



Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Gender differences in the relationship between attentional bias to threat and social anxiety in adolescents [☆]

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ARTICLE INFO

Article history:

Received 16 April 2014

Received in revised form 3 July 2014

Accepted 21 July 2014

Available online 23 August 2014

Keywords:

Adolescence
Attentional bias
Social anxiety
Gender differences

ABSTRACT

In the current study, gender differences in the relationship between attentional bias to threat and social anxiety were tested in 10- to 16-year-olds. Emotional faces were used as the experiment material, and a modified dot probe task was used to measure attentional bias. The level of social anxiety, depression, and loneliness were also measured via the Social Anxiety Scale for Children, Children's Depression Inventory, and Children's Loneliness Scale. Results indicated that males' attentional bias to threat was significantly, positively correlated with their social anxiety, yet no correlation was found for females. For adolescents, the gender differences in the relationship between attentional bias to threat and social anxiety was notable.

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1. Introduction

Social anxiety disorder, or social phobia, is the most common anxiety disorder, with a lifetime prevalence of 12.1% (Beidel & Turner, 2007; Kessler et al., 2005; Rosenberg, Ledley, & Heimberg, 2010). Social anxiety can severely weaken social functioning, and trigger sleep disorders, depression, mood disorders, and suicidal ideation and other psychological disorders (Buckner, Bernert, Cromer, Joiner, & Schmidt, 2008a; Buckner, Eggleston, & Schmidt, 2006; Buckner et al., 2008b; Kessler, Stang, Wittchen, Stein, & Walters, 1999). Adolescents suffer more social pressure and intense emotional experiences, which makes them more prone to social anxiety (Casey et al., 2010). According to a survey, about 7% of adolescents were vexed at social anxiety (Chavira, Stein, Bailey, & Stein, 2004). Social anxiety weakened social and academic functioning in adolescents, as well as decreased their quality of life and put them at risk for the development of other mental disorders in adulthood (Brozovich & Heimberg, 2008; Mychailyszyn, Méndez, & Kendall, 2010; Woodward & Fergusson, 2001).

Attentional bias to threat-relevant information is an important factor that is known to trigger social anxiety experiences (Mogg, Philippot, & Bradley, 2004; Schultz & Heimberg, 2008). Specifically, researchers believe that those with social anxiety are more inclined to be attracted to threat-relevant information (Hofmann, 2007; Mogg & Bradley, 2002; Rapee & Heimberg, 1997). For instance, Mogg and Bradley (2002) used the modified dot probe task with 100 20-year-olds and reported that individuals with high social anxiety showed attentional alerting to threat-relevant information. Some researchers have suggested that it is difficult for individuals with social anxiety to disengage their attention from negative social cues, which is a consequence of their attentional bias to threat-relevant information (Amir, Elias, Klumpp, & Przeworski, 2003; Cisler & Olatunji, 2010; Moriya & Tanno, 2011; Yiend & Mathews, 2001). For instance, Amir et al. (2003) used the space clues task with a sample of 18 patients with social anxiety disorder and 20 without social anxiety disorder. They reported that cue dependency to threat-relevant information of patients with social anxiety disorder was significantly higher than the non-clinical participants; however, no significant differences were observed between the two groups for the neutral and positive stimulus cues. Moreover, Buckner, Maner, and Schmidt (2010) examined eye movement in 46 non-clinical individuals and identified that individuals with high social anxiety had difficulty disengaging their attention from negative social cues.

Few studies have examined gender differences in this relationship. Some evidence has indicated that variations in emotion vulnerability and emotional processing exist between men and

[☆] Role of funding sources: This work was supported by The National Natural Science Foundation of China (31300838), The Young Teacher Research Capacity Advancement Program of Northwest Normal University (SKQNYB12009) and Open Research Fund of the Beijing Key Lab of Applied Experimental Psychology.

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women, where recognition and processing of emotional stimuli may differ between males and females (Collignon et al., 2010; Flores-Gutiérrez et al., 2009; Li, Yuan, & Lin, 2008b; Mak, Hu, Zhang, Xiao, & Lee, 2009; McRae, Ochsner, Mauss, Gabrieli, & Gross, 2008). Therefore, it seems that the onset and development of social anxiety may differ for males and females. Furthermore, neuroscience research suggests that individuals may process emotions through low-road and high-road when receiving threatening signals (Ledoux, 1995, 2003). Importantly, males have low-road superiority, while females possess high-road (Morris, Öhman, & Dolan, 1999). Low-road superiority refers to individuals who tend to respond directly after accepting relevant-threat information. High-road superiority refers to deep processing combined with the internal environment after encountering relevant-threat information (Ledoux, 1995). Thus, in the face of relevant-threat emotional stimuli, men will quickly experience social anxiety, while women may not immediately feel socially anxious since this process is regulated by internal factors such as mood and self-evaluation. Therefore, we assumed that males' attentional bias when encountering relevant-threat emotional stimuli would be positively associated with social anxiety; however, we did not expect the same correlation to emerge for females.

