Cultural Differences in Adult Attachment and Facial Emotion Recognition

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# Contents

## Abbreviations

## 1 Introduction

1.1 Issues .................................................................................................................. 1

1.2 Attachment and facial emotion recognition .......................................................... 3

1.3 Individualism and collectivism ............................................................................. 4

1.4 Cultural differences in attachment ....................................................................... 5

1.5 Cultural differences in facial emotion recognition .................................................. 7

1.5.1 Individualism vs. collectivism in cross-cultural differences of facial emotion recognition ...... 8

1.5.2 Display rules and decoding rules ..................................................................... 9

1.5.3 Dialect theory of emotion .............................................................................. 10

1.5.4 Cultural exposure effect of emotion ................................................................ 12

1.6 Exploration and attachment .............................................................................. 13

## 2 Basic theory and literature review

2.1 Attachment theory .................................................................................................. 16

2.1.1 Internal working models ................................................................................. 16

2.1.2 Adult attachment theory and measurements ..................................................... 17

2.1.2.1 Self report ................................................................................................... 17

2.1.2.2 Attachment interviews .............................................................................. 21

2.2 Universal arguments on adult attachment .............................................................. 22

2.2.1 Universality of the attachment system .............................................................. 22

2.2.2 Adult attachment differences between Eastern and Western cultures .................. 24

2.2.3 Adult attachment studies in China .................................................................... 24

2.2.4 Adult attachment studies in Germany .............................................................. 29

2.3 Emotion recognition theory .................................................................................. 31

2.3.1 Basic emotions ................................................................................................ 31

2.3.2 Emotion recognition research paradigm .......................................................... 34

2.4 Cross-cultural studies on emotion recognition ...................................................... 35

2.4.1 Universality of emotion recognition .................................................................. 36

2.4.2 Facial emotion recognition in Eastern and Western societies .............................. 36

2.4.3 Studies on the cultural exposure effect .............................................................. 40

2.5 Adult attachment and facial emotion recognition ............................................... 40

## 3 Hypotheses ........................................................................................................... 43

## 4 Empirical studies ................................................................................................ 45

4.1 Survey of adult attachment pattern for three groups: CC, CG and GG (Study 1) .......... 45

4.1.1 Materials and methods .................................................................................... 45

4.1.1.1 Participants ................................................................................................ 45

4.1.1.2 Measurements ........................................................................................... 46

4.1.2 Results ............................................................................................................ 49

4.1.2.1 Results for RQ ......................................................................................... 49

4.1.2.2 Attachment anxiety and attachment avoidance (ECR-R results) .................... 52

4.1.3 Discussion .................................................................................................... 53
4.2 Cultural differences in adult attachment and emotion recognition (Study 2) ........................................ 56
  4.2.1 Materials and methods ................................................................................................................. 56
  4.2.1.1 Participants ................................................................................................................................. 56
  4.2.1.2 Measurements ......................................................................................................................... 57
  4.2.2 Results ........................................................................................................................................ 59
    4.2.2.1 Results for RQ ....................................................................................................................... 59
    4.2.2.2 Attachment anxiety and attachment avoidance (ECR-R results) ........................................ 61
    4.2.2.3 Facial emotion recognition in the three groups ................................................................. 62
    4.2.2.4 Correlation and regression analyses for adult attachment and facial emotion recognition ...................................... 65
  4.2.3 Discussion ................................................................................................................................. 67
    4.2.3.1 Adult attachment in the three groups ................................................................................ 67
    4.2.3.2 Emotion recognition in the three groups ................................................................. 69
    4.2.3.3 Adult attachment and facial emotion recognition ............................................................. 72
  5 Summary and Conclusion ................................................................................................................. 74
    5.1 Adult attachment ......................................................................................................................... 74
    5.2 Emotion recognition .................................................................................................................... 75
    5.3 Adult attachment and emotion recognition ......................................................................... 76
  6 Limitations of the present study and implications for future research ................................................. 78
  7 References ....................................................................................................................................... 80
  9 Acknowledgements ......................................................................................................................... 96
  8 Curriculum Vitae ............................................................................................................................ 97
### Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAI</td>
<td>Adult Attachment Interview</td>
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<td>AAP</td>
<td>Adult Attachment Projective Picture System</td>
</tr>
<tr>
<td>CC</td>
<td>Chinese Living in China</td>
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<tr>
<td>CG</td>
<td>Chinese Living in Germany</td>
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<tr>
<td>ECR</td>
<td>Experiences in Close Relationships</td>
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<tr>
<td>ECR-R</td>
<td>Experiences in Close Relationships – Revised</td>
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<tr>
<td>FACS</td>
<td>Facial Action Coding System</td>
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<td>FEEL</td>
<td>Facialy Expressed Emotion Labeling</td>
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<td>GG</td>
<td>Germans Living in Germany</td>
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<tr>
<td>IWM</td>
<td>Internal Working Model</td>
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<tr>
<td>JACFEE</td>
<td>Japanese and Caucasian Facial Expressions of Emotions</td>
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<td>JACNeuF</td>
<td>Japanese and Caucasian Neutral Faces</td>
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<td>PFA-U</td>
<td>Pictures of Facial Affect-Ulm</td>
</tr>
<tr>
<td>RQ</td>
<td>Relationship Questionnaire</td>
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<tr>
<td>RMET</td>
<td>Reading the Mind in the Eyes Task</td>
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<td>SS</td>
<td>Strange Situation</td>
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1 Introduction

1.1 Issues

Both attachment and emotion theorists emphasize the important interaction between an attachment system and facial expressions for emotions in an individual's development (Bowlby 1977; Ekman 1992; Tomkins 1991). However, a few studies have investigated the relationship between attachment and facial emotion recognition. One study indicated that early attachment predicts emotion recognition in children, but the early attachment system has less influence on the ability of to recognize facial expressions for emotions when children grow up (Steele et al. 2008). While, in adulthood, does the adult attachment system correlate with the ability to judge the facial expressions of emotion? Previous studies indicate that adult attachment orientations influence an individual’s encoding and decoding of facial expressions (Dewitte Koster, De Houwer and Buysse 2008; Fraley et al. 2006; Magai, Hunziker, Mesias and Culver 2000; Meyer 2009; Fizke 2010; Mogg, Garner and Bradley 2007; Niedenthal 2002; Suslow 2010; Sonnby-borgström and Jönsson 2003; 2004), but the results varied. These inconsistent results may be due to various foci of researchers on this topic and the adoption of different experimental stimuli and paradigms. Therefore, in the present study, the major aim was to investigate the relationship between adult attachment and facial emotion recognition, in particular, among Chinese and German participants.

However, recent cross-cultural researches on the topic of the attachment system and the ability to recognize facial expressions of emotions have been independently conducted. Nowadays, researchers take an intermediate position to acknowledge that attachment and the facial expression of emotions are both universal and culturally related. An individual’s cognition, behavior and emotions are influenced by his or her cultural background (Ekman 1992; Ekman, Sorenson and Friesen 1969; Elfenbein, Ambady 2002; 2003b; Main 1990; Sagi, Van IJzendoorn and Karie 1991; Schmitt et al.
INTRODUCTION

2004; Van IJzendoorn and Bakermans-Kranenburg 2010; Wei 2004). In the present study, the cultural similarities and differences between China and Germany on the attachment system and the recognition of facial emotions have been explored.

Specifically, Chinese students living in Germany were included in this study as a special subject group. It is noteworthy that the number of Chinese students in Germany rapidly increased from 4760 in 1999 to 22,828 in 2011, and is still increasing. In 2010, China topped the list of the top-20 most common countries of origin among students studying in Germany (Jianni 2012). However, a limited number of studies have focused on overseas students in the field of attachment and facial emotion recognition. Previous studies indicated that the attachment system and the ability to recognize facial emotions of overseas individuals influence their levels of psychosocial adjustment and psychological distress (Wang and Brent 2006; Yoo, Matsumoto and LeRoux 2006). Thus, there is an urgent need to investigate the attachment system and the ability of Chinese students living in Germany to recognize the facial expressions of Germans. Compared to their Mainland Chinese peers, Chinese exposed to German culture may have a different adult attachment system and perform better on facial emotion recognition on German faces.

Accordingly, three populations were included in the present study, namely, Chinese living in China (CC), Chinese living in Germany (CG) and Germans living in Germany (GG). In this dissertation, three issues were explored: a) whether the attachment system influences an individual’s ability to recognize facial emotions; b) the universality and cultural specificity of the adult attachment system and facial emotion recognition between Chinese and Germans; and c) the adult attachment system and the ability of Chinese living in Germany to recognize the expressions of German facial emotion expressions.

In this chapter in order to provide an overview of the background for our studies, theories and studies regarding attachment and facial emotion recognition most
related to this dissertation are briefly introduced. The basic theories and the details of previous studies are described in Chapter 2.

1.2 Attachment and facial emotion recognition

Facial communication is a special interest in the formation of attachment. Bowlby (1977) highlighted the role of emotions in the development of attachment relationships. Emotion theorists correspondingly emphasized the importance of attachment on an individual’s development of emotional expressions. For example, Tomkins (1991) suggested that one of the most potent stimuli involved in emotional learning during childhood is the primary caregiver’s emotionally expressive face; Ekman (1992) proposed the involvement of facial emotion in the formation of an attachment system, which has a crucial influence on the development and regulation of personal relationships.

An individual’s emotional reaction to a face can be assumed to be the result of a comparison of incoming information with a prototypical representation of the maternal face stored in the internal working model (IWM). Shaver and Mikulincer (2002) emphasized that IWMs reflect the underlying regulatory actions of attachment strategies that shape an individual’s cognition, affect and behavior. Specifically, the cognitive representation plays an important role on emotion recognition (Anthony, Copper and Mullen 1992). In terms of attachment anxiety and avoidance, individuals with high attachment anxiety tend to adopt hyper-vigilant strategies towards negative emotional stimuli, while individuals with high attachment avoidance tend to avoid those stimuli (Cooper et al. 2009; Dewitte and De Houwer 2008; Maier et al. 2005).

Although theorists have stressed the relationship between attachment and the perception of facial expressions, limited research has focused on this topic over the past decade. One noteworthy study (Steele et al. 2008) found that the correlation between early attachment (infant–mother attachment) security and the ability to recognize the facial expression of emotions was positive and significant (p < 0.001) in children at 6 years old, but the correlation was reduced when the child was 11 (p < 0.10). Their study indicated that the early attachment system has less influence on the
ability to recognize facial emotions when children grow up. Yet, in adulthood, does the adult attachment system correlate with the ability to judge the facial expression of emotions?

Few studies have indicated that there was some relationship between the adult attachment system and the recognition of facial emotions. But, the results have varied because researchers had different foci on this topic. These studies are described in Chapter 2 below.

1.3 Individualism and collectivism

In the present study, the cultural similarities and differences between Chinese and Germans on attachment systems and facial emotion recognition are explored. Individual and collective formulations were used to explain the cultural and individual differences on many aspects, and, in particular, help us to understand the similarities and specificities of attachment behavior and facial emotion recognition among cultures and individuals (Triandis 2001).

Individualism describes a model in which people act independently and autonomously. Individualists pursue self-relevant goals and concentrate on their own needs, wishes, and desires, while collectivism describes a model in which people act interdependently within their social contexts and focus on in-group goals (Hofstede 1981). In terms of culture, individualistic cultures focus on a sense of autonomy and emphasize personal needs over those of the group, whereas collectivistic cultures focus on in-group harmony, conformity and cooperation and emphasize shared norms over the individual (Markus and Kitayama 1991; Triandis 2001). In terms of the attitudes towards relationships, a collectivist will suppress their own goals to maintain a relationship while an individualist is reluctant to sacrifice their own goals (Giebel and Yang 2009).

Some theorists have identified individualism and collectivism as independent dimensions. Thus, the cultural and individual differences arise from the interaction between individualistic and collectivistic characteristics (Hofstede and Hofstede 2005). According to this point of view, one individual or one society carries characteristics of both individualism and collectivism, but one characteristic is more
dominant than the other (Triandis 2001). In general, Western cultures foster individualism and Eastern cultures foster collectivism. Indeed, the United States, Australia, Canada and the countries of Northern and Western Europe were identified as individualist cultures, while many East Asian countries such as China, Japan and Korea were commonly identified as collectivist cultures (Giebels and Yang 2009; Markus and Kitayama 1991; Triandis, McCusker and Hui 1990).

It should be noted that China is considered a collectivist society whereas Germany is more individualist. Hofstede (1980) described research which included subjects from 66 different countries, the results of which showed the dimension of individualism–collectivism, compared to Chinese individuals, German have a high individualism score (Chinese: 18; German: 67). While Deighton and Traue (2005) found that compared to German subjects, Chinese subjects had a higher score on self-reliance and distance from within groups, both of which indicated a value which was more individualistic. Therefore, the researchers suggested that Chinese values on individualism and collectivism are changing because of globalization and rapid economic development (Cheung and Leung 2007; Deighton and Traue 2005; Moore 2005).

1.4 Cultural differences in attachment

An attachment system is considered an evolutionary consequence which maintains a close tie between child and mother (Bowlby 1969). An individual forms an IWM when he or she interacts with their primary caregivers during childhood. IWMs are mental representations of the concepts of self and others. An individual's cognitive processes, emotional states, and behavioral consequences are influenced by IWMs “from the cradle to the grave” (Bowlby 1988). In the 1970s, Mary Ainsworth and her colleagues created an innovative laboratory paradigm known as the strange situation (SS), which has been used for studies on children's attachment. This SS paradigm provides opportunities to observe how an infant reacts when separated and reunited with its mother, its attitude and response towards strangers, and how it explores attractive toys during the entire process. Ainsworth identified three attachment patterns in infants, namely, insecure-avoidant (category A), secure (category B) and insecure-ambivalent (category C).
Secure infants play with toys freely when their mother is near, viewing their mother as a "secure base" when exploring unfamiliar environments. When their mother is present, they may play with a stranger. When their mother leaves, the attachment system is activated, and secure infants show signs of longing for their mother and might cry. Meanwhile, they may adopt different strategies to seek their mother. During this time, secure infants will ignore a stranger most likely out of fear. Secure infants greet their mother and easily settle back down to play upon being reunited. Insecure–avoidant infants show less distress or no response at all upon separation, and accept comfort from strangers. Typically, when their mother returns, they shift their attention away from their mother and pay more attention to toys or other objects. Insecure–ambivalent infants show fear towards strangers and avoid them throughout the entire process, are strongly distressed and seek attachment when separated from their mother. Upon being reunited with their mother, they are hardly able to settle down and show resistance when their mother approaches.

The original study on white middle-class populations conducted by Ainsworth and her colleagues (1978) demonstrated that 70% of infants are secure, 20% are insecure–avoidance types, and 10% are insecure–ambivalent. Nonetheless, later studies showed the percentages for each attachment pattern varied across cultural and demographic variables. Further research by Mary Main and her colleagues (1986) found that 10% of infants in their samples did not fit into those three categories. Thus, they identified a fourth attachment pattern, which they called disorganized/disoriented attachment. In their description, the infants in this category showed disoriented behavior, such as, incomplete or undirected movements and expressions, direct indices of confusion and apprehension, behavioral stilling, and the simultaneous display of contradictory behavioral patterns. Interestingly, three of the four disorganized infants best fit the secure–attachment category in traditional three-category studies (Greenberg et al. 1990).

Hazan and Shaver (1987) observed that interactions between adult romantic partners and between children and caregivers possess similarities. They identified
three adult attachment patterns which roughly correspond to infant classifications, namely, secure, anxious/ambivalent, avoidant.

After Ainsworth (1979) claimed that attachment behaviors and these attachment classifications were universal across cultures, later studies on the universality of attachment focused on the similarities and differences in the distributions of attachment patterns across cultures. As the most important factor for attachment formation, caretaking systems vary cross-culturally. The distinct cultural expectations may lead individuals to have different socialization experiences. In American culture, secure attachment individuals tended to be more autonomous, self-confident, and had less anxiety in relationships (Bartholomew and Shaver 1998; Wei et al. 2004). However, Asian cultures emphasize dependence on others and seek others’ acceptance for social harmony (Giebels and Yang 2009; Triandis, McCusker and Hui 1990). Interdependence is considered a common pattern in Asian cultures, while it reflects preoccupied attachment traits in Western cultures.

Cross-cultural studies on attachment showed secure attachment patterns were prevalent. Those studies also found children in collectivistic countries had a high percentage of anxious-resistant patterns, while anxious-avoidant patterns were relatively more frequent in individualistic countries (Ainsworth et al. 1978; Van IJzendoorn and Kroonenberg 1988). Countries with high levels of preoccupied adult romantic attachment (a model characterized by high anxiety, negative self-perception, and positive views of others) tended to be or more collectivistic (Schmitt 2004).

