Cross-Cultural Comparison of Empathy
between Australian Caucasians and Mainland Chinese

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CROSS-CULTURAL COMPARISON OF EMPATHY

ABSTRACT

Empathy is an essential social communication skill for sharing and understanding others’ emotional states and experiences. It is deemed to be related to both cultural and personal factors. A few researchers have investigated Western–Asian cross-cultural differences in empathy using self-report questionnaires or behavioural tasks, and some of them found that cultural differences in empathy were evident. Nevertheless, the number of these studies is small and the results reported are inconsistent. Furthermore, reasons underlying the cultural differences have hardly been investigated. The current thesis was conducted to address the limitations in the literature (Chapter II), to bridge some theoretical gaps in the research area (Chapter II), and to provide a better understanding of Western–Asian cross-cultural differences in both self-report and behavioural responses of empathy using Australian and Mainland Chinese participants (Chapters V and VI).

Three studies were conducted. In the first study (Chapter IV), the Empathy Quotient (EQ) was validated in a sample of participants (n = 588) from Mainland China. Results confirmed the validity of the EQ for measuring self-report empathy in the Mainland Chinese population. Moreover, with a comparison with previous publications based on Western populations, the mean score of the EQ was found to be lower in the Mainland Chinese participants; the sex differences in the EQ score was found to be smaller in Mainland Chinese participants, relative to Westerners. Furthermore, the best-fit model of the EQ for Mainland Chinese participants was a one-factor model, suggesting that psychometric characteristics of items for measuring emotional empathy and cognitive empathy were undifferentiated, which was different from the dissociable model reported for Western populations. The possible cultural differences in the mean
value of the EQ scale and in the effect size of sex differences in the EQ score revealed in the first study implied a culture–sex interaction in self-report empathy.

The second study (Chapter V) was conducted to examine Western–Asian cross-cultural differences in self-report empathy, and the possible culture–sex interaction effects in the empathy scores using Australian Caucasian (n = 192; 101 males) and Mainland Chinese Han participants (n = 211; 59 males). Furthermore, the effects of using self-construal and empathy-related personal distress to explain the cultural differences in empathy found between these two cultural groups were measured. Results showed that there were significant culture–sex interactions in self-report emotional empathy, cognitive empathy, and overall empathy scores. Moreover, further analyses indicated that the cultural differences in self-report empathy only existed between the two cultural female groups (i.e., Australian females had higher scores than those of the Mainland Chinese females), but not the male groups. Moreover, the pattern of sex differences in these empathy scores was different between the Australian participants (i.e., females reported higher scores than males did for self-report emotional, cognitive, and overall empathy) and the Mainland Chinese participants (i.e., males reported higher scores than females did on cognitive empathy, and there was no significant sex difference in the emotional and overall empathy scores). Finally, results of mediating effect analyses confirmed that the cross-cultural difference in empathy between these two female groups could be explained, in part, by that the Australian females held a stronger independent self-construal and as a result, suffered less personal distress during empathy-eliciting situations than the Mainland Chinese females. While results of the second study suggested the culture–sex interaction in self-report empathy, it remained to be determined whether similar interaction effects in behavioural responses of empathy could be confirmed in the third study.
As empathy is an interpersonal activity, it might be influenced not only by the characteristics of the participants (i.e., culture and sex), but by the characteristics of the targets (i.e., culture and emotion), and also by the relationship between the participants and the targets (i.e., in-group and out-group bias). An *in-group bias* exists when individuals show more empathy for their in-group than out-group targets, while the *out-group bias* is the opposite. These phenomena could not be investigated using the self-report empathy scales, but could be investigated by using behavioural tasks. In the third study (Chapter VI), self-report empathy and behavioural responses of empathy were compared between Australian Caucasian (*n* = 61; 29 males) and Mainland Chinese (*n* = 68; 32 males) participants. In these behavioural tasks, participants were requested to evaluate their empathy-related responses to targets (i.e, either Caucasian or Asian targets) expressing different emotions (e.g., happiness, sadness, or anger) with or without an emotional background (e.g., in a marathon or before a plain backdrop). Participants’ accuracies in emotion recognition of emotions were statistically controlled. Results of self-report empathy, once again, confirmed the culture–sex interaction as reported in the previous two studies of this thesis.