To test this hypothesis, we selected adolescents aged 10–16 years as the subjects. We used the Chinese version of the Children's Social Anxiety Scale to examine level of social anxiety, as well as an modified dot probe task to measure attentional bias to relevant-threat information. The dot probe task is the most widely used paradigm in the field of attentional bias (MacLeod & Holmes, 2012). In addition, we chose emotional face pictures as the stimuli, which is consistent with stimuli during social situations; therefore, this procedure is ecologically valid. Moreover, in order to examine the influence of depression and loneliness on the results, we also administered the Chinese version of the Children's Depression Inventory and the Children's Loneliness Scale to measure subjects' depression and loneliness.

2. Material and methods

2.1. Participants

All participants were in grades fourth to sixth in a primary school in Gansu province. We distributed 125 copies of the following questionnaires: the Children's Social Anxiety Scale, the Children's Depression Inventory and the Children's Loneliness Scale, a total of 109 valid questionnaires were received. Ninety-two children volunteered and took part in the study; these participants had their guardians sign the informed consent forms. All participants were of Han nationality and were 10- to 16-years-old, with normal vision and corrected visual acuity. All subjects were right-handed and had no history of color blindness, neurological problems, or psychotherapy. The experimental protocol was approved by the Northwest Normal University Psychological Experiment Ethics Committee.

2.2. Measures

2.2.1. Social Anxiety Scale for Children

The Social Anxiety Scale for Children (SASC) was used herein. This scale was developed by La Greca, Dandes, Wick, Shaw, and Stone (1988) and contains 10 items rated on a 3-point scale (0 = never; 1 = sometimes; 2 = always). Children's anxiety was assessed on a scale of "0" to "20", with higher scores indicating more severe social anxiety. Two dimensions were included in the scale: negative evaluation (items 1, 2, 5, 6, 8, and 10) and social avoidance and vexation (items 3, 4, 7, and 9). The verified Chinese

version of the Social Anxiety Scale for Children has reported sound reliability and validity (Li, Su, & Jin, 2006).

2.2.2. The Children's Depression Inventory

The Children's Depression Inventory (CDI) was used herein and contained 27 items rated from 0 to 2 points (Saylor, Finch, Spirito, & Bennett, 1984). Scores ranged from 0 to 54, and higher scores indicate higher levels of depression. The Chinese version of the Children's Depression Inventory yields indices of good reliability and validity (Wu, Lu, Tan, & Yao, 2010).

2.2.3. The Children's Loneliness Scale

The Children's Loneliness Scale (CLS) was used to measure subjects' loneliness (Asher, Hymel, & Renshaw, 1984). Twenty-four items on the scale can be used to assess loneliness in children from the third to sixth grade. Sixteen items measure students' loneliness, social adaptability, and adaptation; in addition, ten items assess solitude and six items measure a lack of loneliness. Eight items were added about extracurricular activities and personal preferences in order to encourage candid and relaxed responses. The items are rated on a scale from 1 to 5 (1 = always; 2 = often; 3 = sometimes; 4 = very little; five = no). Ten items expressing solitude were reverse scored (3, 6, 9, 12, 14, 17, 18, 20, 21, 24), the total score ranged from 16 to 80 points, with higher scores indicating greater loneliness. The Chinese version of the Children's Loneliness Scale (CLS) has been validated and demonstrated good reliability and validity (Gao & Chen, 2011).

2.2.4. The dot probe task

From the Chinese Affective Picture System we chose pictures of happy, neutral and disgust faces of fourteen people as the stimuli (Bai, Ma, Huang, & Luo, 2005). The proportion of male and female pictures was evenly distributed (50%). Six pairs displayed happy (arousal, $M = 7.2$, $SD = 0.1$) and disgust ($M = 7.2$, $SD = 0.5$) faces; the remaining 16 pictures were neutral faces ($M = 5.2$, $SD = 0.1$). We adopted Photoshop 7.01 simplified Chinese edition to process the face picture into 10.8 cm × 12.7 cm with same brightness (black and white).

Participants completed the questionnaires in a quiet and spacious classroom with the help of a research assistant. The questionnaires were pencil-and-paper tests; three of the questionnaires were randomly presented to the participants. At the end of 14.7 ($SD = 1.14$) days, we measured the participants' attentional bias to threat-relevant information using the modified dot probe task developed by Macleod (MacLeod, Mathews, & Tata, 1986). All participants entered the 15-m² laboratory that was appropriately lighted, and were seated in a comfortable chair; their hand was lightly placed on the mouse. The instructions were then repeated and subjects completed a practice task by clicking the "Q" key. After the presentation of the emotion faces, participants were required to discriminate the letters that appeared as quickly and accurately as possible. Each trial began with a 500 ms fixation point that was presented centrally on a black background. It was followed by a randomized blank screen presented within 400–800 ms. Two emotional face stimuli of the same person remained on the screen for 500 ms. After the face stimulus disappeared, a blank screen was presented randomly between 400 and 800 ms. Probe point ("E" or "F") randomly appeared where one of the face stimuli was located. We asked participants to discriminate the type of probe points by clicking the left ("E") or right ("F") mouse button. The offset of the probe point for the next trial began after one second. Two neutral face stimuli of the same person were presented during the practice task, and were repeated twice. Thus, there were eight people and 16 (2 repetition × 8 person) trials in all. If accuracy was lower than 90%, subjects returned to the practice session. Each participant had three practice opportunities, or

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