1.5 Cultural differences in facial emotion recognition

Facial expressions are considered a universal phenomenon, which have been proven to have similarities between humans and animals, infants and adults, and across different cultures (Darwin 1872; Ekman, Sorenson and Friesen 1969; Ekman 1992; Izard 1994). It has been found that individuals with different cultural backgrounds can recognize some facial expression images on the same level. For example, the accuracy of recognizing happiness, anger, and fear on human faces was similar between preliterate cultures (New Guinea and Borneo) and literate cultures (the United States, Brazil and Japan) (Ekman, Sorenson and Friesen 1969). Meanwhile,
plenty of studies which focused on the universal arguments for facial expressions have been conducted by researchers. In those studies, differences between Eastern and Western cultures on the encoding and decoding of facial emotions were found, and these differences were explained by cultural orientation (individualism or collectivism) (Mai et al. 2011; Matsumoto 1990; 1992; Matsumoto and Ekman 1989; Yuki 2007), display rules and decoding rules (Ekman 1994; Ekman, Sorenson and Friesen 1969), and dialect theory and the cultural exposure effect (Elfenbein 2013; Elfenbein and Ambady 2002; 2003a).

1.5.1 Individualism vs. collectivism in cross-cultural differences of facial emotion recognition

It was assumed that individualistic and collectivistic profiles influence an individual's processing of emotions within cultures. Individualistic cultures could be more tolerant of negative emotions in their society, while collectivistic cultures tend to suppress negative emotions in order to maintain social harmony.

Matsumoto (1990) found that Americans displayed more negative emotions (disgust and sadness) within in-groups than Japanese, while Japanese displayed more anger emotions in out-groups. He (Matsumoto 1992) also suggested that individualism was positively correlated with the ability to recognize negative emotions (anger and fear), while collectivistic individuals tend to rate those emotions at a lower intensity level. In addition, the study compared Japanese and American preferences on mouth and eye cues when recognizing illustrated faces and edited human faces, indicating that the eye cues are more important than information from the mouth for Japanese when recognizing facial expressions. In contrast, Americans concentrated more on the mouth (Yuki 2007). They argued that, in Japanese culture, emotional subduction is the norm. Thus, a Japanese individual will pay more attention to eye clues since the muscles around the eyes are difficult to control and the information from the eyes is more genuine. An American individual, however, would
prefer to focus on the mouth because it carries an overt expression. The same finding has been confirmed in Chinese subjects. Mai et al. (2011) found that Chinese who placed a greater value on collectivism pay more attention to eye cues when recognizing Duchenne and non-Duchenne smiles (a Duchenne smile is also called a genuine smile, which involves the contraction of both the zygomatic major muscle (which raises the corners of the mouth) and the orbicularis oculi muscle (which raises the cheeks and forms crow’s feet around the eyes; a non-Duchenne smile involves only the zygomatic major muscle).

1.5.2 Display rules and decoding rules

To date, from facial expression studies in diverse cultures, researchers have found that the expression and recognition of six basic facial emotions are universal. These emotions are happiness, fear, surprise, sadness, anger, and disgust (Ekman 1992; Ekman, Sorenson and Friesen 1969). The classic empirical study conducted by Ekman and his colleagues (1969) demonstrated that there was a high recognition rate for six basic emotions in literate cultures and low accuracy in preliterate cultures. Despite this, the accuracy of happiness, anger and fear were similar across all cultures. They reviewed Darwin’s idea in order to explain his findings and support his proposition on emotion. They suggested that six basic emotions are well recognized across cultures since the accuracy of each emotion recognition was above the level of chance and indicated that there are pan-culture elements exist for facial emotion recognition. On the issue of the universality of emotions, Ekman (1972) initiated an approach called the neuro-cultural theory which includes an evolutionary perspective and the social influences on facial emotions. In the neuro-cultural theory of emotion recognition, Ekman suggested that there are some facial emotions that can be recognized by all cultures because those emotions are innate. However, performance on emotion recognition is also determined by culturally learned display rules (Ekman, Sorenson and Friesen 1969):

“Display rules were defined as procedures learned early in life for the management of affect displays and include deintensifying, intensifying, neutralizing, or masking an affect display. Those rules prescribe what to do
about the display of each affect in different social settings; they vary with the social role and demographic characteristics, and should vary across cultures.”

Based on display rules, Matsumoto and Ekman (1989) introduced decoding rules to explain that Japanese had lower intensive ratings for emotions than Americans. They suggested that individualism and collectivism have different strategies when judging the facial expression of emotion. Japanese tend to suppress their real understanding of emotions in order to maintain social harmony, while Americans may exaggerate their responses.

1.5.3 Dialect theory of emotion

Dialect theory originated from linguistic theory, which proposed variations in a language used by different speakers who are separated by geographic or social boundaries. The similarities and differences in emotion expressions and perceptions in cultures were described as having universal grammars and dialects for emotions, respectively (Elfenbein 2013; Elfenbein and Ambady 2002; 2003a; Tomkins and McCarter 1964).

By reviewing classic studies conducted by Ekman (1972), Elfenbein and Ambady (2003b) noticed that U.S. subjects performed better than Japanese when recognizing American facial emotion images. By using meta-analysis, the universality and cultural specificity of emotion recognition were explored (Elfenbein and Ambady 2002). The results revealed that individuals were better at recognizing facial emotions within their own culture rather than in others. Based on the finding that the prevalent in-group advantage showed in recognizing and understanding emotions, dialect theory was expanded to explain emotions and depicted particularly by Elfenbein and Ambady (2002; 2003a; 2003b).

By questioning if the dialect effect exists for all emotional expressions equally, the subtle differences in emotion expressions across cultures have been investigated (Elfenbein et al. 2007). In their first study, participants were drawn from two culturally dissimilar groups of students from sub-Saharan Africa (Gabon) and North America (Quebec, Canada). Participants were asked to freely pose for 10 emotional expressions (i.e., anger, contempt, disgust, fear, happiness, sadness, serenity, shame,
and surprise), which were subsequently coded according to the facial action coding system (FACS) (Ekman et al. 2000). Different facial elements for surprise and embarrassment between two groups were not found. In contrast, participants from each group showed systematic differences in facial emotion displays for the other eight emotions. This result was identical to Ekman’s (1972) suggestion that muscle movements have subtle differences among cultures.

In the second study conducted by Elfenbein et al. (2007) using those freely posed emotion images as normative emotional expressions, an in-group advantage was found for participants identifying their own cultural facial images; the same advantage was not found for standardized expressions, i.e., Japanese and Caucasian facial expressions of emotions (JACFEE). Meanwhile, the cross-cultural difference in the accuracy of emotion recognition was greater when the emotions had greater differences in expression style. The authors suggested that, apart from emotion bias and decoding rules, cultural differences in expressive styles could influence facial emotion recognition. Dialect theory proposed that emotion expressions and recognition have different dialects in different cultural settings and are also potentially influenced by a cultural interaction (see Fig 1.1).

![Fig 1.1 Illustration of the relation between the universal emotion and the specific emotion programs for two cultures (Originally from Hillary Anger Elfenbein (2003)).](image-url)
In particular, Elfenbein argued (2013) that the dialect theory was different from display rules and decoding rules in the following ways: a) the dialect theory allows that there are cultural similarities in facial emotion recognition, indicating that emotion is a universal phenomenon with subtly different dialects; and b) individuals can stumble over differences in judging facial expressions of emotion in out-groups, rather than deliberately ignore other’s emotions, like subjects suppressing their displays of emotions intentionally.

The dialect theory was proposed based on the in-group advantage of facial emotion recognition. However, the reverse result of the in-group advantage was found by Matsumoto, Olide and Willingham (2009). In recognizing spontaneously expressed emotions, American subjects were better at judging the emotions of Japanese expressers, while Japanese subjects were better at judging American expressers. They suggested that spontaneous emotion may be different from a posed facial emotion. But, two other studies using spontaneous stimulus found an in-group advantage (Gray, Mendes and Denny-Brown 2008; Kang and Lau 2012). When only considering the eyes to test the difference between Japanese and American participants judging emotions from eye cues on the same or other culture, both subject groups held an in-group advantage (Adams et al. 2010).

In the present study, the in-group advantage was tested between Chinese and German subjects in the emotion recognition of German facial expressions.

1.5.4 Cultural exposure effect of emotion

Research on cross-cultural emotion recognition suggests that there is a cultural exposure effect. That is, when people come into contact with another culture, it will lead them to a greater understanding of people’s facial expressions in that culture. When Ekman, Sorenson and Friesen (1969) explored the universal argument for the facial expressions of emotions, they used preliterate cultures as the control group to investigate the cultural exposure effect on an individual’s ability to recognize Caucasian faces. Their results showed that subjects from Brazil and Japan (literate cultures) performed better when recognizing Caucasian emotion expressions (disgust, surprise and sadness) compared with subjects from New Guinea and Borneo (preliterate cultures). From the meta-analysis of facial emotion recognition studies,
Elfenbein et al (2002b) noticed that the in-group advantage was smaller when subjects recognized the emotion from familiar cultures. Based on their findings, Elfenbein (2013) argued that cross-cultural exposure is the only significant moderator to explain the in-group advantage. The language difference and ethnic bias could not explain the in-group advantage because, in previous studies, this advantage existed among homogeneously Caucasian groups and groups sharing the same language.

Furthermore, a training program can increase familiarity with out-group facial expressions and eliminate the in-group advantage (Elfenbein 2006). Previous studies also indicated that facial emotion recognition ability was more plastic and could be changed in childhood (Sangrigolin et al. 2005). The in-group advantage diminished when the observer was in a happier emotional state rather than in a fearful or neutral state (Johnson and Fredrickson 2005).

In the present study, CG was considered a special group: a CG has been exposed to German society and culture. In daily communication with German colleagues, friends, and even strangers in social life, the ability to recognize facial emotions plays a vital role to them. Whether the familiarity with German society is helpful for Chinese living in Germany to recognize German facial expressions is another concern. Therefore, the comparison of CC and CG is also included in this study.

1.6 Exploration and attachment

Bowlby (1969) viewed the attachment system as a control system for individuals that one could cope with stressful situations by the close proximity of the primary caregivers. In his theory, the attachment system includes both attachment behavior and exploration behavior. From Bowlby’s description (1969), exploration involves serial behaviors and thoughts: new activities or situations, mental activity like thinking about relationships or solutions, and the important role of social situations, which he stressed in particular (May 2006).

The interaction between those two systems forms and influences an individual’s attachment patterns and behavioural characteristics. In a threatening situation, the
attachment system will be activated. Thus, an infant will seek close proximity and comfort from its main caregivers. Ainsworth and her colleagues identified the caregiver as a "secure base" to foster exploration (Ainsworth, Blehar, Waters and Wall 1978). If there is no danger near and the main caregiver plays the role of "secure base", the infant will engage in exploring the environment and learning about the world. The interaction between the attachment and exploration system is dynamic. This balance of attachment and exploration behavior maintains the survival purpose for children (Bowlby 1988). Each attachment pattern has different features in this interaction. Ainsworth and his colleagues (1978) identified three types of attachment patterns from the observation of how infants behave when separated and reunited with their mother and when staying with a stranger in SS. The number of exploration activities (e.g., playing with toys) the child engaged in throughout is an important observation index in SS. Bowlby (1969) believed that infants explore more when they are secure and the secure attachment can be seen as the most adaptive attachment pattern. Insecure attachment infants with an avoidance pattern and anxious/ambivalent pattern showed hampered exploration: avoidant infants showed little emotion when their mother left and returned and explored less regardless of the scenario. Anxious/ambivalent infants showed high distress during exploration even when their mother was present. Bowlby (1969) suggested that children generalize the image of themselves and others from interactions with caregivers in IWMs, which is presumed to provide a continuous influence on the development of an individual’s affects, cognition, and behavior. Based on this theoretical framework, researchers considered romantic attachment as an attachment process for adults (Hazan and Shaver 1987). In adulthood, peers and romantic partners also serve as attachment figures. Parallel to the childhood attachment system, adult attachment has four categories (secure, preoccupied, dismissing and fearful), which are characterized by how an individual represents themselves and others in a romantic relationship.

The range of adult exploration behavior related to attachment research is quite broad, which includes work orientation and performance (Hazan and Shaver 1990),
state and trait curiosity (Mikulincer 1997), attitudes about exploration (Green and Campbell 2000), leisure activities (Carnelley and Ruscher 2000), achievement motivation (Elliot and Reis 2003), exploration attitudes, and behaviors toward adult romantic partners (Martin 2006). The main results from previous empirical studies indicated that secure individuals were more open to exploration compared to insecure attachment individuals (Green and Campbell 2000), enjoy their work more (Hazan and Shaver 1990), had a significantly higher degree of curiosity (Mikulincer 1997), are influenced by a high need for mastery, and possess a low level of fear of failure (Elliot and Reis 2003). Support provided by a romantic partner is an important mediating effect on exploration behavior (Wu and Yang 2012). Those studies confirmed the association between adult attachment and exploration.

There is little doubt that going abroad is certainly an exploratory activity for adults. From attachment theory, we suggest that, compared with peers living in their native land, individuals residing overseas may have a higher secure attachment orientation. However, previous studies investigated parental, romantic, and peer attachment between Canadian and visiting Chinese students. They reported that visiting Chinese students had lower romantic and peer attachment security (DiTommaso, Brannen and Burgess 2005). Their result was opposite to our assumption, which leads us to investigate the adult attachment system of CC and CG. Does attachment play any role in influencing Chinese individuals’ decisions to chase their dreams to go abroad? Are CG more securely attached since they have the ability to explore compared with CC? Or, are participants in CG less securely attached since they are removed from their familiar environment and peers? Therefore, analyses in this dissertation investigated the adult attachment features among Chinese who are living in Germany.
2 Basic theory and literature review

2.1 Attachment theory

2.1.1 Internal working models

As one of the most generative psychological theories, attachment theory has been developed and improved rapidly in the past several decades. Bowlby (1958) inherited Freud's basic insights about an infant's tie to his/her mother by using the evolutionary and cognitive psychological terms to describe the mother–infant bond in early childhood. He proposed that, for both the infant and the mother, this bond allowed the infant to survive. Moreover, he also indicated that the important figure in an attachment relationship is not only the mother, but also other caregivers. The early relationship between infant and caregivers has a stable and continuous influence on an individual “from the cradle to the grave” (Bowlby, 1958). An individual develops Internal working models (IWMs) from childhood attachment experiences with their primary, principal attachment figures (Allen, Hauser and Borman-Surrell 1996; Rosenstein and Horowitz 1996). IWMs are formulated as unconscious manners which influence an individual's emotional experiences, cognitions, and behaviors in later life.

Generating important ideas about one's self, significant others, and the relationships between self and others are the main processes of IWMs. It is hypothesized that those representative operations contain information about whether the primary caregivers are perceived as sensitive and supportive responders towards an infant's request, and whether the self is acceptable and worthy of receiving help from caregivers. For instance, Bowlby (1969) suggested that a secure attachment child who experiences caregivers as emotionally available, responsive, and supportive will construct a model of itself as being lovable and competent. Conversely, an insecure attachment child who experiences caregivers as emotionally unavailable and rejective will lead to the construction of an unlovable, unworthy, and
incompetent self-model. These earliest dyadic relationships are internalized and come to define the parameters of IWMs.

IWMs were viewed as hierarchical models (Bowlby 1980; Bretherton 1985; 1990; Collins and Read 1994; Main et al. 1985). These models are arranged from general to specific, whereby general models are higher-level models with abstract rules or assumptions about the attachment relationship; the specific models are the lower-level models which organize information about specific relationships (Bowlby 1980; Bretherton 1999; Main, Kaplan and Cassidy 1985). The contents of IWMs originate from past events which are stored in the long-term memory (Crick and Dodge 1994). From a social cognition perspective, these memories are related to one another when processing and interpreting social cues. People with different attachment patterns have different emotional processing procedures (Bartholomew and Horowitz 1991; Pietromonaco et al. 1997). Studies have suggested that early attachment can predict the accuracy of facial emotion recognition in children, which has proven that IWMs have certain influences on the perception of facial expressions— that is, extraordinarily important messages in social communication (Steele, Steele and Croft 2008).

2.1.2 Adult attachment theory and measurements

2.1.2.1 Self report

Self-report adult attachment measurements are derived from adult attachment theory. To date, around 30 self-report adult attachment questionnaires have been developed for different purposes by researchers (Ravitz et al. 2010). Some popular attachment measurements will be introduced in this dissertation.