Results of the behavioural tasks illustrated a three-way interaction (participant culture, participant sex, and target culture) in behavioural responses of cognitive empathy for anger within an emotional context. A further analysis of the three-way interaction revealed that the cultural difference was only significant between the two female participant groups (i.e., the Australian females reported higher cognitive empathy than did the Mainland Chinese females for Caucasian targets), the sex difference was found to be only significant in the Australian participants (i.e., the Australian females reported higher cognitive empathy than did the Australian males for both Caucasian and Asian targets), and that the in-group bias was only shown by the
Australian females (i.e., they reported more cognitive empathy for Caucasian than Asian targets). Therefore, the three-way interaction in behavioural responses of empathy was in line with the two-way interaction found for self-report empathy. Apart from the three-way interaction, several two-way interactions between participant culture and target culture were found in emotion recognition, emotional empathy, cognitive empathy, and perspective-taking for sadness or happiness. Taken together, results of the third study suggest that empathy is a complex interpersonal activity, and individuals might modulate their empathy responses according to the characteristics of the targets. Finally, an empirical suggestion is that as non-verbal delivered emotions could be misunderstood by the out-group, openly expressing emotions, feelings, and needs might help to improve cross-cultural communication.

In summary, this thesis reported new insight into Western–Asian cross-cultural differences in empathy from three dimensions: psychometric characteristics, self-report empathy, and behavioural responses, using Australian and Mainland Chinese participants. In addition, the current study also validated the EQ in Mainland China, and this scale is expected to assist future researchers to study empathy and study cultural differences in empathy based on the Mainland Chinese populations. More importantly, the current results suggest that to understand cultural differences in empathy, researchers should account for the impact of culture–sex interaction, for cultural differences in self-construal, for cultural differences in empathy-related personal distress, and for the relationship between the participants and the targets. In all, the current results demonstrate that empathy is a complex social interpersonal activity, and suggest that any conclusion stating one culture has better ability in empathy than others is too simplistic. Finally, the preliminary results of this thesis illustrated that individuals should learn how to control their personal distress and to keep a clear boundary between
self and others in order to be able to exhibit more empathy, and meanwhile, people ought to study how to effectively express emotions to the out-groups so as to have a better cross-cultural communication.
STATEMENT OF ORIGINALITY

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

Signed

Date 15-Feb-2018

Qing Zhao
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ACKNOWLEDGEMENT OF PUBLISHED PAPERS

Included in this thesis are papers in Chapters IV and V which are co-authored with other researchers. My contribution to each co-authored paper is outlined at the front of the relevant chapter. The bibliographic details for Chapter IV (published) and status for Chapter V (submitted), including all authors, are:

Chapter IV: Zhao, Qing, David L. Neumann, Xiaoyan Cao, Simon Baron-Cohen, Xiang Sun, Yun Cao, Chao Yan, Yuna Wang, Lin Shao, and David HK Shum (2017). Validation of the Empathy Quotient in Mainland China. *Journal of Personality Assessment*, 1-10. doi: 10.1080/00223891.2017.1324458


Appropriate acknowledgements of those who contributed to the research but did not qualify as authors are included in each paper.

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CHAPTER I.
Overview and General Aim

Appreciating and understanding the emotional states and experiences of others is empathy (Baron-Cohen & Wheelwright, 2004). Some researchers consider empathy an essential social skill (Baron-Cohen & Wheelwright, 2004), some regard it as important as morality (Jami, Mansouri, Thoma, & Han, 2018), and others describe it as an act of love (Shek & Li, 2015). Sociologists predicted that after the agricultural age (19th century), the industrial age (20th century), and the information age (21st century), humans would enter into a new era named ‘the age of empathy’ (Waal, 2009; Zink, 2008). In the new era, empathy and creativity will become the most essential characteristics of the individual, business, and society (Zink, 2008). To date, researchers have started to discuss the possible changes brought about by the new age, and what people should do in both the social and research realms to welcome the new era (Matusall, 2013; Pedwell, 2014).

Currently, some researchers consider that individual differences in empathy can be explained by both personal and cultural variables (Zhao et al., 2017). The personal characteristics include biological sex (Baron-Cohen, 2002), autistic attributes (Baron-Cohen & Wheelwright, 2004), alexithymia attributes (Zhao et al., 2017), hormonal levels (e.g., Hurlemann et al., 2010), and genes (e.g., Huetter et al., 2016). Culture is a multidimensional psychological concept, and researchers consider it may be divided into six dimensions, including power distance, uncertainty avoidance, indulgence/restraint, long-term/short-term orientation, masculinity/femininity, and individualism/collectivism (also known as self-construal) (Jami et al., 2018). In empirical investigations, researchers use a string of simple proxies of background and out-looking characteristics to define the cultural group of participants, including
nationality (e.g., Kaelber & Schwartz, 2014), ethnicity (e.g., Xu, Zuo, Wang, & Han, 2009), and country of origin (e.g., Cassels, Chan, & Chung, 2010).

