including social traits rating, decision making in social scenarios, and economic games. The tasks were counterbalanced to reduce sequential effects. Structure of experimental design is shown in Figure 1.

Figure 1: structure of the experiment. The order of three tasks are counterbalanced. For each task, there are practice trial, and then the main trials.

In each single trial, response time was limited to be within 5 seconds. Participants made response with keyboard keys from 1 to 9.

Social traits rating

Each participant rated 6 social traits for each of the 52 images, including attractiveness, dominance, emotional-ness, intelligence, memorability, and trustworthiness. 52 faces were displayed for each trait. The order of traits was randomized for each participant to reduce order effects. One sample trial is shown in figure 2a.

Decision making in social scenarios

We asked 5 questions about different social scenarios, including dating app, job applicants, eyewitnesses, election, and standard motorists. Questions are attached in the appendix. One sample trial is shown in figure 2b.

Economic Game

Each subject participated in 3 economic games, including ultimatum game, prisoner's dilemma, and trust game. One sample trial is shown in figure 2c.

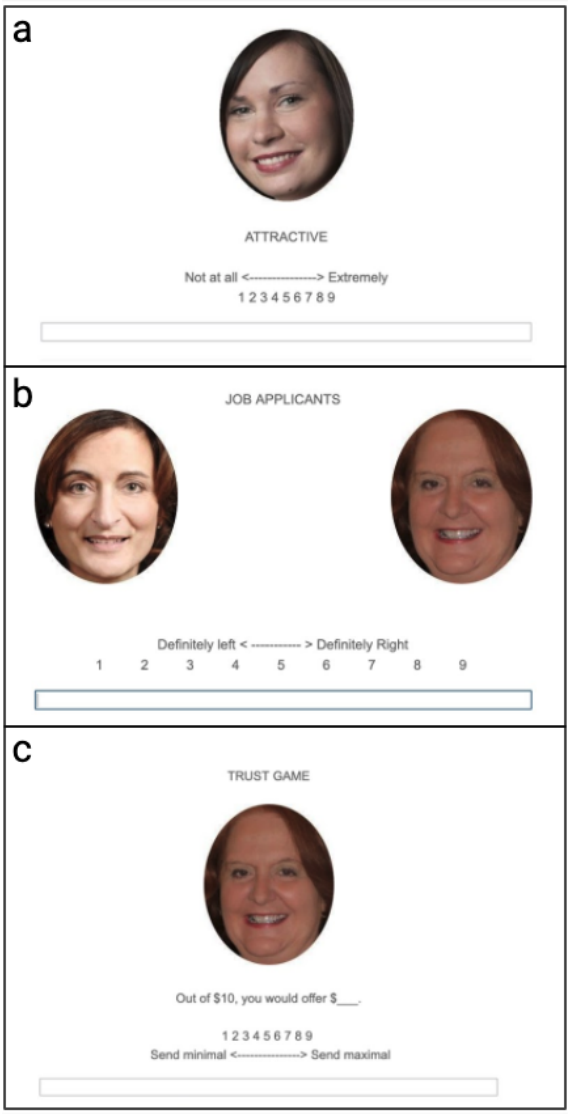

Figure 2: experimental design. A shows one trial of rating attractiveness in social traits rating. B shows one trial of job applicants in social scenario decision making. C shows one trial of trust game in economic game tasks.

Results

We have collected 473 complete subject responses so far. Figure 3 shows the distribution of their anxiety and depression scores.

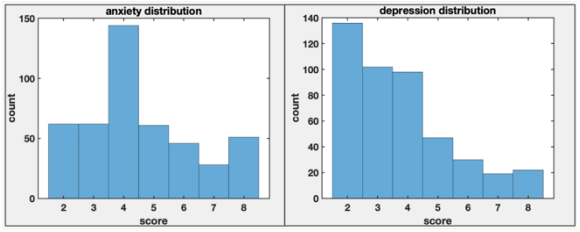

Figure 3: the distribution of anxiety and depression scores. The psychiatric survey contains four questions in total, two for anxiety and two for depression. For each question, the possible score ranges from 1 to 4. 4 repents being anxious/depressed almost every day during the past few weeks, 1 means not at all. We added two questions together for each trait. So, for each trait, the possible scores were from 2 to 8. As shown, most students were not depressed, while most students were sometimes anxious during the past two weeks before they did the experiment. There are relatively enough number of participants covering each possible depression and anxiety score.