The topic which refers to romantic relationships was proposed by Cindy Hazan and Phillip Shaver in the late 1980s. Hazan and Shaver noticed that interactions between adult romantic partners and between children and caregivers have similarities. They created the first romantic attachment questionnaire for adults
Roughly corresponding to infant classifications, three patterns of adult romantic attachment have been identified, namely, secure, anxious/ambivalent, avoidant. This questionnaire was a retrospective report of the most important romantic relationship. Participants were asked to choose one of three descriptions which best fit their circumstances. Although this method was rarely used in adult attachment research, it has a significant influence on formulating the other adult attachment measurements. The statements of three adult romantic attachment patterns were described as follows (Hazan and Shaver 1987):

- **Secure**: I find it relatively easy to get close to others and am comfortable depending on them and having them depend on me. I don't often worry about being abandoned or about someone getting too close to me.

- **Avoidant**: I am somewhat uncomfortable being close to others; I find it difficult to trust them completely, and difficult to allow myself to depend on them. I am nervous when anyone gets too close, and often, love partners want me to be more intimate than I feel comfortable being.

- **Anxious/Ambivalent**: I find that others are reluctant to get as close as I would like. I often worry that my partner doesn't really love me or won't want to stay with me. I want to merge completely with another person, and this desire sometimes scares people away.”

Bartholomew and Horowitz (1991) defined an attachment model based on a four-category classification schema. This model has two dimensions: thoughts about one’s self and thoughts about others which divide adult attachment into four patterns, namely, secure, preoccupied, dismissing, and fearful. Thoughts of one’s self and others represent the images of and knowledge about oneself and the other. The positive model of one’s self revealed the degree to which an individual has a high sense of self worth, is more confident, and thinks of themselves as a lovable person. The negative
model of one's self is associated with anxious thinking of one's self and feels uncertain of their own lovability. Thus, the model of self is also associated with anxiety and dependence in the relationship. The positive model of others indicates the degree to which others are viewed as available or supportive. The negative model of others revels thinking that others are untrustworthy and unreliable. Thus, the model of others relates to avoidance and independence in the relationship (see Fig. 2.1).

<table>
<thead>
<tr>
<th>Thoughts of Self</th>
<th>Thoughts of Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Secure</strong></td>
<td><strong>Preoccupied</strong></td>
</tr>
<tr>
<td>Positive</td>
<td>Preoccupied with relationships</td>
</tr>
<tr>
<td></td>
<td>Comfortable with intimacy and autonomy</td>
</tr>
<tr>
<td>Negative</td>
<td><strong>Fearful</strong></td>
</tr>
<tr>
<td>Dismissing</td>
<td>Strongly independent</td>
</tr>
<tr>
<td>Fearful</td>
<td>Fearful of intimacy Socially avoidant</td>
</tr>
</tbody>
</table>

Fig. 2.1 Models of attachment patterns in self and other (Bartholomew and Horowitz 1991).

Secure individuals have positive thoughts of themselves and others and internalize themselves as a lovable and acceptable person who has a high self-esteem. Preoccupied individuals were defined as someone who has negative thoughts of themselves and positive thoughts of their partner, they are persistently seeking intimacy in relationships, and hoping others could accept them and support them, but they lack confidence and are preoccupied with relationships. Compared with the secure person who has a healthy dependence, a preoccupied person possesses an overdependence on partners. Dismissing individuals have positive thoughts of themselves and negative thoughts of their partner. Compared with others, dismissing individuals are more independent, lack trust, and possess a compulsive self-reliance, while tending to avoid intimacy, and place emphasis on achievement. Fearful individuals have negative thoughts of themselves and their partners, they have the
The desire for intimacy and contact and need other’s approval, yet they have a high level of interpersonal anxiety and avoid social contact. Conflict and low self-esteem make fearful individuals angry or hostile.

The relationship questionnaire (RQ) was created by Bartholomew and Horowitz (1991) under this two-dimensional attachment schema. The RQ is a self-report measurement consisting of four descriptions of prototype attachment patterns. It has been widely used and accepted by researchers.

![Two-dimensional model of adult attachment](image)

Fig. 2.2 The two-dimensional model of adult attachment (Bartholomew and Shaver 1998).

A factor analysis includes 60 well-known self-report measurements relating to romantic attachment conducted by Brennan, Clark and Shaver (1998), which revealed that two dimensions of romantic attachment known as anxiety and avoidance exist (see Fig. 2.2). Based on this finding, they developed a 36-item scale for adult romantic attachment research, known as experiences in close relationships (ECR) in which four adult attachment patterns are derived from the anxiety and avoidance dimensions. The secure attachment is characterized by low anxiety and low avoidance, which is
associated with feelings of self-confidence and trust in others; the preoccupied attachment is characterized by high anxiety and low avoidance; the dismissing attachment is characterized by low anxiety and high avoidance; and the fearful attachment is characterized by high anxiety and high avoidance.

Another widely used adult attachment questionnaire, named experience in close relationships-revised (ECR-R), was developed by Fraley, Waller and Brennan (2000). The ECR-R includes 36 items which were derived from an item response theory (IRT) analysis of the other four self-report measures of adult romantic attachment (experiences in close relationships scales (Brennan, Clark and Shaver 1998), adult attachment scales (Collins and Read 1990), relationship styles questionnaire (Griffin and Bartholomew 1994), and J. Simpson's (1990) attachment scales. Like the ECR, the ECR-R has two dimensions, namely, avoidance and anxiety. Fraley (2012) strongly recommended considering dimensions basis of the continuous scores rather than divide subjects into four categories.

### 2.1.2.2 Attachment interviews

Besides self-report measurement tools, interviewing and projective measurement tools, such as the adult attachment interview (AAI) (George, Kaplan and Main 1984) and adult attachment projective picture system (AAP) (George, West and Pettem 1999), aim to explore an adult's mental representations of attachment by using the interview method.

The AAI was developed by George, Kaplan and Main (1984) to assess adults' IWMs with respect to their attachment relationships. The AAI is a semi-structured interview for adults related to childhood attachment experiences and it reflects the "current state of mind with respect to attachment" (Main, Kaplan and Cassidy 1985). The basic assumption of AAI is that early experiences with the primary caregivers are represented as IWMs that are stable throughout one's life unless revised by a critical new experience. The AAI consists of 20 questions related to early relationships with parents, and it takes between 45 and 90 min to administer. During the interview, the
adult is asked to talk about his or her general view of the relationship with their parents, give five adjectives for each parent, and describe the relationship with their parents as early as possible. Thereafter, they are asked to describe episodes related to those five adjectives. Moreover, the way in which the individual describes the episodes is also included in the classification, e.g., the tone of voice, pauses, the coherence of the transcript, and thoughts. The AAI coding system leads to adult attachment classifications into three main categories parallel to SS classifications for infants (Ainsworth, Blehar, Waters and Wall, 1978), namely, secure dismissing and preoccupied.

The AAP (George, West and Pettem, 1999) is similar to the AAI, but it uses projective pictures to reflect the IWMs of attachment. It includes seven attachment images and one neutral image. That is, eight drawings in total. In this test, the adult participants were required to give eight stories based on these eight scenes. The AAP was used to detect the mental representations and the defensive processes which are associated with the attachment theory. It emphasizes the evaluation of unconscious defensive processes. The AAP test requires approximately 35 min to administer. According to George and West (2001), the internal reliability for all subscales had an alpha value of 0.82. This system identifies four adult attachment groups: secure, dismissing, preoccupied, and unresolved.

### 2.2 Universal arguments on adult attachment

#### 2.2.1 Universality of the attachment system

Bowlby (1958; 1969) elaborated upon the theory of attachment from an evolutionary perspective. He emphasized the evolutionary essence of the attachment relationship which is formed between a child and its protective caregivers. Furthermore, Harlow and Zimmermann (1959) reported that they have observed attachment behavior in Rhesus monkeys (which have a genetic overlap with humans approximating 94%; Sibley, Comstock and Ahlquist, 1990). They found that Rhesus
monkeys seek close physical proximity to and the availability of protection from attachment figures when stressed. The early mother–infant relationship has an impact on non-human animal (rodents and non-human primates) behaviors in stressful situations (Cirulli et al. 2009). This evidence points to attachment behaviors as being innate and universal.

A valid instrument to measure attachment patterns in children is SS (Answorth et al. 1978), which is used in the observation of mother–infant interactions, and which provides the opportunity to conduct cross-cultural research of attachment in children. Ainsworth et al. (1978) found a “normative” pattern for American attachment in children, which indicated that about 70% were secure, 20% were anxious–avoidant, and 10% were anxious–resistant. Ainsworth (1979) later claimed that attachment behaviors and these attachment classifications were universal across cultures. Researcher explored the attachment system on children and adults in a variety of cultures. In 1988, IJzendoorn and Kroonenberg conducted a meta-analysis of SS on 32 samples from 8 countries. The purpose of that study was to compare more precisely intra-cultural versus inter-cultural differences on the distribution of attachment classifications. The results suggested that, in Western countries, the majority of children are securely attached (up to 60%). In SS, secure parent–child attachment is the most prevalent in Western cultures (Ainsworth 1979), and several studies have documented the pervasiveness of secure parent–child attachment in non-Western cultures, including in Uganda (57% of children studied were classified as secure), China (68%), and Japan (68%) (van IJzendoorn and Sagi 1999). However, secure children may vary considerably across samples within any one culture (Grossmann et al. 1981).

Cross-cultural research on 62 cultures measured by the RQ reported the relationship between romantic attachment profiles and sociocultural indicators: insecure romantic attachment is associated with higher fertility rates across cultures. This finding supports the evolutionary suggestion that basic human mating strategies can influence romantic attachment. Meanwhile, secure romantic attachment was
normative in 79% of cultures (the most commonly observed romantic attachment orientation across cultures) (Schmitt et al. 2004). In their study, Chinese samples from Hong Kong and Taiwan were included. Additionally, they demonstrated that the two-dimensional structure of romantic attachment is truly culturally universal.

### 2.2.2 Adult attachment differences between Eastern and Western cultures

Although attachment researchers regard IWMs as an essential developmental process for attachment which is universal across the human cultures (Main 1990), the argument of the universality of attachment behavior was inevitable because attachment theory was established in Western societies. Thus, several researchers have explored the idea that attachment is a universal issue in different cultures.

Previous studies have used meta-analysis on children’s attachment showing that Japanese and Israeli children had a higher percentage of anxious-resistant patterns compared with children in Western societies (Van IJzendoorn and Kroonenberg 1988). Meta-analysis on adult romantic attachment showed that preoccupied romantic attachment was particularly prevalent in East Asian cultures (Schmitt et al. 2004). Another study focused on four ethnic groups and showed that, compared with Caucasian subjects, Hispanic Americans reported greater attachment anxiety, while African Americans and Asian Americans reported greater attachment avoidance (Wei, Russell, Mallinckrodt and Zakalik 2004).

### 2.2.3 Adult attachment studies in China

#### 2.2.3.1 Attachment studies in Mainland China

The first Chinese attachment study using SS was conducted in 1996 by Hu and Meng (published in Chinese). Their study included 31 families with a middle-class background. The distribution of attachment classifications in Chinese infants was
similar to that found in previous studies among American children (Ainsworth 1978; IJzendoorn and Kroonenberg 1988): 68% were secure, 16% were avoidant, and 16% were ambivalent. This was the only Chinese SS research cited in the *Handbook of Attachment* in the chapter on cross-cultural patterns of attachment (van IJzendoorn 2008).

Until recently, only one Chinese SS study has been published in an English-language journal (Trnavsky 1998), with another study published as a PhD dissertation (Archer 2012).

Table 2.1 Distribution of Attachment Classifications in Normal Chinese Infants (Strange Situation Result).

<table>
<thead>
<tr>
<th>Author, Published Year</th>
<th>Location</th>
<th>n</th>
<th>Age (in months)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hu and Meng 1996</td>
<td>Beijing</td>
<td>31</td>
<td>12</td>
<td>16%</td>
<td>68%</td>
<td>16%</td>
<td>Not considered</td>
</tr>
<tr>
<td>Gu et al. 1997</td>
<td>Shanghai</td>
<td>52</td>
<td>21-27</td>
<td>6%</td>
<td>67%</td>
<td>23%</td>
<td>4%</td>
</tr>
<tr>
<td>Trnavsky 1998</td>
<td>Shenyang</td>
<td>29</td>
<td>12-16</td>
<td>25%</td>
<td>65%</td>
<td>10%</td>
<td>Not found</td>
</tr>
<tr>
<td>Liang et al. 2000</td>
<td>Beijing</td>
<td>122</td>
<td>21-27</td>
<td>11%</td>
<td>73%</td>
<td>7%</td>
<td>9</td>
</tr>
<tr>
<td>Hu and Meng 2003</td>
<td>Beijing</td>
<td>64</td>
<td>12</td>
<td>15%</td>
<td>53%</td>
<td>23%</td>
<td>9</td>
</tr>
<tr>
<td>Li et al. 2004</td>
<td>Guangdong</td>
<td>75</td>
<td>8-14</td>
<td>17%</td>
<td>65%</td>
<td>13%</td>
<td>4</td>
</tr>
<tr>
<td>Ding et al. 2008</td>
<td>Shanghai</td>
<td>62</td>
<td>12-18</td>
<td>6%</td>
<td>68%</td>
<td>26%</td>
<td>Not considered</td>
</tr>
<tr>
<td>Yue et al. 2010</td>
<td>Beijing</td>
<td>178</td>
<td>24</td>
<td>10%</td>
<td>72%</td>
<td>9.5%</td>
<td>8.5%</td>
</tr>
<tr>
<td>Archer, 2012</td>
<td>Shanxi</td>
<td>61</td>
<td>12-38</td>
<td>13.1%</td>
<td>57.4%</td>
<td>16.4%</td>
<td>13.1%</td>
</tr>
</tbody>
</table>

Note: A: avoidant; B: secure; C: ambivalent; D: disorganized

Table 2.1 summarizes some of the results from Chinese attachment research on children. The majority of children were securely attached in those Chinese SS studies (from 53% to 73%). The distribution of attachment patterns was inconsistent
between Northern (Beijing, Shenyang and Shanxi) and Southern (Shanghai and Guangdong) regions. The inconsistent results from these studies may be due to the researchers who analyzed data without necessarily having any training on SS. Moreover, the intra-cultural differences and family characteristics might also have influenced the results.

Chinese research on adult attachment only refers to self-reported attachment. The RQ and ECR have been widely used in those studies. The Chinese version of the ECR was tested by Tonggui and Kazuo (2006) and used in recent Chinese adult attachment research. The distribution of adult attachment in their study was as follows: 49.18% were secure, 16.4% were dismissing, 22.8% were preoccupied, and 11% were fearful. The result on secure attachment was similar to the U.S. sample (46.2%). But, there were some differences found for the insecure attachment patterns. In the U.S. sample, 14.7% were dismissing, 16.1% were preoccupied, and 23.0% were fearful (Brennan, Clark and Shaver 1998).

Adult attachment studies in Chinese undergraduate students using RQ and ECR-R were inconsistent. As previous studies indicated, intra-cultural differences seemed to be larger than inter-cultural differences (Van IJzendoorn and Sagi-Schwartz 2008). As shown in Table 2.2, compared to child attachment patterns, the proportion of secure attached adults (from 41.12% to 59.3%) were higher and preoccupied attached adults (from 18.3% to 27.53%) were lower. Preoccupied attachment was considered more prevalent in East Asian cultures (Schmitt et al. 2004), which was confirmed by these Chinese studies.

<table>
<thead>
<tr>
<th>Author, Published Year</th>
<th>Location</th>
<th>n</th>
<th>Age (Year)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Anxiety</th>
<th>Avoidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonggui and Kazuo 2006</td>
<td>Beijing</td>
<td>231</td>
<td>20</td>
<td>16.4%</td>
<td>49.18%</td>
<td>22.18%</td>
<td>11%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 2.2.3.2 Attachment studies among Chinese students abroad

To my knowledge, few studies have explored the traits of adult attachment on overseas Chinese individuals from the acculturation perspective. Wang and Mallinckrodt (2006) investigated the relationship between adult attachment, acculturation index, and psychosocial adjustment on Chinese international students living in the United States. The results indicated that adult attachment anxiety was negatively correlated with acculturation to U.S. culture, and adult attachment anxiety and avoidance influenced a student’s psychosocial adjustment.

The study most related to the present work was carried out by Enricon DiTommaso and his colleagues (2005). In their study, the relationship between adult attachment and loneliness in Canadian and visiting Chinese students in Canada was investigated. They reported that visiting Chinese students had lower romantic and peer attachment security compared with Canadian students, and argued that visiting students removed from their peer network may lead to a lower score for secure attachment compared with their home-student peers. However, this study only focused on the comparison between visiting Chinese students in Canada and native Canadians on adult attachment and loneliness; the comparison between Chinese in Canada and Chinese in China were missing. Considering the relevance of acculturation...
and cultural diversity, this cross-cultural study on attachment should add Mainland Chinese as a control group. In addition, from attachment theory, individuals engaging in academic exploration activities such as studying in another country may have a higher secure feeling of attachment, a high self-esteem, and more confidence. Therefore, to investigate the difference between Chinese and Germans on adult romantic attachment, three groups, i.e., CC, CG and GG have been included in the present study.