To date, a few researchers have investigated cultural differences in empathy, and the majority of studies were conducted with Western and Asian participants (Han & Northoff, 2008). Researchers agree that a key difference between Western and Asian cultures is in the construct of individualism-collectivism (Kashima et al., 1995; Triandis, 2018). Nevertheless, researchers do not agree on which aspect of self-construal, individualism or collectivism, has a more positive influence on empathy (Decety & Lamm, 2006; Kaelber & Schwartz, 2014). Moreover, even though researchers have used self-report questionnaires (e.g., Melchers et al., 2016), behavioural tasks (e.g., Neumann, Boyle, & Chan, 2013), and brain imaging (e.g., Cheon et al., 2011) to investigate Western–Asian cross-cultural differences in empathy, their results are equivocal. Therefore, which cultural group, Westerners (i.e., tends towards individualism) or Asians (i.e., tends towards collectivism), has higher empathy and the possible reasons for the cultural differences are important subjects of further study (Jami et al., 2018).

The aim of the current thesis is to enhance understanding of cultural differences in empathy using a sample of Australian Caucasians and Mainland Chinese. At the beginning of the following chapter, the definition and theories of empathy are presented and previous findings on Western–Asian cross-cultural differences in empathy are summarised (Chapter II). After examining the limitations of the previous research, it was found that the accumulated understanding of the cultural differences in empathy was limited, and that research which could investigate this topic using a systematic approach was needed (Chapter II and III). Therefore, 10 research questions and the research plan of the current thesis were proposed (Chapter III). Three empirical studies
were performed to investigate the Western–Asian cross-cultural differences in empathy in three aspects; namely, psychometric property (Chapter IV), self-report score (Chapters V and VI), and behavioural response (Chapter VI). At the end of this thesis, a general discussion of the findings and limitations of the current thesis is presented (Chapter VII).

Three empirical studies were conducted in this thesis: the first study was aimed at translating and validating the Empathy Quotient (EQ; Baron-Cohen & Wheelwright, 2004), a self-report questionnaire of empathy, for using with the Mainland Chinese population; meanwhile, to identify potential cultural impacts in empathy, the psychometric characteristics of the EQ based on the current Mainland Chinese participants were compared with previous publications based on Western populations (Chapter IV); the second study was aimed at investigating the Western–Asian cross-cultural differences in self-report empathy using Australian and Mainland Chinese participants (Chapter V); and the third study was aimed at examining cross-cultural differences in behavioural responses of empathy between the two cultural groups by using computer tasks. Meanwhile, in-group and out-group biases in empathy (i.e., if participants show more empathy to the in-group than out-group targets, it is in-group bias, while the opposite trend is the out-group bias) were examined in the third study (Chapter VI). At the end of the thesis, the overall findings of this study, the limitations, and suggestions for further investigations were discussed (Chapter VII).

In this thesis, the cross-cultural comparisons included two aspects. First, comparisons were made between the two cultural groups regarding the same characteristics. Three cases in point were comparing psychometric characteristics of self-report empathy between Mainland Chinese participants with those reported in the literature based on Westerners (Chapter IV), comparing self-report empathy between
Australian and Mainland Chinese participants (Chapters V and VI), and comparing between the two cultural groups on behavioural responses of empathy with targets expressing different emotions (Chapter VI). Second, cross-cultural comparisons in this thesis were also performed to investigate in-group and out-group biases in empathy. That is, the current authors compared Australian participants’ empathy responses to Caucasian targets with their responses to Asian targets, and vice versa for the Mainland Chinese participants (Chapter VI).

Finally, it should be borne in mind that one of the main reasons to investigate cultural differences in empathy is to improve empathy and understanding between cultures. Building cross-cultural empathy is an important social issue and people in different fields have been working to increase the empathy. A well-known example is a true story that John H. Griffin wrote in his memoir, *Black Like Me* (Griffin, 2004): in the fall of 1959, this Caucasian journalist took pigment-changing medicine to darken his skin in order to walk in the shoes of another cultural group for a few weeks. This role changing experience was painful, but for the first time in his life, he felt full empathy for another group. It was a big sacrifice for building cross-cultural empathy and it was a foresight in his generation. In the final chapter of this thesis, possible solutions to increase cross-cultural empathy between Westerners and Asians were discussed (Chapter VII).
References


CHAPTER II.