We then calculated the correlation between score from each trait/scenario/game and anxiety/depression score separately. Shown in figure 4, we found there was a negative correlation between trustworthiness and anxiety ($r = -0.1146$, $p < 0.05$); trustworthiness and depression ($r = -0.1667$, $p < 0.05$); intelligence and anxiety ($r = -0.1113$, $p < 0.05$); intelligence and depression ($r = -0.1208$, $p < 0.05$); prisoner's dilemma and anxiety ($r = -0.1074$, $p < 0.05$); prisoner's dilemma and depression ($r = -0.1401$, $p < 0.05$); trust game and anxiety ($r = -0.1074$, $p < 0.05$); and trust game and depression ($r = -0.1401$, $p < 0.05$).

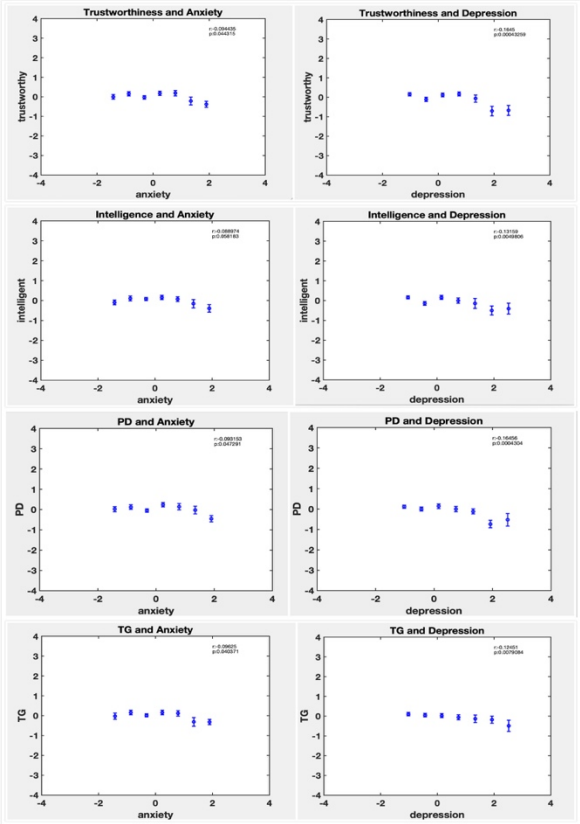

Figure 4: correlation between selected traits/games and anxiety/depression. The traits and games selected here are the ones with significant correlation. Trait/game score was calculated by averaging across all the images for each subject.

Then, we calculated the correlation between each trait/game and anxiety/depression. We found significant correlation between anxiety and the correlation coefficients of emotional-ness and prisoner's dilemma ($r = -0.85$, $p < 0.05$); between anxiety and the correlation coefficients of emotional-ness and trust game ($r = -0.78$, $p < 0.05$); between depression and the correlation coefficient of attractiveness and trust game ($r = -0.44$, $p < 0.05$); between depression and the correlation coefficient of attractiveness and ultimatum game ($r = -0.79$, $p < 0.05$); between depression and the correlation coefficient of emotional-ness and prisoner's dilemma ($r = -0.91$, $p < 0.05$); between depression and the correlation coefficient of emotional-ness and trust game ($r = -0.86$, $p < 0.05$); between depression and the correlation coefficient of intelligence and prisoner's dilemma ($r = -0.84$, $p < 0.05$); between depression and thee correlation coefficient of trustworthiness and prisoner dilemma ($r = -0.80$, $p < 0.05$); between depression and the correlation coefficient of trustworthiness and trust game ($r = -0.93$, $p < 0.05$). These negative correlations suggest it is possible that when a person is more depression or anxious, he will utilize some of these traits less to direct his decision for economic games.

Discussion

Overall, we have found significant effects on face perception from different degree of depression and anxiety. We are not sure if the difference is systematic across all the faces or due to some certain face features. Further analysis on individual faces data combining with lab face model needs to be taken (Guan et al. 2018).

We also need to continue collecting data with more comprehensive psychiatric questionnaires that contain some psychiatric traits and mental states assessments.

This study will help understand, diagnose, and treat people with psychiatric disorders. It will also help reveal how people make social decisions and judgements of other people based on facial appearance.

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Appendix

Decision making in social scenarios

These questions were used in social scenario decision making tasks.

Stranded motorists:
Suppose two drivers are standing next to broken-down cars on the side of the highway. Which of them would you be more willing to help?

Dating app:
Suppose two people on a dating app sent you a greeting message. Which of them would you (or your friend of the appropriate sexual orientation) be more willing to respond to?

Job Applicants:
Suppose you represent a company at a job fair, and two individuals approached you to discuss job openings. Which of them would you more willing to talk to?

Eyewitnesses:
Suppose two people are eyewitnesses of a gas station robbery and gave contrary accounts. Which of them would you be more willing to believe?

Election:
Suppose two people are candidates for a state-wide election. Which of them are you more likely to vote for?