### 2.2.3.3 Adult attachment in Chinese culture

Several concepts have been viewed as the basic components in the representation of Chinese romantic attachment among the rapidly increasing research on Chinese attachment. Wang and Song (2010) mentioned five cultural concepts necessary to understanding Chinese romantic attachment in their understanding of Chinese cultural characteristics, namely, self-construal, *yuan*, filial piety, romantic love, and dialectical thinking patterns. In this study, only *yuan* and filial piety will be introduced due to their particular contributions to Chinese romantic relationships.

**Yuan (缘)**

*Yuan* (also known as *yuanfen*), meaning the chance for affinity, is a special concept used to describe the predetermined relationship among people or events in Chinese culture. *Yuan* is a Buddhist concept described as the “binding force” that makes people enter into a relationship. It can also refer to the universal force which serves as a governing effect on things and events. In Chinese cultural understanding, *yuan* is different from the notion of karma in that *yuan* is a deterministic concept and always indicates something good happening, whereas karma often indicates cause and effect and usually refers to something bad. Furthermore, *yuan* is often used in relation to romantic relationships referring to couples who are fated to be together. The expression “having fate without destiny (有缘无分)” usually offers an explanation regarding why two persons who love one another could not continue in a relationship. In other words, the phase “having fate without destiny” means that those two persons were fated to meet, but they were destined to live separately. Thus, this concept has a
significant influence on the formation and maintenance of individual Chinese relationships, which is considered an important parameter to understanding Chinese romantic relationships.

**Filial piety (孝, pronounced as xiao)**

Filial piety is an essential idea which emphasizes individual loyalty and respect towards family members, especially with regard to elders. Wang and Song (2010) addressed this concept as one of the most important features in Chinese culture and which influences individuals' daily life. It does not only significantly affect the parent–child relationship, but also contributes to an adult's thoughts on how to look upon the romantic relationship. For example, the quotation 不孝有三,无后为大 (pronounced as bu xiao you san, wu hou wei da) written by Mencius (孟子) can be understood as follows:

"There are three behaviors of Unfilial Piety. The first is simple-mindedly obeying one's parents without any expostulation when they made mistakes; the second is to not earn or support them when the family is poor or they are old; the third is to not marry or to not produce offspring, thereby severing the family line. Among these, the worst is to sever the family line."

Under potential cultural influences, especially those Chinese who believe in this traditional idea, one would think more seriously about romantic relationships.

### 2.2.4 Adult attachment studies in Germany

Grossmann et al. (1985) observed the North German infant–mother interaction in SS and at home, and reported an overrepresentation of avoidant attachment infants. However, this finding was not supported by their studies in South German infants. Therefore, they referred to a regional characteristic that northerners are more independent and to a cultural value that German infants are more independent, contrary to Grossmann and Grossmann (2005).

In 1993, Spangle and Grossmann repeated the test of SS with 1-year-old German infants. His results revealed that 30 (73.2%) out of 41 infants were classified as secure, 7 (17.1%) as avoidant, only 1 (2.4%) as ambivalent, and 3 (7.3%) were not classified using the coding based on the three traditional categories. In addition, when
using a four-category coding, the results showed that 56% were secure, 15% were avoidant, 2.5% were ambivalent, and 22% were disorganized.

Zach and Keller (1999) investigated the attachment–exploration balance of infants using two cultural samples: Northern German and American. Their findings indicated that the 1-year-old US infants’ attachment and exploration behaviors in novel situations and familiar situations were in accordance with attachment theory. However, North German infants demonstrated fewer “check backs” with their mothers in unfamiliar situations, which revealed that 1-year-old North German infants regulated their distress independently from their mothers. These results were consistent Grossmann’s (1985) study.

The German culture is described as having an individualistic orientation and as a self-reliant culture (Friedlmeier and Trommsdorff 2008). Grossmann (2007) argued that the high proportion of avoidance attachment in their German children’s sample was due to the self-reliance concept in German culture and did not imply that German parents were rejective.

In 2007, Kirchmann, Fenner and Strauss tested 8 adult attachment measurements on 65 German students. The results from the German version of ECR-R (ECR-RD) showed that the mean anxiety score was 3.20 and avoidance was 2.68. While, in the same year, Ehrenthal et al. (2009) reported that the German version of ECR-RD was evaluated in a large normal population (n = 1006) with an average age of 18.92 years. The results are shown in Table 2.3.

Table 2.3 Adult Attachment Anxiety and Avoidance Results from the German Version of the Experience of Close Relationships (ECR-RD) Survey and Scores for Four Attachment Patterns from the Second Part of the Relationship Questionnaire (RQ-2) (Ehrenthal et al. 2009).

<table>
<thead>
<tr>
<th>Adult Attachment</th>
<th>M (± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECR-RD Anxiety</td>
<td>2.77 (± 1.09)</td>
</tr>
<tr>
<td>ECR-RD Avoidance</td>
<td>2.36 (± 1.0)</td>
</tr>
<tr>
<td>RQ-2 Secure</td>
<td>5.09 (± 1.57)</td>
</tr>
</tbody>
</table>
### TABLE 2.3

<table>
<thead>
<tr>
<th>Adult Attachment</th>
<th>M (± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ-2 Dismissing</td>
<td>3.58 (± 1.78)</td>
</tr>
<tr>
<td>RQ-2 Preoccupied</td>
<td>2.46 (± 1.55)</td>
</tr>
<tr>
<td>RQ-2 Fearful</td>
<td>2.91 (± 1.94)</td>
</tr>
</tbody>
</table>

Considering the large sample size for Ehrenthal’s study, their results can be considered as the norm for ECR-RD and RQ-2 in adult German populations (see Table 2.3). The norm for ECR-R released by Fraley in 2000 is based on an online sample of over 17,000 subjects with an average age of 27 years, which showed that the dimension of anxiety in ECR-R was 3.56 (±1.12) and the dimension of avoidance was 2.92 (±1.19) (Van Ecke 2007). Compared with Fraley’s report, Ehrenthal’s results showed that German adults have lower levels of attachment anxiety and avoidance.

### 2.3 Emotion recognition theory

Human communication includes both spoken language and non-verbal cues. Undoubtedly, facial expressions which are used to express feeling and give feedback play the most important role in our daily social life. The formulation of basic emotion theories were established by means of cross-cultural studies on facial emotion recognition. Some theorists defined basic emotions as discrete categories based upon their own understanding and research paradigm (Ortony and Turner 1990; Tomkins 1984).

#### 2.3.1 Basic emotions

Do basic emotions exist? If they do, what emotions are basic and how does a basic emotion differ from other emotions?

As shown in Table 2.4, several emotions have been defined as basic emotions in various studies. Happiness (joy), fear, surprise, sadness, anger, and disgust were frequently mentioned in those studies.
Table 2.4 Basic Emotions as Defined by Research (Ortony and Turner 1990).

<table>
<thead>
<tr>
<th>Theorist</th>
<th>Basic Emotions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ekman, Friesen and Ellsworth 1982</td>
<td>Joy, fear, surprise, sadness, anger, disgust</td>
</tr>
<tr>
<td>Frijda 1986</td>
<td>Happiness, surprise, sorrow, desire, interest, wonder</td>
</tr>
<tr>
<td>Gray 1985</td>
<td>Joy, terror, rage, anxiety</td>
</tr>
<tr>
<td>Izard 1977</td>
<td>Joy, fear, surprise, sadness, anger, disgust, contempt, distress, guilt, interest, shame,</td>
</tr>
<tr>
<td>James 1984</td>
<td>Love, fear, rage, grief</td>
</tr>
<tr>
<td>Oatley and Johnson-Laird 1987</td>
<td>Happiness, sadness, anger, disgust, anxiety</td>
</tr>
<tr>
<td>Plutchik 1980</td>
<td>Joy, fear, surprise, sadness, anger, disgust, acceptance, anticipation</td>
</tr>
<tr>
<td>Panksepp 1980</td>
<td>Expectancy, fear, rage, panic</td>
</tr>
<tr>
<td>Tomkins 1984</td>
<td>Joy, fear, surprise, sadness, anger, disgust, interest, contempt, distress, shame,</td>
</tr>
<tr>
<td>Weiner and Graham 1984</td>
<td>Happiness, sadness</td>
</tr>
</tbody>
</table>

Beside these concrete emotions, some researchers also argued that emotions can be differentiated as positive, negative and neutral (Edelstein 2006; Calder et al. 2003). Tomkins believed that there are three categories of emotions: positive (joy, interest), negative (anger, contempt, disgust, distress, fear, shame), and neural (surprise) (Tomkins 1984). In order to explore the universality of emotion, the original empirical study conducted by Ekman, Sorenson and Friesen (1969) picked six of Tomkins’s basic emotions as stimuli, namely, happiness, fear, surprise, sadness, anger, and disgust. In their study, they investigated the recognition accuracy of six emotions in both literate (United States, Brazil and Japan) and preliterate (New Guinea and Borneo) cultures. The results showed that the accuracy of recognition was higher than by chance in all cultures, the agreement of recognition was higher in literate cultures, and, then, in Ekman’s later empirical studies, he specified those six emotions as basic emotions. Ekman’s theory adopted an evolutionary perspective, which claims that emotions are evolved and adapted. He introduced Darwin’s theory to explain his discovery on the universality of emotions and clarified that those basic emotions have adaptive functions to deal with fundamental life tasks. The criteria he used to distinguish the basic emotions can be summarized as follows: (a) continuous and universal (present in human and primate species, same performance in all cultures), (b) quick onset in which the emotion happens automatically before one is aware, and
(c) distinctive patterns for each basic emotion in terms of signaling and psychobiology (Ekman 1999; Levenson 2011).

From psychological theory, these six basic emotions result in a model which is widely accepted since each of these emotions have strongly distinctive characters. The six basic emotions framework is the most widely employed model for basic emotions research. In the 1990s, Ekman added a series of positive and negative emotions as basic emotions, highlighting the importance of basic emotions for emotion research. His basic emotions list has been expanded and now includes amusement, contempt, contentment, embarrassment, excitement, guilt, relief, satisfaction, sensory pleasure, shame, and pride in one's achievements (Ekman 1999).

Disagreeing with the emotion classification theory, other theorists provided dimensional models of emotion. Those models define emotions according to one or more dimensions. For example, the “circumplex model” was first developed by James Russell (1980), who suggested that emotions are situated in a two-dimensional (arousal and valence) circular space (see Fig. 2.3).

![Fig. 2.3 Schematic for the Two-Dimensional Structure of Emotions (Feldman Barrett and Russell 1998).]
2.3.2 Emotion recognition research paradigm

The most popular research paradigms on facial emotion recognition include forced-choice (Atkinson et al. 2009; Matsumoto and Ekman 1989), reaction time (Edelstein and Gillath 2008; Mogg, Millar and Bradley 2000), and emotion recognition morphs (Fraley et al. 2006; Hoffmann et al. 2010; Montirosso et al. 2010; Niedenthal, Brauer, Robin and Innes-K 2002). The forced-choice method attempts to detect the accuracy of emotion recognition. Reaction time is commonly used to discover an individual’s bias and selective attention. Emotion recognition morphs focus more on the subject’s sensitivity to changing emotions.

In terms of stimuli in studies of facial emotion recognition, several data sets have been employed in this field including cartoon pictures (Gallagher et al. 2000; Masuda et al. 2008) and images of real human faces (Adams and Kleck 2005; Matsumoto and Ekman 1989). In most studies, the stimuli of real human faces were selected from the Japanese and Caucasian Facial Expressions of Emotion (JACFEE) (Matsumoto and Ekman 1989), which possesses a high reliability and validity in displaying the intended emotions (Biehl et al. 1997). In addition, various studies have shown the reliability and validity of the JACFEE set in displaying the intended emotions (Biehl et al. 1997). Researchers also divided different facial features into various facial emotion recognition stimuli, with a particular focus on testing the regions of the mouth and eyes (Yuki et al. 2007). Reading the Mind in the Eyes Task (RMET) (Baron-Cohen et al. 1997) is a particular stimulus which includes different emotions only displayed in the eye region.

In the present study, the stimulus named “Pictures of Facial Affect Ulm” (PFA-U) developed by Limbrecht (2012) was employed, which consists of a set of high-quality and standardized German facial emotion images for six basic emotions displayed according to the FACS (Ekman et al. 2000). This stimulus was used given that our focus was on the commonality and specificity of facial emotion recognition on German faces among Chinese and Germans. The PFA-U set was applied to the facially expressed emotion labeling (FEEL) test, which was developed by the Department of Medical Psychology at Ulm University (Kessler et al. 2002). The FEEL test is a computer program developed to measure an individual’s facial emotion recognition...
ability. It contains six basic emotions (happiness, fear, surprise, sadness, anger and disgust) shown by Japanese and Caucasian individuals (using the JACFFEE) and neutral faces from each expresser (Japanese and Caucasian neutral faces (JACNeuF)). The whole test contains three parts: introduction, training exercise, and main task. The introduction gives subjects an idea of how the FEEL test works and detail about the six emotional labels. The aim of the training segment is to familiarize subjects with the emotional faces and performing the FEEL test. In the main FEEL test, subjects need to label 42 emotional facial images. For each emotional label, first, a neutral facial expression for one expresser (1500 ms) appears. When the image begins to appear, a short acoustic signal accompanies it in order to alert the subject. After that, a fixation point is shown on a gray screen for 1000 ms, then, the emotional stimulus is displayed for 300 ms. After another pause (500 ms), subjects have 10 s to choose which emotional expression is shown in the image. The forced-choice format offers a result for the person's emotion recognition accuracy for each emotion. Kessler et al. (2002) did a pilot study of the FEEL test on 77 healthy subjects and found it had the highest reliability (Cronbach’s alpha coefficient of r = 0.77). For the emotion recognition study, the FEEL test is a very useful tool not only because of its high reliability, but also because of the following: a) one can increase and decrease the number of images and images are replaceable; and b) the results can be imported into SPSS and other analytical software for further analysis. In the present study, the PFA-U set (which includes 96 images) was used as the facial emotional stimulus applied to the FEEL test program. This particular research paradigm will be described in detail in the chapter on methods.

2.4 Cross-cultural studies on emotion recognition

The argument about whether emotion recognition is universal or culturally specific has been debated in recent decades. Cross-cultural research on emotion recognition has been conducted extensively. Since Charles Darwin published his book entitled The Expression of the Emotions in Man and Animals in 1872, several inter-cultural studies supported and confirmed his arguments that the expression of emotions is universal regardless of one’s culture (Ekman 1969; 1994; Elfenbein and Ambady 2002). Some scientists, however, doubted this suggestion (e.g., Russell 1993). Nowadays, researchers have found that the universality and cultural specificity of
facial emotion recognition concurrently exist (Ekman 1994; Elfenbein and Ambady 2002; 2007). The investigation of the universality of facial emotion recognition with various specific procedures is still underway and will continue.

2.4.1 Universality of emotion recognition

In order to illustrate his arguments on the theory of evolution, Charles Darwin collected hundreds of photographs recording facial expressions from normal life (babies, children, men and women). He hired actors and psychiatric patients for his book *The Expression of the Emotions in Man and Animals* (Darwin 1872), emphasizing in particular that man and animals express the same emotions through similar movements. Since the early 1970s, numerous researchers have been investigating the topic of emotion recognition. Studies of human facial expressions were carried out to clarify this particular topic.

To date in facial expression studies in diverse cultures, researchers have found the universality in the expression and recognition of six basic facial emotions, i.e., happiness, fear, surprise, sadness, anger, and disgust (Ekman 1969; 1992). A study conducted by Ekman and his colleagues (1969) demonstrated that there was a high recognition rate for six basic emotions in literate cultures and a low accuracy in preliterate cultures. Despite this, for happiness, anger, and fear the accuracy rates for recognition were similar in all cultures. On the issue of the universality of emotion, Ekman (1972) initiated an approach called the neuro-cultural theory which includes an evolutionary perspective and the social influences of facial emotions. In the neuro-cultural theory of emotion recognition, Ekman suggested that there are some facial emotions that can be recognized at the same level by all cultures because those emotions are innate.