Literature Review and Research Importance

Definitions

One interesting fact concerning empathy is that researchers lack an agreed-upon definition of it (Lishner, Stocks, & Steinert, 2017). In the late nineteenth century, empathy was firstly used to describe the ability to appreciate a piece of art (Reed, 2014; Wisp, 1987). Later on, around the mid-twentieth century, empathy began to be used as a psychological term to describe the ability to appreciate others’ emotions (Wisp, 1987). Currently, a set of definitions of empathy have been provided by researchers, including, “empathy is the drive or ability to attribute mental states to another person/animal, and entails an appropriate affective response in the observer to the other person’s mental state.” (Baron-Cohen & Wheelwright, 2004, p. 168); “the tendency to be psychologically in tune with others’ feelings and perspectives” (Chopik, O’Brien, & Konrath, 2017, p. 23); and “the ability to perceive what other people are feeling and appropriately share that emotional state” (Cassels, Chan, & Chung, 2010, p. 309).

In this thesis, the definition provided by Cohen and Strayer (1996), namely, empathy is “understanding and sharing in another’s emotional state or context” (p. 988), was chosen. This choice was made based on the clarity and conciseness of the definition. Moreover, this definition suggests that empathy includes two main components: sharing emotions (i.e., emotional empathy) and understanding emotions (i.e., cognitive empathy). This concept is consistent with the research interest of this thesis (i.e., to identify cultural differences in overall, emotional, and cognitive empathy) and with the existing findings in the literature (as discussed in the next paragraphs).
Emotional Empathy and Cognitive Empathy

Most researchers consider that empathy consists of two main components: emotional empathy and cognitive empathy (Cohen & Strayer, 1996; Lawrence, Shaw, Baker, Baron-Cohen, & David, 2004; Shamay-Tsoory, 2011). Emotional empathy is sharing another person’s emotional state and responding to it with an appropriate emotion (Baron-Cohen & Wheelwright, 2004; Smith, 2006). Cognitive empathy is the ability to recognise another person’s emotional states, thoughts, intentions, and perceptions (Baron-Cohen & Wheelwright, 2004; Shamay-Tsoory, 2011; Smith, 2006). Nevertheless, researchers hold different opinions about the relationship between the two main components of empathy.

Shamay-Tsoory, Aharon-Peretz, and Perry (2009) consider emotional empathy and cognitive empathy to be independent and deem that the dysfunction of one component does not necessarily affect the function of the other. They introduced a double-dissociated model to describe this relationship. However, this model contradicts some common findings. For example, in non-clinical samples, participants’ self-report scores and behavioural performances on emotional empathy and on cognitive empathy are highly correlated (e.g., Neumann, Boyle, & Chan, 2013; Neumann, Chan, Wang, & Boyle, 2016). In contrast, Decety (2011) proposed an interdependent model, suggesting that emotional empathy and cognitive empathy were related and closely intertwined (e.g., Neumann et al., 2013; Neumann et al., 2016). Nevertheless, this model could not be used to explain the dissociation of cognitive empathy (i.e., impaired) and emotional empathy (i.e., intact) found in individuals with Asperger’s syndrome (Dziobek et al., 2008). Finally, Baron-Cohen and Wheelwright (2004) developed a two-component overlapped model that combined the characteristics of the double-dissociated model (Shamay-Tsoory et al., 2009) and the interdependent model (Decety, 2011). The two-
The two-component overlapped model acknowledges both the similarity and differentiation between emotional and cognitive empathy (Baron-Cohen & Wheelwright, 2004). Moreover, the two-component overlapped model is consistent with the current brain imaging findings of empathy.

The anatomical brain network of empathy is a ‘relay’ from limbic areas to cortical regions (Carr, Iacoboni, Dubeau, Mazziotta, & Lenzi, 2003). The limbic areas involved in empathic processes include the amygdala (Carr et al., 2003; Decety, 2011), thalamus (de Greck et al., 2012), hypothalamus (Decety, 2011), and hippocampus (Decety, 2011). These regions are known as the emotional control centre of the brain, for emotional self-control, emotion recognition, and emotional processing (Decety, 2011). A known anatomical overlap shared by different components of empathy is in the superior temporal sulcus (STS; BA21/22; Blair, 2005). The STS is the brain region that manages the representation and imitation of actions (Carr et al., 2003; Schulte-Rüther et al., 2011; Shamay-Tsoory et al., 2009). Results showed that patients with autism spectrum disorder (ASD), compared with healthy controls, have anatomical and functional abnormalities in the STS (Zilbovicius et al., 2006), deficiencies in automatic emotional imitation (McIntosh, Reichmann-Decker, Winkielman, & Wilbarger, 2006), and lower empathy (Baron-Cohen & Wheelwright, 2004).

Beyond the limbic areas and STS, researchers consider that brain networks of emotional and cognitive empathy can be dissociated (Shamay-Tsoory et al., 2009). Emotional empathy is considered to be related to the function of the mirror neuron system (MNS), which is mainly located in the inferior frontal gyrus (IFG; BA44/45) (Shamay-Tsoory et al., 2009). Researchers have found that patients with lesions in the IFG are selectively deficient in emotional empathy, but not cognitive empathy (Shamay-Tsoory et al., 2009). The function of cognitive empathy is considered to be
related to the function of several neural regions, including the medial prefrontal cortex (mPFC; BA9/10/11; Decety, 2011; Schulte-Rüther et al., 2011), temporo-parietal junction (TPJ; BA40/42; Cheon et al., 2011; Lawrence et al., 2006), and inferior temporal gyrus (ITG; BA20; Cheon et al., 2011; de Greck et al., 2012). These brain regions are seen as related to theory of mind, perspective-taking, and cognitive inference (de Greck et al., 2012; Lawrence et al., 2006). Researchers have found that patients with lesions in the ventro-mPFC had selectively deficient cognitive empathy but relatively intact emotional empathy (Shamay-Tsoory et al., 2009).

In addition, neurological dissociation of emotional and cognitive empathy has also been detected in brain regions that connect limbic with cortical areas. First, the cerebral insula is considered to play an essential role in empathy, as it serves as a relay station in transmitting signals between the limbic and cortical regions (Carr et al., 2003). Researchers deem the middle insula (MI) to be related to cognitive empathy, while the anterior insula (AI) to emotional empathy (Wang et al., 2014). Second, the anterior cingulate cortex (ACC; BA24/32) is a key region of the ‘pain matrix’, which is activated when feeling pain and when empathising with pain (Carr et al., 2003; Decety, 2011; Lawrence et al., 2006; Morrison, Lloyd, Di Pellegrino, & Roberts, 2004; Xu, Zuo, Wang, & Han, 2009). Some researchers consider that the ACC is related to emotion regulation (Carr et al., 2003; Decety, 2011; Lawrence et al., 2006); while others consider the ACC to be related to emotional empathy (de Greck et al., 2012).

Finally, it is interesting to note that the strategies for utilising the two components of empathy may differ between Western and Asian participants (Atkins, Uskul, & Cooper, 2016; Han & Ma, 2014; Masuda, Wang, Ishii, & Ito, 2012; Matsumoto, Hwang, & Yamada, 2012; Moriguchi et al., 2005). For example, it was found that while empathising with negative feelings, Caucasian participants reported
more emotional empathy to the targets but had a lower accuracy in identifying the targets’ emotions (i.e., cognitive empathy) than Asian participants (Atkins et al., 2016). In addition, based on psychometric analyses of self-report data, researchers have found that emotional and cognitive empathy are two separate factors in Western populations (e.g., Lawrence et al., 2004), but was indissociable as one factor in Chinese populations (Guan, Jin, & Qian, 2012; Siu & Shek, 2005; Zhao et al., 2017). These results indicated that there could be some Western–Asian cross-cultural differences in empathy.

**Variables Related to Empathy**

**Culture.** Empathy is a culturally sensitive construct (Atkins et al., 2016; Cassels et al., 2010). Culture, just like the concept of empathy, is a multidimensional concept (Jami, Mansouri, Thoma, & Han, 2018). According to Clifford Geertz (1973), culture is “a system of inherited conceptions expressed in symbolic forms by means of which men communicate, perpetuate, and develop their knowledge about and attitudes toward life.” (see from Triandis & Brislin, 1984, p. 4). Researchers consider that culture is composed of six dimensions (Jami et al., 2018), and one of them is individualism/collectivism, or self-construal, which is considered the most significant differentiation between Western and Asian cultures (Kashima et al., 1995; Triandis, 2018). In empirical investigations, researchers use simple proxies, such as nationality (e.g., Kaelber & Schwartz, 2014), ethnicity (e.g., Xu et al., 2009), and country of origin (e.g., Cassels et al., 2010), to judge a participant’s cultural background.