2.4.2 Facial emotion recognition in Eastern and Western societies

Despite the widespread assumption in theories of emotion suggesting that facial emotion is a universal phenomenon, many approaches were employed to investigate the culture-specific influence on facial emotion recognition.
The comparison between Western and Eastern societies is representative of the cultural differences in the study of facial emotion recognition. In this field, the typical study conducted by Ekman (1987) and Matsumoto (1990) provides the basis of comparison between Japanese and Caucasians performances on six basic emotion recognition tasks. In their studies, a set of pictures which contained the JACFEE images were developed. To test the display rule according to a cultural difference on individualism and power distance, Matsumoto (1990) collected data from American and Japanese subjects and asked them to chose the appropriateness of displaying emotions in different situations and rate how appropriate those emotions were. The results showed that Americans rated happiness as more appropriate than Japanese did in public situations both for Japanese and Caucasians. Whereas Americans rated disgust and sadness as more appropriate in in-groups, Japanese rated anger as more appropriate in out-groups. Matsumoto argued that, compared with Japanese, as an individualistic culture, Americans are more tolerant of negative emotions in in-groups. Previous studies also showed that compared with American subjects, Japanese inhibit their real facial expressions when watching a disgusting film in the presence of researchers (Ekman and Friesen 1969).

Studies also indicated that Japanese and South Koreans rely more on context when perceiving emotion on faces than Westerners do. These differences were explained as cultural differences which exist in emotional perception. That is, Japanese culture is more relational in nature compared to that experienced by American subjects, who tend to experience things more individualistically (Masuda 2008; Matsumoto et al. 2010).

In addition, each cultural group has their own specific emotional program learned during socialization which results in differences in emotion expression (Elfenbein and Ambady 2003). Recent cross-cultural studies assumed that there may be differences in the way multiple emotional cues are decoded. For example, cultural differences have been found in the use of the eyes and mouth as cues to recognize emotions in Japan and the U.S., in which Japanese weighed eye signals more heavily than Americans. By contrast, Americans weighed signals in the mouth region more heavily than Japanese (Yuki et al. 2007). Another study investigated the observer-specific internal representations of six basic facial emotions between Europeans and
Chinese. By using complementary statistical image analyses, they found European internal representations mainly featured in the eyebrows and mouth, whereas Chinese internal representations showed a preference for facial expressive information in the eye region (Jack, Caldara and Schyns 2012). Also, Mai et al. (2011) found that Chinese who placed a higher value on collectivism pay more attention to eye cues when recognizing Duchenne and non-Duchenne smiles. Jack et al. (2012) explored the emotion representation difference for six basic emotions among Western, European and Chinese individuals. The results showed that eye activity is predominantly featured for Chinese in representing emotions, whereas Europeans represent six basic emotions with distinct facial movements. However, Chinese represent intense sadness expressions of emotion specifically in the mouth area (see Fig 2.4 in next page) (Jack, Caldara and Schyns 2012, pp. 3).
Fig 2.4 Spatiotemporal Location of Emotional Intensity Representation in Western Caucasian and Chinese Cultures
(Each row shows color-coded faces illustrating the culture-specific spatiotemporal location of expressive features representing the emotional intensity for each of the six basic emotions. Color coding is as follows: blue, Western Caucasian; red, East Asian, where values reflect the t statistic. All color-coded regions show a significant (p < 0.05) cultural difference as indicated by asterisks labeled in the color bar (Jack, Caldara and Schyns 2012 Pp. 3)).
2.4.3 Studies on the cultural exposure effect

The influence of culture on facial emotion recognition has been widely accepted. Early studies on facial emotion recognition among cultures sought to refute this influence, in which preliterate cultures were used as a control group to prove the universality of facial emotions. The phenomenon of “cultural exposure” has been clearly outlined by Elfenbein and Ambady (2003). They suggested that the in-group advantage could be reduced if an individual had extensive exposure to other socio-cultural environments. In their study, Mainland Chinese, Chinese in the US, and Americans were investigated. The results showed that Chinese in China were less accurate than Chinese in the US and Americans in the US when recognizing American facial emotions. The stimuli they used were chosen from Ekman and Friesen’s “Pictures of Facial Affect,” a collection of Caucasian facial expressions. Furthermore, the idea of “cultural exposure” was applied to Korean children who were adopted by European families. The result implied an advantage to recognizing European facial recognition (Sangrigoli et al. 2005).

A reverse cultural exposure effect was found in Hong Kong Chinese who performed better when recognizing American emotion faces than Japanese emotion faces displaying negative emotions (contempt, disgust, surprise and sadness), and only fearful emotional expression recognition appeared to be influenced by cultural exposure (Lee et al. 2005). They attributed these results to a) the use of Japanese faces instead of Hong Kong Chinese faces, and b) Hong Kong Chinese have been extensively exposed to American culture and Japanese culture.

2.5 Adult attachment and facial emotion recognition

In line with Tomkins' affect theory, one of the most potent stimuli involved in emotional learning during childhood is the primary caregiver's emotionally expressive face (Tomkins 1991). Facial emotion is involved in the formation of attachment and has a crucial influence on the development and regulation of personal relationships (Ekman 1992). Facial communication has special interest for the formation of attachment. IWMs reflect the underlying regulatory action of attachment strategies that shape cognition, affect, and behavior (Shaver and Mikulincer 2002).
Early attachment persistently influences the facial expression recognition ability in adults. Considering the two dimensional attachment model, Fraley et al. (2006) found that individuals who were highly anxious were more likely to perceive facial emotion expressions earlier but made more mistakes than other people, while the correlation between emotion perception and attachment avoidance was not found in the same study. Anxious individuals tended to divert attention from happy faces (Dewitte and Houwer 2008), and were more likely to direct their gaze at intense, negative facial expressions (Mogg 2007). Individuals with high attachment anxiety and high attachment avoidance tended to divert attention away from fearful faces (Dewitte and Houwer 2008).

Considering the four categories of adult attachment and with regards to offsetting happiness and anger facial expressions, under stress-free conditions, response speed (from quickest to slowest) was as follows: fearful attachment, preoccupied and dismissing individuals, and securely attached individuals. While under stressful conditions, the responses were completely opposite (Niedenthal 2002). Dismissing attachment tendencies were related to a higher vigilance to social stimuli (e.g., social interactions, human facial emotional expressions) (Maier et al. 2005). Decoding facial emotion results indicated in facial expressions such as joy and a decoding bias of shame can predict the secure attached model; the facial expression of disgust can predict the preoccupied attachment model. A decoding bias for disgust can predict the dismissing attachment model, and the fearful attachment model was predicted by the facial expression of shame and a decoding bias towards anger (Magai, Hunziker, Mesias and Culver 2000).

Two studies used the RMET as an assessment of emotion perception accuracy. They found that the attachment pattern results in differences in emotion perception. With regards to negative emotions, preoccupied subjects had an increased accuracy and dismissing individuals had a lower accuracy at judging emotions (Meyer 2009). When the attachment system is aroused by attachment-related pictures, both the patients and the control group changed their emotion perception accuracy. In the control group, the dismissing and preoccupied individuals had an increased accuracy while the secure and unresolved individuals had a decreased accuracy, while all patients had a lower accuracy overall (Fizke 2010).
Facial emotion recognition is influenced by the decoding process and facial expression style (Elfenbein 2007). Sonnby-Borgström and Jönsson (2003; 2004) investigated the relationship between adult attachment and emotion reaction. Compared with subjects with a positive self model of attachment, negative self model individuals showed a significantly stronger corrugators response which is related to the display of negative emotions, and reported more negative feelings at the cognitive controlled level (2350 ms exposure time); toward angry faces, dismissing attachment individuals showed normal corrugator reactions at the automatic information processing level (56 ms exposure time), whereas, at the cognitive controlled level, they showed inverted zygomatic reactions which are related to positive emotions and decreased their corrugators response. This result indicated that dismissing attachment individuals prefer to cognitively repress their negative emotion reaction on a cognitive level.
3 Hypotheses

1. The major aim of this study was to explore the relationship between adult attachment and facial emotion recognition ability in three groups: CC, CG, and GG. Although attachment theory suggests that attachment anxiety and avoidance impact a person’s cognitive processes, the results of previous studies were inconsistent. Thus, in the present study, we adopt German facial expressions of emotion as stimuli to explore the relationship between adult attachment and facial emotion recognition in three groups.

Hypothesis I: The recognition performance on German facial expressions of emotion will be influenced by the adult attachment system.

2. The second aim of this study was to investigate the attachment profiles of CG. Studying in another country is assumed to be an exploration activity. Based on attachment theory, a secure attachment individual has the ability to freely explore its environment. In the present study, several attachment-related questions have been considered: four adult attachment patterns (i.e., secure, preoccupied, dismissing and fearful); two attachment dimensions (i.e., attachment-related anxiety and avoidance); and two internal working models which represent the self and others (i.e., the self model and the other model).

Hypothesis II: CG will have a higher percentage of secure attachment, will show a higher self model and other model, and will have a lower level of anxiety and avoidance compared with CC.

3. Although attachment behavior is generally regarded as a universal phenomenon, several studies indicated that the attachment system was influenced by cultural values among different countries. Compared with Chinese society, a German individual was identified as having an individualistic orientation while Chinese tend to be more collectivistic. Since the norm of attachment between Chinese and Germans was different, we would like to explore the inter-cultural difference between the two cultures in adult attachment. Thus, the third hypothesis is follows:
Hypothesis III: Cultural differences exist in the adult attachment pattern between German and Chinese individuals. Germans will have a higher level of attachment avoidance, while Chinese students will have a higher level of attachment anxiety. Considering the attachment patterns, Germans will have a higher percentage of dismissing attachment or show a higher score on the dismissing pattern, while Chinese will have a higher percentage for the preoccupied attachment pattern or possess a higher score on the preoccupied attachment pattern.

4. The last aim of the present study was to investigate the emotion recognition accuracy on the six basic emotions between Chinese and Germans when judging German facial expressions. Based on previous studies, the association between cultural exposure and the accuracy of facial emotion recognition can be determined, but the related result for Chinese and other foreign nationals living in Germany is still not clear.

Hypothesis IV: Considering that emotion recognition is a universal ability among cultures, we assume that there will be no significant difference between Chinese and Germans on the recognition of certain emotions, such as happiness.

Considering the individualistic and collectivistic orientations, we assumed that the consequence on the accuracy rate for German subjects would be better for negative facial emotions compared with the two Chinese groups.

Considering cultural exposure and the dialect effects, the results for the accuracy rate in German subjects would show the best performance on the facial emotion recognition task while the CC would have the worst results, whereas the results found for CG would fall in between the other two groups. In addition, for CG, the emotion recognition accuracy will be positively related to a person's duration of living in German.
4 Empirical studies

4.1 Survey of adult attachment pattern for three groups: CC, CG and GG (Study 1)

The purpose of this study was to investigate the difference between adult attachment patterns among these three groups: CC, CG and GG. Considering the category of adult attachment, we would expect the proportions for each adult attachment pattern to vary in different cultural contexts. For the investigation of cultural variations in emotion recognition on different attachment patterns, the situation for attachment pattern for each cultural group must be considered. In addition to the first hypothesis regarding the four adult attachment patterns, the secondary purpose of this study was to determine if sufficient data can be collected to meet the statistical requirements. For the testing of our hypotheses, compared with CC, CG will have a higher proportion of secure attachment, a higher self model and other model, and lower levels of anxiety and avoidance. Therefore, a pilot study on adult attachment was carried out first.

4.1.1 Materials and methods

4.1.1.1 Participants

In this study, 60 Chinese in China (29 males, 31 females) were recruited online, 71 Chinese in Germany (32 males, 39 females), and 60 Germans participants in Germany (25 males, 35 females) were recruited via posters displayed on campuses or online.

Table 4.1 shows their demographic information including age, educational background, and their relationship status.
Table 4.1 Demographic Information for the Three Groups (CC, CG and GG) in Study 1.

<table>
<thead>
<tr>
<th></th>
<th>CC (n = 60)</th>
<th>CG (n = 71)</th>
<th>GG (n = 60)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>26.47 (4.53)</td>
<td>28.20 (4.08)</td>
<td>24.47 (5.93)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate</td>
<td>58.3% (n = 35)</td>
<td>35.7% (n = 25)</td>
<td>75.0% (n = 45)</td>
</tr>
<tr>
<td>Graduate</td>
<td>41.7% (n = 25)</td>
<td>64.3% (n = 46)</td>
<td>25.0% (n = 15)</td>
</tr>
<tr>
<td><strong>Relationship Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>46.7% (n = 28)</td>
<td>32.4% (n = 23)</td>
<td>41.7% (n = 25)</td>
</tr>
<tr>
<td>In a relationship</td>
<td>53.3% (n = 32)</td>
<td>67.6% (n = 48)</td>
<td>58.3% (n = 35)</td>
</tr>
</tbody>
</table>

### 4.1.1.2 Measurements

Measurements include demographic questions (gender, age, educational level, and relationship status), followed by the attachment questionnaires: the Relationship Questionnaire (RQ) and the Experiences in Close Relationships-Revised (ECR-R).

#### Choice of measurements

From the literature, over 30 measurements have been developed for attachment research. Choosing the proper attachment measurement is vital for psychological studies. In addition to reliability and validity, investigators have to consider what relationship is the focus of the study (romantic partner, parents, children, etc.); what kind of attachment constructs, dimensions, or categories are of interest with respect to the research question; and the time required for training, administration, and scoring.

In psychosomatic research, the AAI, ECR-R, and RQ are the most commonly used scales to date (Ravitz et al. 2010). The AAI remains the most established instrument with excellent psychometric properties in those studies in which attachment is the primary focus of investigation. However, it requires a large number of resources, time, and training for administration, transcription, and coding, thus limiting the feasibility of its use in many settings. Differing coding methods can be more time-efficient (Fonagy et al. 1998). When attachment is a secondary focus of investigation, a forced-choice questionnaire, such as the RQ, has an adequate reliability and a very good face and discriminant validity. Dimensional self-report attachment instruments
such as the ECR and ECR-R may be more appropriate when attachment is the primary focus of the study, but interview or observational measures are not feasible (Ravitz et al. 2010).

In this study, emotion recognition is probed in addition to adult attachment patterns. Furthermore, the qualified Chinese versions of AAI and AAP are still under development. Thus, the RQ and ECR-R were chosen for the assessment of adult romantic attachment in this study.

**Relationship Questionnaire**

The Relationship Questionnaire (RQ; Bartholomew and Horowitz 1991) is a self-report measurement used to test an adult individual's attitudes towards their close romantic partner. It consists of four sets of descriptions (without the titles of each attachment pattern), each of which describes a category or pattern for an attachment prototype. RQ stems from the framework of the self model and other model dimensions, which divide attachment into four categories. Secure attachment represents low anxiety and low avoidance, and a positive view of one's self and of others; preoccupied represents high anxiety and low avoidance, and a negative view of one's self and a positive view of others; dismissing represents low anxiety and high avoidance, and a positive view of one's self and a negative view of others; and fearful represents low anxiety and low avoidance, and a negative view of one's self and others.

For example, the prototype for secure was described as: “It is relatively easy for me to become emotionally close to others. I am comfortable depending on others and having others depend on me. I don't worry about being alone or having others not accept me.” In RQ-1, the subject is asked to select the one description that participants consider to be most similar to themselves. In RQ-2, the participant is asked to rate their degree of correspondence to each prototype on a 7-point scale. The self model and other model can be calculated in RQ-2: self model = positive self models (secure plus dismissing) - negative self models (fearful plus preoccupied); other model = positive other models (secure plus preoccupied) - patterns characterized by negative other models (fearful plus dismissing). RQ-1 and RQ-2 provide a complete picture of
an individual’s attachment feelings and behavior. This short measurement has a good face and discriminant validity (Griffin and Bartholomew 1994; Paula Ravitz et al. 2010)

**Experiences in Close Relationships–Revised**

The Experiences in Close Relationships–Revised (ECR-R; Fraley, Waller and Brennan 2000) questionnaire is a 36-item scale which contains two subscales instead of distinct dimensions for an attachment system: attachment anxiety and attachment avoidance. There are 18 items which assess anxiety, and 18 for avoidance. The anxiety sample items include “I worry a lot about my relationships” and “When I’m not involved in a relationship, I feel somewhat anxious and insecure.” Examples of avoidance items include “I prefer not to show a partner how I feel deep down” and “I find it difficult to allow myself to depend on romantic partners.” Each item was rated on a 7-point scale, with 1 being “strongly disagree” and 7 being “strongly agree.” After reversing items that are reverse-scored, subscale scores were calculated from the averages of their corresponding items.

In a study examining the internal consistency and factor structure of the ECR-R in a college student sample, the attachment anxiety subscale had an alpha coefficient of 0.917 and the attachment avoidance subscale had an alpha coefficient of 0.927 (Fairchild and Finney 2006). The German version, ECR–RD, was evaluated in a large non-clinical and clinical sample. Overall, the good psychometric properties were confirmed (Cronbach’s a = 0.91/0.92) (Ehrenthal 2009).

In the present study, the reliability of ECR-R was good: in study 1 (in CC, the attachment anxiety subscale had an alpha coefficient of 0.90 and the attachment avoidance subscale had an alpha coefficient of 0.91; in CG, the attachment anxiety subscale had an alpha coefficient of 0.90 and the attachment avoidance subscale had an alpha coefficient of 0.87; and in GG, the attachment anxiety subscale had an alpha coefficient of 0.92 and the attachment avoidance subscale had an alpha coefficient of 0.90); in study 2 (in CC, Cronbach’s a = 0.74 for anxiety and 0.72 for avoidance; in CG, Cronbach’s a = 0.87 for anxiety and 0.88 for avoidance; and in GG, Cronbach’s a = 0.88 for anxiety and 0.90 for avoidance).
4.1.2 Results

4.1.2.1 Results for RQ

Attachment distributions for three groups (RQ-1 results)

The first hypothesis was to determine if there was a higher proportion of a participant in the CG group with a higher secure attachment pattern compared with CC and GG. Figure 4.1 describes the results of the first part of RQ-1 for the three groups. In the CC group, 53.3% participants had a secure attachment pattern, 16.7% participants had a dismissing attachment pattern, 15.0% were preoccupied, and 15.0% were fearful. In the CG group, those same proportions were 64.3%, 19.7%, 14.1%, and 2.8%, respectively, while in GG group, 43.3%, 13.3%, 16.7%, and 26.7% were found to be secure, dismissing, preoccupied, and fearful, respectively.

![Fig. 4.1 Distribution (%) of Attachment Patterns from RQ-1 for CC, CG and GG.](image)

In order to compare the distribution of adult attachment in the three groups, a series of cross tab tests were conducted. According to the results, there was a significant difference among three groups (\(\chi^2(6,191) = 16.50, p = 0.011\)). The distribution of adult attachment was significantly different between CG and GG (\(\chi^2(3,131) = 16.81, p = 0.001\)), and nearly significant between CC and CG (\(\chi^2(3,131) = 6.50, p = 0.09\)). However, there was no significant difference on the adult attachment distribution between CC and GG (\(\chi^2(3,120) = 2.86, p = 0.41\)).

As can be seen from Fig. 4.1, the significant differences between the CG and GG groups were found for the secure and fearful attachment patterns. There were 64.3%
secure attachment individuals in the CG group, while 53.3% were secure in the CC group and 43.3% were secure in the GG group. For the fearful attachment pattern, the proportions reached 26.7% participants in the GG group, while only 15.0% in the CC group and 2.8% in the CG group, respectively, were identified. As we hypothesized, there was a higher percentage of secure attachment individuals in CG (64.3%) compared with CC (53.3%).

**Rating score for the four attachment patterns for three groups (RQ-2 results)**

Figure 4.2 shows the mean and standard deviation for the four attachment patterns: secure, dismissing, preoccupied, and fearful. The basic scores for the four attachment patterns and the scores for the “self model” and “other model” were calculated.

The one-way ANOVA demonstrated a main effect on the score of fearful attachment among the three groups ($F(2, 188) = 10.19, p = 0.00$). The post-hoc test with the Dunnett T3 correction indicated that the CG was significantly lower on the fearful attachment pattern than for the other two groups (compared with CC ($T(130) = 0.80, p = 0.015$, equal variance not assumed) and compared with GG ($T(130) = 1.35, p = 0.000$, equal variance not assumed)).

The one-way ANOVA indicated a main effect on the scores for the secure and preoccupied attachment patterns among the three groups, and the difference was significant at the 0.1 probability level (secure: $F(2, 188) = 2.62, p = 0.076$; preoccupied: $F(2, 188) = 2.72, p = 0.069$). The post-hoc test with the Bonferroni correction indicated that the CG had a higher secure attachment than CC, but the difference was not significant ($T(130) = 0.53, p = 0.104$), while CC was significantly higher for preoccupied attachment than CG, and the difference was significant at the 0.1 probability level ($T(130) = 0.66, p = 0.065$).

By using the four ratings for the attachment patterns, attachment views for the “self model” scores and “other model” scores were created. The one-way ANOVA revealed a main effect on the “self model” scores ($F(2, 188) = 6.70, p = 0.002$). The post-hoc test with the Bonferroni correction revealed that the CG group had a significantly higher “self model” score ($M = 4.74, SD = 3.40$) than the other two groups.
(compared with CC: $M = 2.73$, $SD = 3.77$, $T (130) = 2.01$, $p = 0.008$; compared with GG: $M = 2.65$, $SD = 4.12$, $T (130) = 2.10$, $p = 0.005$). Regarding the “other model” scores, the significant difference was at the 0.1 level among the three groups by using a one-way ANOVA ($F (2, 188) = 2.74$, $p = 0.067$). The post-hoc test with the Bonferroni correction revealed that the CG group had a higher “other model” ($M = 2.30$, $SD = 3.58$) than GG, and the difference was significant at the 0.1 probability level ($M = 0.82$, $SD = 4.07$, $T (130) = 1.48$, $p = 0.061$).

![Figure 4.2](image)

Fig 4.2 Results of the RQ-2 for CC, CG and GG. The scores for the four attachment patterns (secure, dismissing, preoccupied and fearful) range from 1 to 7. The self model and other model were calculated from the scores of the four attachment patterns (see 4.1.1.2 Measurements) (# $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).
4.1.2.2 Attachment anxiety and attachment avoidance (ECR-R results)

Figure 4.3 shows the mean and standard deviation for the two dimensions of anxiety and avoidance related to adult attachment. The mean for anxiety was 3.4 (SD = 1.00) for the CC group, 2.93 (SD = 0.96) for the CG group, and 3.04 (SD = 1.05) for the GG group. The one-way ANOVA demonstrated a main effect for anxiety among the three groups (F (2, 188) = 4.36, p = 0.014). A post-hoc test with the Bonferroni correction revealed that, in the dimension of anxiety, CC was significantly higher than CG (T (130) = 0.50, p = 0.014). The mean for avoidance was 3.07 (SD = 0.92) for CC, 2.73 (SD = 0.81) for CG, and 2.29 (SD = 0.79) for GG. The one-way ANOVA also showed a main effect on the dimension of avoidance (F (2, 188) = 13.13, p = 0.000). The post-hoc test showed that GG was significantly lower in the dimension of avoidance compared with CC (T (119) = 0.78, p = 0.000), and CG (T (130) = 0.44, p = 0.09) (significant at the 0.1 probability level). In addition, CC was significantly (at the 0.1 level) higher on attachment avoidance than CG (T (130) = 0.34, p = 0.066).

Fig 4.3 Mean and Standard Deviation for Attachment Anxiety and Attachment Avoidance for CC, CG and GG (# p < 0.10, * p < 0.05, *** p < 0.001).
4.1.3 Discussion

Study 1 was intended to discern the attachment features for three populations: CC, CG and GG. The first aim was to explore whether CG had specific profiles for adult attachment, especially compared with CC. Previous studies indicated that visiting Chinese students in Canada had lower romantic attachment security compared with native Canadians (DiTommaso, Brannen and Burgess 2005). We took the viewpoint from attachment theory and suggested that, compared with peers living in their native land, overseas individuals may have a higher secure attachment orientation since behaviour such as studying in another country certainly is an exploration activity. According to attachment theory, CG subjects who have high achievement goals and academic pursuits should have a high ability to conduct exploratory activities. Meanwhile, CG formed their attachment patterns within Chinese culture and may be influenced by German culture. Thus, it is necessary to investigate the adult attachment for CG.

In the present study, the first hypothesis predicted that CG will have a higher proportion of secure attachment individuals compared with CC. A series of cross tab tests indicated that the distribution of adult attachment was significantly different between CC and CG. The difference was especially prevalent for the secure and fearful attachment patterns. As the data showed, 64.3% participants in the CG group fell into the secure attachment pattern versus 53.3% participants in the CC group; there were 15.0% participants in the CC group with a fearful attachment pattern versus 2.8% in the CG group. Thus, our prediction that the secure attachment pattern was predominant in the CG group was confirmed. The result implies that very few fearful Chinese had the courage to explore in Germany. It may also mean that fearful Chinese adopt a more avoidance attitude that renders them reluctant to participate in this study.

In addition, the distribution of the four attachment patterns between CG and GG were significant. As seen in Fig. 4.1, GG had a lower percentage for the secure attachment pattern and a higher percentage for the fearful attachment pattern compared with CG (43.3% secure attachment individuals in the GG group, 64.3% in the CG group; 26.7% fearful attachment in the GG group, and only 2.8% in the CG
From previous attachment studies among German children, high percentages of insecure adult attachment patterns in Germany were attributed to German mothers who were generally less tender and affectionate (Grossmann, Grossmann, Spangler, Suess and Unzner 1985). This result reveals the effect of the traditional German model character image, which is strict, and emotionally inaccessible (Schölmerich and van Aken 1996). However, the inter-cultural difference on the distribution of adult attachment was not found between CC and GG.

The adult attachment self model was significantly higher in the CG group compared with the other two groups. Compared with GG, CG had a higher other model. The high self model and other model in CG were consistent with the results from RQ-1 where CG had a high percentage for the secure attachment pattern and a lower percentage for the fearful attachment pattern. Additionally, the results from RQ-2 also showed that, compared with CC and GG, CG had a significant lower level of fearful attachment patterns towards their romantic partners. The self model and other model were opposite to the anxiety and avoidance dimensions. The high self model stands for low anxiety and high other model instead of low avoidance. In terms of ECR-R which detects the attachment anxiety and avoidance level in particular, the data indicated a similar result whereby CG had a significantly lower level of attachment anxiety and attachment avoidance than CC. The result indicated that, compared with CC, CG is endowed with a positive concept of self and others, has internalized a sense of self-worth, views one’s self as competent and loveable, and considers others as trustful, dependable persons. However, those results may be influenced by demographic factors such as the CG group having the highest percentage of “in a relationship” status (67.6% for CG, 53.3% for CC, and 58.3% for GG).

The second hypothesis was aimed at detecting the difference between attachment profiles for CC and GG subjects since these two particular populations have different cultural backgrounds. In addition to the evolutionary suggestions about all cultures sharing the same innate structure of attachment, we also consider the cultural influence as a crucial factor for the formation and stability of adult attachment. However, a series of cross tab tests indicated that the distribution of adult attachment was not significantly different between CC and GG. Contrary to our second
hypothesis, GG had a significantly lower level of avoidance compared with the Chinese groups. The German ECR-R results in attachment avoidance in this study were similar to a previous study with 1006 subjects (Ehrenthal et al. 2009). The low level of avoidance indicated that German subjects had less emotional distance and more dependence with a romantic partner compared with Chinese. Traditional thinking in German culture concedes an individualistic orientation in which subjects are more independent and act more autonomously. This simple consideration of an individualistic orientation in German society was not enough to explain our results. Considering the stronger intra-cultural difference (Van IJzendoorn and Kroonenberg 1988; Schmitt et al. 2004), the low level of avoidance for adult attachment may be due to the collection of data from our German subjects coming from south Germany (in Ulm). Grossmann and Grossmann (2005) also mentioned that, in their infant attachment studies, they found a high percentage of avoidance in infants in north Germany compared with south Germany. They suggested that northerners are more independent than southerners.

Furthermore, our hypothesis about the cultural differences between CC and GG was not supported. The only significant difference between CC and GG on adult attachment was found on the attachment avoidance dimension, where GG had low-level attachment avoidance.

Interestingly, a high percentage of fearful attachment German participants were found in RQ-1, while a low avoidance of adult attachment in the GG was found in ECR-R. Fearful attachment is assumed to have high anxiety and high avoidance toward romantic partner attachment. The inconsistent results from RQ and ECR-R may due to the difference between the two measurements. Moreover, the special traits of the German population need to be considered and discussed. As an individualistic culture, German subjects are more independent, but do not avoid confronting relationship problems.

Taken together, as predicted, CG had a greater proportion of secure attachment individuals than CC and GG. This result indicated that participants with secure attachment patterns were willing to engage in exploration activity such as going abroad. CG individuals had a higher positive model of themselves and others, were
more confident in thinking of themselves as loveable and acceptable by others, and view others as trustworthy and supportive.

4.2 Cultural differences in adult attachment and emotion recognition (Study 2)

4.2.1 Materials and methods

4.2.1.1 Participants

In order to explore the influence of cultural exposure on facial emotion recognition, three groups (CC, CG and GG) of subjects with two cultural backgrounds were recruited by flyers on a college campus. All students voluntarily participated in this study. As a reward, they received a gift after the task was completed.

A total of 98 participants (50 males, 48 females) aged between 22 and 32 years (M = 24.18, SD = 1.40) were recruited to form the CC group. All of them were students at China University of Geosciences (Wuhan, Middle China). They reported no previous experience in any emotion recognition tasks. In addition, 69 participants (34 males, 35 females) aged between 21 and 41 years (M = 26.59, SD = 4.54) were recruited for the group of CG at Ulm University, Ulm, Germany. These students had been living in Germany for at least 0.2 years (M = 2.5, SD = 2.5). Finally, 71 participants (37 males, 34 females) aged between 17 and 48 years (M = 23.78, SD = 4.8) were included in the group of GG at Ulm University, Ulm, Germany. These were all students who had been born and raised in Germany.

| Table 4.2 Demographic Information for CC, CG and GG. |
| CC (n = 97) | CG (n = 69) | GG (n = 71) |
| Age         | 24.19 (1.40) | 26.62 (4.54) | 23.78 (4.80) |
| Education   | Undergraduate 48.5% (n = 47) | 50.7% (n = 35) | 78.9% (n = 56) |
|             | Graduate 51.5% (n = 50) | 49.3% (n = 34) | 21.1% (n = 15) |
| Relationship Status | Single 28.9% (n = 28) | 37.7% (n = 26) | 60.6% (n = 43) |
|             | In a relationship 70.1% (n = 68) | 62.3% (n = 43) | 39.4% (n = 28) |
Table 4.2 shows the demographic information for these three groups. In the CC group, one participant was excluded due to a missing questionnaire. Therefore, in total 97 participants (49 males, 48 females) for the CC group, 69 participants (34 males, 35 females) for the CG group, and 71 participants (37 males, 34 females) for the GG group provided data for this study.

4.2.1.2 Measurements

Questionnaires

Demographic data was collected through a demographic questionnaire which included questions about gender, age, educational level, relationship situations and so on. Data on adult attachment was gathered using the RQ (Bartholomew and Horowitz 1991) and ECR-R measurement instruments (Fraley, Waller and Brennan 2000). For a full discussion of these instruments, refer to chapter 4.1.1.2.

PFA-U and FEEL-Test

The stimulus PFA-U consists of 96 colorful frontal facial expressions using 48 different actors (two facial emotions per person) portraying the six basic emotions (happiness, sadness, disgust, fear, surprise, and anger). These images were developed by Limbrecht in 2011. In previous studies, the recognition results varied between 71% for fear and 99% for happiness, but were quite homogeneous within the distinct emotional categories (Limbrech et al. 2012).

In the present study, those facial emotion images were embedded into a software program, the Facially Expressed Emotion Labeling (FEEL) test, which is a computer-based method for measuring individual emotion recognition ability (Kessler et al. 2006). The program can then be used to present and record the accuracy of individual emotion recognition.

Before the 96 images are presented, 6 pairs of black and white pictures taken from JACFEE are shown as training materials, so that the subjects can acquaint themselves with the task. Then, a choice circle appears after a 500-ms pause. This choice circle is displayed for a maximum of 15 s, during which the participants must assign the facial emotion image to a category (see Fig. 4.4).
The FEEL test has been revised for use in this study in the following ways: a) 96 images were chosen from PFA-U; b) the choice circles contain different levels of confirmation from “not recognized” to “very sure” of each emotion; and c) the choosing time was increased to 15 s to give participants enough time to evaluate the facial emotion.

In order to allow participants to have a better understanding of each emotion, a series of related emotional words are offered for each emotion label in the introduction as follows:

- **Happiness** (also joy, delight, elation, pleasure, etc.)
- **Fear** (also anxiety, anguish, panic, etc.)
- **Disgust** (also revulsion, disrelish)
- **Anger** (also aggravation, irritation, rage, etc.)
- **Surprise** (also astonishment, etc.)
- **Sadness** (also mourning, dolorous, etc.)

Fig. 4.4 Presentation of Facial Emotion Stimulus.
4.2.2 Results

4.2.2.1 Results for RQ

Attachment distributions for the three groups (RQ-1 results)

Fig. 4.5 shows the percentage of each attachment pattern among the three groups. According to the cross tab test, as predicted, there was a significant difference between the three groups ($\chi^2(6,237)=33.14, p=0.000$). The percentage of participants for each category was significantly different between CC and GG ($\chi^2(6,168)=23.61, p=0.000$) and between CG and GG ($\chi^2(3,140)=14.29, p=0.003$). The difference between CC and CG was not significant ($\chi^2(3,166)=6.13, p=0.105$).

![Attachment Distribution (%) for RQ-1 for CC, CG and GG.](image)

As Fig. 4.6 shows, the ANOVA test revealed a main effect on the four attachment patterns among the three groups: secure ($F(2, 234) = 4.66, p = 0.10$), Dismissing, ($F(2, 234) = 5.04, p = 0.07$), preoccupied ($F(2, 234) = 13.17, p = 0.00$), and fearful ($F(2, 234) = 7.72, p = 0.001$). The post-hoc test with the Bonferroni correction showed that CG has a significantly higher secure attachment score than GG ($T(139) = 0.79, p = 0.008$). GG has a significantly higher dismissing attachment score than CC ($T(165) = 0.73, p = 0.08$). The post-hoc test with the Dunnett T3 correction showed that CC has the highest score for preoccupied attachment compared with the other two groups (compared with CG ($T(165) = 0.74, p = 0.024$), equal variance not assumed; compared with GG ($T(139) = 1.34, p = 0.000$), equal variance not assumed, respectively). GG has the highest fearful attachment score compared with Chinese
groups (compared with CC ($T(139) = 0.89, p = 0.002$), equal variance not assumed; compared with CG ($T(167) = 0.93, p = 0.002$).

![Graph](image)

Fig. 4.6 Results of the RQ-2 for CC, CG and GG. The score for the four attachment patterns (secure, dismissing, preoccupied, and fearful) range from 1 to 7. The self model and other model were calculated from the scores for the four attachment patterns (see 4.1.1.2 Measurements) ($\# p < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001$).

The “self model” and “other model” scores were calculated according to the scores for the four attachment patterns. The ANOVA test showed that there was a significant difference on the score for the “other model” ($F(2, 234) = 22.74, p = 0.000$). The post-hoc test with the Dunnett T3 correction revealed that the GG group has a significantly lower score for the “other model” compared with the CC group ($T(167) = 3.38, p = 0.000$, equal variance not assumed) and the CG group ($T(139) = 2.86, p = 0.000$, equal variance not assumed), respectively.
4.2.2.2 Attachment anxiety and attachment avoidance (ECR-R results)

Fig. 4.7 shows the results of the ECR-R for the three groups. The ANOVA test on ECR-R revealed that there was a significant difference on the dimensions of anxiety (F (2, 234) = 7.85, p = 0.001) and avoidance (F (2, 234) = 3.1, p = 0.047). According to the results of the post-hoc test with the Bonferroni correction, CC has the highest anxiety level compared with CG (T (165) = 0.51, p = 0.003) and GG (T (167) = 0.49, p = 0.003), respectively. Furthermore, CC has a significantly (at the 0.1 level) higher score on avoidance than CG (T (165) = 0.31, p = 0.067).

![Fig. 4.7 Mean and Standard Deviation of Attachment Anxiety and Attachment Avoidance for CC, CG and GG (# p < 0.10, ** p < 0.01).](image-url)
4.2.2.3 Facial emotion recognition in the three groups

Universality of emotion recognition

First of all, the performances on facial emotion recognition in the three groups were above the level of occurring by chance (16.67%). According to previous studies and our hypothesis, we compared the total recognition accuracy rate among the three groups. The ANOVAs indicated that the three groups significantly differed in total (average of accuracy across six basic emotions) emotion recognition accuracy ($F(2, 234) = 17.94, p = 0.000$). The post-hoc test with the Bonferroni correction showed that the accuracy of CC was significantly lower than for the other two groups (CG ($T(165) = 5.07, p = 0.000$) and GG ($T(167) = 7.57, p = 0.000$)). However, there are no significant differences between CG and GG in the total recognition accuracy of the six emotions. Meanwhile, there was no significant difference among the three groups on the recognition of happiness (see Fig. 4.8).

Fig. 4.8 Accuracy of Facial Emotion Recognition on Six Basic Emotions and the Average Accuracy across Emotions in the Three Groups.
Group differences and the cultural exposure effect

Surprisingly, the results of the ANOVA indicated main effects for sadness (F (2, 234) = 7.08, p = 0.000), anger (F (2, 234) = 36.26, p = 0.000), surprise (F (2, 234) = 16.21, p = 0.000), disgust (F (2, 234) = 11.43, p = 0.000), and fear (F (2, 234) = 3.41, p = 0.035).

The post-hoc test with the Dunnett T3 (when equal variance not assumed) and the Bonferroni were run to compare the differences between the three groups on facial emotion recognition. As can be seen in Figure 4.8, compared with the other two groups, CC had a significantly lower accuracy for surprise (compared with CG: T (165) = 9.19, p = 0.000, equal variance not assumed; compared with GG: T (167) = 10.52, p = 0.000, equal variance not assumed) and disgust (compared with CG: T (165) = 8.57, p = 0.012; compared with GG: T (167) = 13.70, p = 0.000).

In terms of anger, GG had a significantly higher accuracy than CC and CG (T (138) = 21.72, p = 0.000, equal variance not assumed; T (167) = 17.96, p = 0.000, equal variance not assumed). It is interesting that Germans had a significantly lower recognition accuracy for facial emotions on sadness compared with CC and CG (T (138) = 7.23, p = 0.008; T (167) = 9.05, p = 0.002).

However, a main effect was found in the ANOVA on the emotion recognition of fear (F (2, 234) = 3.41, p = 0.035). The post-hoc test with the Bonferroni correction indicated that, compared with CG and GG, CC had a significantly lower level of accuracy for fear recognition, and the difference was at the 0.1 level (T (165) = 7.04, p = 0.076; T (167) = 6.65, p = 0.099). Tables 4.3, 4.4 and 4.5 show the extent of accuracy for each of the six emotions and the average across the six basic emotions in the three groups.

Table 4.3 Average Accuracy of Recognition (%) for Six Emotions in CC.

<table>
<thead>
<tr>
<th>CC</th>
<th>Correct Emotion</th>
<th>Selected Emotion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fear</td>
<td>Anger</td>
</tr>
<tr>
<td>Fear</td>
<td>59.99</td>
<td>3.80</td>
</tr>
<tr>
<td>Anger</td>
<td>1.35</td>
<td>65.08</td>
</tr>
<tr>
<td>Disgust</td>
<td>5.28</td>
<td>21.20</td>
</tr>
<tr>
<td>Happiness</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>Sadness</td>
<td>3.54</td>
<td>3.16</td>
</tr>
<tr>
<td>Surprise</td>
<td>15.01</td>
<td>0.19</td>
</tr>
</tbody>
</table>
Table 4.4 Average Accuracy of Recognition (%) for Six Emotions in CG.

<table>
<thead>
<tr>
<th>Correct Emotion</th>
<th>Fear</th>
<th>Anger</th>
<th>Disgust</th>
<th>Happiness</th>
<th>Sadness</th>
<th>Surprise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear</td>
<td>67.03</td>
<td>2.45</td>
<td>2.72</td>
<td>0.54</td>
<td>5.34</td>
<td>21.92</td>
</tr>
<tr>
<td>Anger</td>
<td>1.90</td>
<td>68.84</td>
<td>22.10</td>
<td>0.63</td>
<td>5.25</td>
<td>1.27</td>
</tr>
<tr>
<td>Disgust</td>
<td>4.26</td>
<td>16.85</td>
<td>74.09</td>
<td>0.18</td>
<td>3.26</td>
<td>1.36</td>
</tr>
<tr>
<td>Happiness</td>
<td>0</td>
<td>0.27</td>
<td>0.18</td>
<td>99.28</td>
<td>0.18</td>
<td>0.09</td>
</tr>
<tr>
<td>Sadness</td>
<td>3.89</td>
<td>3.44</td>
<td>8.61</td>
<td>0.91</td>
<td>80.62</td>
<td>2.45</td>
</tr>
<tr>
<td>Surprise</td>
<td>8.42</td>
<td>0.09</td>
<td>0.18</td>
<td>0.91</td>
<td>0.09</td>
<td>90.31</td>
</tr>
</tbody>
</table>

Table 4.5 Average Accuracy of Recognition (%) for Six Emotions in GG.

<table>
<thead>
<tr>
<th>Correct Emotion</th>
<th>Fear</th>
<th>Anger</th>
<th>Disgust</th>
<th>Happiness</th>
<th>Sadness</th>
<th>Surprise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear</td>
<td>66.64</td>
<td>1.58</td>
<td>16.55</td>
<td>0.44</td>
<td>3.17</td>
<td>11.62</td>
</tr>
<tr>
<td>Anger</td>
<td>2.55</td>
<td>86.80</td>
<td>5.02</td>
<td>0.88</td>
<td>3.61</td>
<td>1.14</td>
</tr>
<tr>
<td>Disgust</td>
<td>0.97</td>
<td>17.61</td>
<td>79.23</td>
<td>0.18</td>
<td>1.23</td>
<td>0.79</td>
</tr>
<tr>
<td>Happiness</td>
<td>0</td>
<td>0.26</td>
<td>0.09</td>
<td>99.30</td>
<td>0.18</td>
<td>0.18</td>
</tr>
<tr>
<td>Sadness</td>
<td>12.50</td>
<td>5.37</td>
<td>6.34</td>
<td>0.88</td>
<td>71.57</td>
<td>3.35</td>
</tr>
<tr>
<td>Surprise</td>
<td>5.99</td>
<td>0.35</td>
<td>0.62</td>
<td>1.14</td>
<td>0.26</td>
<td>91.64</td>
</tr>
</tbody>
</table>

In order to test the exposure effect, a correlation analysis was conducted for the years of a subject’s stay in Germany and the accuracy of emotion recognition. As shown in Table 4.6, there was no significant correlation between these two variables, although CG had a better performance on German facial emotion recognition for fear (significant at the 0.1 level), disgust and surprise. Our hypothesis that emotion recognition accuracy will be positively correlated with a person’s duration of living in Germany was not supported.

Table 4.6 Correlation (Pearson’s r) for Years of a Chinese Subject’s Stay in Germany and Accuracy of Emotion Recognition.

<table>
<thead>
<tr>
<th></th>
<th>Fear</th>
<th>Anger</th>
<th>Disgust</th>
<th>Happiness</th>
<th>Sadness</th>
<th>Surprise</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of stay in Germany</td>
<td>-0.09</td>
<td>0.17</td>
<td>0.07</td>
<td>0.07</td>
<td>0.14</td>
<td>0.02</td>
<td>0.10</td>
</tr>
</tbody>
</table>
4.2.2.4 Correlation and regression analyses for adult attachment and facial emotion recognition

A correlation analysis was conducted to examine the relationship between facial emotion recognition accuracy and the level of attachment anxiety and attachment avoidance. Because there were very few fearful attachment individuals in study 1 (2 fearful attachment individuals from 72 CG subjects) and study 2 (6 fearful attachment individuals from 69 CG subjects), there were an insufficient number of fearful attachment CG for statistical analysis. Thus, in this study, we considered the attachment dimensions rather than patterns in the following correlation analyses.

Pearson's product-moment coefficients (Pearson's r) were calculated for the relationship between attachment dimensions (anxiety and avoidance) and the recognition accuracy for emotions (six facial emotional expressions and the overall facial emotion recognition accuracy) in the three groups.

Analyses revealed significant negative correlations between attachment avoidance and emotion recognition accuracy on fear, happiness, and sad facial images in the CC group (r = -0.20, p = 0.047; r = -0.24, p = 0.019; and r = -0.25, p = 0.013, respectively). In the CG group, attachment avoidance was significantly negatively correlated with fear emotion recognition ability (r = -0.24, p = 0.045), and attachment anxiety was significantly negatively correlated with the total emotion recognition ability (r = -0.27, p = 0.024). However, the correlation between the attachment system and emotion recognition in GG was not significant (see Table 4.7).

Table 4.7 Significant Correlation between Adult Attachment System (Anxiety and Avoidance) and Emotion Recognition Accuracy in CC, CG and GG.

<table>
<thead>
<tr>
<th></th>
<th>Chinese in China</th>
<th>Chinese in Germany</th>
<th>German in Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Anxiety</td>
<td>Avoidance</td>
<td>Anxiety</td>
</tr>
<tr>
<td>Fear</td>
<td>ns</td>
<td>-0.20*</td>
<td>ns</td>
</tr>
<tr>
<td>Happiness</td>
<td>ns</td>
<td>-0.24*</td>
<td>ns</td>
</tr>
<tr>
<td>Sadness</td>
<td>ns</td>
<td>-0.25*</td>
<td>ns</td>
</tr>
<tr>
<td>Total of six emotions</td>
<td>ns</td>
<td>ns-</td>
<td>-0.27*</td>
</tr>
</tbody>
</table>

Note: ns = not significant; *p < 0.05
Due to the results that adult attachment anxiety and avoidance are correlated with facial emotion recognition, a linear regression analysis was conducted to explore whether adult attachment anxiety and avoidance contributed to certain emotion recognition abilities. It was revealed that, for CC, the avoidant dimension significantly predicted 4\% of the recognition of German fear facial expression (T (95) = -2.01, p = 0.047), 6\% of the recognition of German happiness facial expression (T (95) = -2.39, p = 0.019), and 6\% of the recognition of German sadness facial expression (T (95) = -2.53, p = 0.013) (see Table 4.8).

| Table 4.8 Regression Models for the Recognition of Facial Expressions (Fear, Happiness and Sadness) Explained by Adult Attachment Avoidance for CC. |
|---------------------------------|---|---|---|---|
| Predictor                     | B  | SE  | β    | R²   |
| Fear                          |    |     |      |      |
| Model                         |    |     |      |      |
| Avoidance                     | -5.17 | 2.5 | 0.20* | 0.04 |
| Happiness                     |    |     |      |      |
| Model                         |    |     |      |      |
| Avoidance                     | -0.67 | 0.28 | 0.24* | 0.06 |
| Sadness                       |    |     |      |      |
| Model                         |    |     |      |      |
| Avoidance                     | -4.57 | 1.80 | -0.25* | 0.06 |

Note: *p < 0.05 (one-tailed)

It was revealed that, for CG, adult attachment avoidance significantly predicted 6\% of the recognition ability of German fear facial expression (T (67) = -2.04, p = 0.045) (see Table 4.9), and attachment anxiety significantly predicted 7\% of the recognition ability of all six German facial expressions of emotions (T (67) = -2.30, p = 0.024) (see Table 4.10).

| Table 4.9 Regression Model for the Recognition of German Fear Facial Expressions Explained by Adult Attachment Avoidance for CG. |
|---------------------------------|---|---|---|---|
| Predictor                  | B  | SE  | β    | R²   |
| Fear                       |    |     |      |      |
| Model                      |    |     |      |      |
| Avoidance                  | -5.17 | 2.57 | 0.20* | 0.06 |

Note: *p < 0.05 (one-tailed)

| Table 4.10 Regression Model for the Recognition of German Facial Expressions (Six Basic Emotions) Explained by Adult Attachment Anxiety for CG |
|---------------------------------|---|---|---|---|
| Predictor                    | B  | SE  | β    | R²   |
| Total of six emotions        |    |     |      |      |
| Model                       |    |     |      |      |
| Anxiety                     | -2.47 | 1.07 | -0.27* | 0.07 |

Note: *p < 0.05 (one-tailed)
4.2.3 Discussion

4.2.3.1 Adult attachment in the three groups

Chinese in Germany as an exploratory group

The first aim of the current study was to verify the results from study 1 in which CG report a higher percentage of secure attachment patterns, have a lower preoccupied score, and exhibit a lower level of attachment anxiety when compared with CC. The results from study 2 were consistent with the result from study 1, both of which indicated that the Chinese secure attachment pattern leads to engagement in exploratory activities such as living in Germany. This finding is consistent with previous investigations that individuals who report secure attachment in romantic relationships report more curiosity and have a more positive attitude about curiosity and exploring social and novel situations (Aspelmeier and Kerns 2003; Milulincer 1997), exhibit greater feelings of competence at academic tasks, are less worried about their work performance (Hanzan and Shaver 1990), have a high need for achievement, and possess little fear of failure (Elliot and Reis 2003). DiTommaso and his colleagues (2005) found that visiting Chinese students had lower romantic and peer attachment security compared with Canadian students. They explained that visiting Chinese students removed from their peer network may exhibit lower scores for secure attachment. The results of the current study point to a contrary conclusion that visiting students had a higher degree of secure attachment compared with their peers in Mainland China. The reason for this disagreement may be due to the subjects being included representing only two groups—visiting Chinese students and native Canadians—while the current study considered three groups—CC, CG and GG.

Inter-cultural differences

The results of this study showed that CC reported high levels of attachment anxiety and had the highest preoccupied score compared with GG. Moreover, compared with Chinese groups, GG had the lowest score on the other model, which indicates that GG had negative models for others. We expected these results for the hypothesis, which were not supported in study 1. In study 1, the difference of
attachment anxiety and preoccupied attachment proportion were found between CC and CG, that, CC reported high levels of attachment anxiety and had higher preoccupied score compared with CG. And the other model score of GG was only higher than CG. In study 2, compared with CC, GG showed a higher level for dismissing attachment according to data from RQ-2. Combined with this result, the RQ-1 results showed that GG had a higher percentage for fearful attachment patterns, where both the fearful and dismissing attachment orientations indicated negative values of others. These results supported our hypothesis that Chinese, as a collectivistic society, have higher preoccupied attachment scores and German individuals were more individualistic, resulting in higher dismissing scores. The inter-cultural differences on adult attachment were obvious. The different results from study 1 and study 2 may be due to the demographic characteristics of our participants, and the different methods of data collection. In study 1, CC, CG, and GG had similar percentages for their relationship status, while in study 2, a greater percentage of CC were involved in a relationship (70.1%) and a greater percentage of GG were single (60.6%). While the average age of the two groups was very similar (CC: 24.19; GG: 23.78), a higher percentage of Chinese were in a romantic relationship at that time. The difference in relationship status between CC and GG may be influenced by the particular cultural expectation for romantic relationships and marriage. According to population data, in 2005, in Germany, the average age for a first marriage was 35 for men and 30 for women (Nieschlag 2010), while, in China, the average age was 25.86 for men and 23.49 for women (Chang, Chen and Ji 2011). Traditional Chinese concepts such as yuan and filial piety may reinforce Chinese thinking on the importance of romantic relationships and getting married almost 10 years earlier than Germans.

In addition, the percentage for fearful attachment in GG was higher than among the Chinese groups. In a previous attachment study among German children, 22% were identified as disorganized (Spangle and Grossmann 1993). German culture has a special influence on German’s attachment orientation. The expression “German angst” became recognized worldwide and has been used to describe an intense feeling of insecurity, anxiety, or inner turmoil. Angst is a German word which means fear or anxiety, and is described as a typical German character in the German literature. As a characteristic phenomenon in German society, politics, and collective behaviors,
German angst may influence an individual’s attitude on adult attachment (Bode 2006).

The percentages for secure attachment in CC and GG were similar, which indicated the universality of secure attachment. Compared with GG, CG had a significantly higher score for secure attachment patterns. The possible explanation of this result may be due to the percentage of secure attachment in CG and the high percentage of fearful attachment in GG.

4.2.3.2 Emotion recognition in the three groups

Universality of emotion recognition

The hypothesis regarding the universality of emotion recognition was partially confirmed by the current study. All participants had the emotion recognition accuracy above the level occurring by chance (16.67%), which indicated that German facial expressions were commonly recognized by the three groups. The results showed that no matter which cultural background (Chinese or German) our participants had and how exposed Chinese students were to German society, Chinese and German subjects had the same ability to recognize happy facial expressions. Previous findings suggested that happiness was commonly recognized by literate cultures and preliterate culture (Ekman, Sorenson and Friesen 1969). One explanation is that happiness is more biological and nonsocial compared with other emotions (Elfenbein, Beaupre, Levesque and Hess 2007). For example, a smile is produced much more often than other expressions (Bavelas and Chovil 1997).

In-group advantage

Evidence of an in-group advantage was found in facial expression recognition for fear (significance level at 0.01), anger, disgust, and surprise. GG had a higher accuracy on these four negative facial emotions than CC. Previous studies also indicated that an Asian individual’s performance was worse when recognizing Caucasian facial emotion images (Elfenbein et al 2007; Huang et al. 2008).
finding is consistent with the notion that German culture was more individualistic compared with Chinese culture. Thus, individualistically oriented persons would be more tolerant of negative emotions since they are not threatened by face-to-face conflict. Furthermore, German subjects may pay more attention to the nose and forehead to get the information necessary to interpret expressions, especially for anger, disgust, and surprise expressions (Jack, Caldara and Schyns 2012).

**Cultural exposure effect**

The findings that CG subjects were significantly better at facial emotion recognition for fear (significance level at 0.01), disgust, and surprise than CC confirmed the hypothesis regarding “cultural exposure.” Chinese students living in Germany may have developed a better ability to understand German facial expressions, especially for fear, disgust and surprise. According to the suggestion of “cultural exposure” in dialect theory, Chinese living in Germany may be closely associated with German society and going through the process of socialization. Therefore, they have to acquire German facial expressions, especially those related to social interactions. The fact that CG recognized German facial expressions (fear, disgust and surprise) better than CC potentially implies that emotion expression can be learned through feedback from another cultural environment (Elfenbein and Ambady 2003a). Although those emotions were particularly viewed as strongly linked to reflexes and less related to a social object (Elfenbein et al. 2007), the influence of culture and social environments cannot be ignored. The correlation between duration (at least three months) of living in Germany and the accuracy of German facial emotion recognition was not significant in our CG group. This may be explained by the fact that the first three months of living in Germany are more important for Chinese in order to familiarize themselves with German facial expressions. Another reason may lie in the fact that those Chinese prepared to study aboard in Germany will learn more about German culture before they go abroad. For example, they are likely to learn the German language and watch German movies.
**Collectivism and individualism**

The emotional inhibition of anger is persistent in the Chinese group. That is, despite the fact that Chinese are living in a German cultural environment, Chinese students still have lower recognition accuracy for anger. One explanation is that Chinese culture tends to inhibit emotional expression (Mai et al. 2011). For example, smiling without showing one’s teeth is considered more polite by Chinese. In social circumstances, anger is associated with strong disagreement and potentially leads to conflict. Previous studies on emotion recognition demonstrated that Eastern cultures focus on collectivism, which emphasizes harmony and, therefore, expressing emotion is indirect and implicit (Elfenbein 2003; 2006). Chinese show fewer negative emotions in social contact. In contrast, Western cultures which are commonly individualistic emphasize the expression of emotions more directly and explicitly.

It is interesting to note that German individuals recognized sadness (mimicked by a German actor) significantly worse than Chinese individuals. German individuals identified sadness in a Caucasian face at a lower rate than the average recognition accuracy, while both Chinese groups had similar accuracy levels in terms of the average recognition accuracy. This indicates an inhibition of sadness particular to the German population. As researchers have suggested, each culture has their own specific emotional programming, which can influence emotion recognition (Elfenbein and Ambady 2003). This could explain the specificity of facial emotion recognition in Germans. Considering the Western culture of individualism, Germans with their independent self-construction may tend to deny the expression and one’s true self (Markus and Kitayama 1991). The inhibition of emotion was particularly found for sadness among Germans. Another explanation is that Chinese recognize sadness facial expressions better than Germans due to the special facial features for sadness. The difference between sadness expressions and other emotional expressions are shown in the mouth region of the face. Thus, the character of a sad face is the down-turned mouth (Fridlund 1997). Although previous studies demonstrated that Eastern societies focus more on eye cues (Jack, Caldara and Schyns 2012; Mai et al.
one study (Jack, Caldara and Schyns 2012) showed that the sadness facial expression is an exception. Thus, Chinese pay more attention to mouth cues for sadness expression, which is accompanied by significant mouth movement.

To sum up, both the universality and specificity of facial emotion recognition in Chinese and German cultural backgrounds have been found in the present study. Therefore, emotion recognition is universal and specific to a particular cultural group at once.

4.2.3.3 Adult attachment and facial emotion recognition

A correlation between attachment orientation (anxiety versus avoidance) and facial emotion recognition was found in this study. For both Chinese and German subjects, attachment anxiety and attachment avoidance have no influence on their emotion recognition performance for certain German emotion expressions (anger, disgust and surprise).

For CC individuals, adult attachment avoidance has a considerable influence when Chinese individuals recognize the German facial expressions for fear, happiness, and sadness. It is worth noting that, when recognizing these emotions, the performances for CC and CG were similar, and the influence of the attachment traits was well marked. For CC, when viewing out-group faces, attachment avoidance is particularly related to negative facial expression (fear and sadness) and to happiness. For CG, high attachment anxiety individuals showed a lower total facial emotion recognition ability and high attachment avoidance individuals showed a lower ability in terms of fearful emotion recognition. Most previous studies indicated that attachment anxiety has an impact on facial emotion recognition (Dewitte and De Houwer 2008, Fraley et al. 2006; Mogg, Garner and Bradley 2007). For negative emotions, individuals with avoidance attachment had a lower accuracy (Meyer 2009) and showed a low automatic affective response (Suslow, Dannlowski, Arolt and Ohrmann 2010). An attachment avoidance impact in particular was found in this study when CC judged German facial expressions (fear, sadness and happiness). One
explanation is that German faces may appear threatening to Chinese. When judging out-group faces, the attachment system is activated, which affects cognitive processing and reduces facial emotion recognition accuracy.

Surprisingly, for German individuals, the attachment system did not influence their emotion recognition accuracy when judging German facial expressions. That may be due to their ability to recognize their own faces and because the attachment system was not activated.
5 Summary and Conclusion

Based on both theoretical and empirical approaches, the aim of this dissertation was to explore the relationship between adult attachment and facial emotion recognition in the context of cultural differences. Our first hypothesis was: the performances of emotion recognition on facial expressions in our subject (CC, CG, and GG) are correlated with their adult attachment systems. In our studies, CG living abroad is a special group which may have special features on adult attachment. According to the theory of attachment, we supposed that CG may have more secure attachment quality since they have the ability to explore their life in Germany. Thus, study 1 aimed to investigate the attachment features in three groups was carried out firstly. Encouraged by the results of the study 1, and in order to get robust evidence for further studies, all data were collected in the PC room for study 2. Data on adult attachment was gathered using the relationship Questionnaire (RQ) and Experiences in Close Relationship - Revised (ECR-R). For the emotion recognition test, 96 standardized German colorful frontal facial images for six basic emotions were selected as stimuli. In this chapter, the main findings and conclusions were summarized.

5.1 Adult attachment

Findings of study 1 and study 2 indicated that CG have a more secure attachment pattern and lower levels of attachment anxiety and avoidance compared with CC. Our finding suggested that overseas Chinese individuals who have the courage to live their life in another country may have a higher secure attachment orientation than Chinese who live in Mainland China.

Both of study 1 and study 2 indicated secure adult attachment was prevalent in Chinese and German cultures. The universality argument of adult attachment was confirmed on Chinese and German subjects in our studies.
Additionally, results of study 2 showed more intercultural differences between CC and GG. Firstly, the distribution of adult attachment was significantly different between CC and GG. Compared with Germans, CC had a less fearful (28.2% for GG, 7.2% for CC) and preoccupied (18.3% for GG, 8.7% for CC) adult attachment patterns. Secondly, compared with GG, CC had significantly higher score for preoccupied attachment and attachment anxiety, and significantly lower score for dismissing attachment. These results confirmed the attachment theory and the findings from previous studies (Ainsworth et al 1978; IJzendoorn and Kroonenberg 1988; Schmitt 2004). Due to the collectivistic background, Chinese are more dependent and have higher level of preoccupied attachment, while German individuals are more individualistic, which resulting in higher level of dismissing attachment in GG.

5.2 Emotion recognition

In particular, Study 2 was aim to investigate the emotion recognition accuracy on the six basic emotions between Chinese and Germans when judging German facial expressions. The stimulus PFA-U consists of 96 colorful frontal facial expressions were embedded into the Facially Expressed Emotion Labeling (FEEL) test.

The results of this study confirmed the universality of the happiness emotion, but cultural differences on other facial expressions of emotion. The GG showed the best performance, the CC had the worst results, whereas the results found for CG were fall in between the other two groups. This finding especially reflected in the accuracy of facial emotion recognition of fear, disgust, and surprise. These in-group advantage results implied the special dialect exists for German emotions. Compared with Chinese culture, German culture is more individualistic. Studies suggest that people from individualistic societies recognize negative facial expressions at a higher rate than ones from collectivistic societies. This is because, for collectivistic individuals, negative information threatens social harmony (Elfenbein 2003; 2006). These finding also proved the “cultural exposure” effect. The Culture familiarity breeds recognition accuracy, and strongly improved CG’s ability to recognize German surprise, disgust, fearful facial emotions. This effect may play a role beginning in the first three months
when a CG arrives in Germany or even prior to their arrival.

Nowadays, researchers argue that the universal and cultural specificity for facial emotion recognition concurrently exist (Ekman 1994; Elfenbein and Ambady 2002; 2007). Our studies indicated that emotion recognition is a universal ability among cultures. Firstly, all participants had the emotion recognition accuracy above the chance level. Secondly, we proved that there was no significant difference between Chinese and Germans on the recognition of happiness. In addition, the cultural specific emotion programs have been found. The deficit in recognizing anger faces in Chinese groups was observed. For CG, the ability to recognize German expressions of anger did not improve although they were living Germany. As a collectivistic culture, expressions of anger may be inhibited by Chinese in order to maintain social harmony. Moreover, German subjects showed a lower accuracy for the recognition of sadness compared with Chinese subjects, even though German are supposed to recognize better such negative emotion due to the individualistic culture.

5.3 Adult attachment and emotion recognition

Both of attachment and emotion theorists emphasize the important interaction between the attachment system and the facial expressions of emotions in an individual’s development (Bowlby 1977; Ekman 1992; Tomkins 1991). Some studies indicated that adult attachment orientations influence an individual’s encoding and decoding processes for facial expressions. But, the results were different because researchers had different concerns related to this topic. Thus, they adopted different experimental paradigms and relied on varied stimuli (Dewitte et al. 2008; Elfenbein 2007; Fraley et al. 2006; Fizke 2010; Magai et al. 2000; Meyer 2009; Mogg 2007; Niedenthal 2002; Sonnby-Borgström and Jönsson 2003; 2004 Suslow 2010;). In the present study, the correlation between the adult attachment system and facial emotion recognition was explored.

For German subjects, their attachment system was not correlated with the
recognition accuracy for German facial expressions. However, the attachment system influenced German facial emotion recognition among Chinese participants. Previous studies indicated that, when the attachment system is activated, it will change a subject’s emotion perception accuracy (Fizke 2010). In our study, among Chinese subjects, German faces may present unfamiliar information, representing a threatening context which activates their attachment system. The emotion recognition ability of Germans was not influenced by the attachment system because they view German facial images as normal information, thus their attachment system was not activated. The attachment system could influence an individual’s ability to judge unfamiliar information.
6 Limitations of the present study and implications for future research

The present study explored the relationship between adult attachment and facial emotion recognition in three subject groups: CC, CG and GG. Moreover, the universality and specificity of adult attachment and facial emotion recognition were investigated in this study. Some limitations of the present study should be discussed and some corresponding suggestions will be provided to guide future studies.

Firstly, except for gender and age, we did not control for other demographic characteristics of our subjects. The current situation and the history of romantic relationships may have influenced the adult attachment system. Secondly, samples were collected in universities and the sample size was not big enough, which could be potentially biasing to the results and influence the statistical representation. Thirdly, there were some limitations on study method. Only German facial images were considered in the present study. The facial expression images were taken from the PFA-U, which does not include Chinese facial expression images at present. Although Japanese facial images are available in JACFEE (Matsumoto and Ekman 1989), we avoided using those images because, in my experience, Chinese can recognize that those images are of Japanese individuals. Although the self-report questionnaires of adult attachment are widely used by researchers, one obvious weakness of self-report measures cannot be neglected: some subjects may adopt conscious defenses to certain questions. The adult attachment interview may be helpful to solve this problem. However, in our studies, due to the lack of Chinese version of adult attachment interview, only the RQ and ECR-R were used to investigate the Adult attachment profiles in three groups.

Study 1 and study 2 showed partial inconsistent results on adult attachment which may due to the different methods of data collection. In study 1, the adult attachment data for CC group were collected online, whereas all data in study 2 were
collected in the PC room (not online). Furthermore, the difference of relationship status may influence on attachment results. For example, in study 1, 53.3% CC were in a relationship and in study 2 this number was 70.1%. The relationship situation was particularly relevant to individual’s attachment system (Young and Acitelli 1998).

According to these limitations, recommendations for further studies can be made. Firstly, romantic relationship history and the current situation of individuals should be considered. Secondly, subjects with different background should be collected. Thirdly, in order to investigate the in-group advantage, Chinese facial images are necessary. If possible, Germans who live in China can be included to explore the “cultural exposure” effect further. Furthermore, the present study suggested that cultural background (individualism and collectivism) may influence attachment patterns and facial emotion recognition ability. For further study, this relationship could be discussed in particular and the measurement of the individualism and collectivism constructs are required. In addition, the measurement of exploration orientation could also be included when the relationship between exploration and attachment orientation is investigated for overseas individuals. For Chinese, out-group faces may play the role of signaling a threatening situation, which activates the attachment system, which, in turn, influences an individual’s recognition processes. Future research could consider using in-group and our-group images as stimuli to explore how a person’s attachment system influences the processing of emotional information.
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