Evidence suggesting cultural differences in empathy between Western and Asian participants has been found. For instance, researchers found that German university students had higher self-report empathy scores than Mainland Chinese university students (e.g., Melchers, Li, Chen, Zhang, & Montag, 2015). Using eye-tracking and brain imaging techniques, researchers found that, while performing an empathic task,
Westerners’ attention was focused on the faces of the targets, and brain regions activated were those involved in emotional processing (Masuda et al., 2008; Moriguchi et al., 2005). In contrast, when performing the same task, Asians’ attention was more focused on the background, and brain regions activated were those related to cognitive processing (Masuda et al., 2008; Moriguchi et al., 2005).

Empathy is an interpersonal activity, and both participants and targets bring with them a cultural background when they engaged in interpersonal interactions. The target’s cultural background may also modulate participants’ empathy responses. One phenomenon in empathy is that individuals may show more empathy with in-group than out-group targets, and this phenomenon is known as the in-group bias, with the out-group bias being the diametrically opposite phenomenon (Molenberghs, 2013). Some researchers found that both Australian and Chinese participants had an in-group bias in empathy for others’ sorrow (Neumann et al., 2013). Nevertheless, some other researchers found that when empathising negative emotions, only Korean participants behaviourally reported an in-group bias in empathy while American participants did not (Cheon et al., 2011). Moreover, Cheon et al. (2011) found that there could be some neural mechanisms underlying the in-group bias found in the Korean group. That is, relative to American participants, Korean participants had higher brain activation in the TPJ, a cognitive empathy-related brain region, while watching in-group targets compared with watching out-group targets (Cheon et al., 2011).

Sex. Participant’s sex is another important demographic variable related to empathy (Baron-Cohen & Wheelwright, 2004; Davis, 1980). A common stereotype is that women show a higher level of empathy than men (Toussaint & Webb, 2005). Researchers found both prenatal (e.g., genes and hormones; Hurlemann et al., 2010; Wu, Li, & Su, 2012) and postnatal (e.g., social expectations and cultural requirements;
Dehning et al., 2013; Ickes, Gesn, & Graham, 2000) evidence to support the notion that females exhibit higher levels of empathy than males. Consistently, Western females have typically been found to exhibit a higher level of self-report empathy than Western males (Groen, Fuermaier, Den Heijer, Tucha, & Althaus, 2015). Interestingly, increasing evidence suggests that in Asian populations, sex differences in self-report empathy are small or non-significant (Guan et al., 2012; Kim & Lee, 2010; Siu & Shek, 2005). Melchers et al. (2015) found that there was a culture–sex interaction in self-report empathy in Mainland Chinese and German participants. According to Melchers et al., this interaction might occur because of a smaller sex difference in empathy found in the Mainland Chinese participants compared with the German participants. As far as the current authors know, Melchers et al. is the only research group that has reported the culture–sex interaction in empathy; nevertheless, they did not investigate it from another perspective; namely, investigating the cross-cultural differences in empathy separately for females and males. The findings of the cultural impact on empathy may differ according to the sex groups. Future researchers should investigate this two-way interaction with care.

**Self-construal.** Self-construal is the concept of self being independent or interdependent on others (Cheon et al., 2013; Singelis, 1994). Researchers have proposed that self-construal may be a variable that affects empathy, even though empirical evidence has not been found (de Greck et al., 2012; Kaelber & Schwartz, 2014; Xu et al., 2009). Self-construal is one dimension of culture (Jami et al., 2018), and is considered the most important differentiation between Western and Asian cultures (Kashima et al., 1995; Triandis, 2018). Self-construal can be divided into independent and interdependent self-construal (Cheon et al., 2013; Singelis, 1994). Independent self-construal is the prevailing type in Western cultures, and it emphasises
autonomy, uniqueness, and separation from others (Cheon et al., 2013; Singelis, 1994). In contrast, interdependent self-construal is the dominant type in Asian cultures and stresses harmonious interpersonal relationships, sacrificing individual benefit for the group, and believing that lives are highly intertwined (Cheon et al., 2013; Singelis, 1994).

Nowadays, researchers hold different opinions regarding the nature of correlations between self-construal and empathy. Some researchers predicted that interdependent self-construal might have a positive correlation with empathy, while independent self-construal might have a negative correlation with empathy (Kaelber & Schwartz, 2014). This prediction was made because empathy stresses taking the perspective of others and suppressing egocentric feelings (Cheon et al., 2013). However, Decety and Lamm (2006) have argued that keeping some self–other distinction is important in empathy. Their concern was that individuals with highly interdependent self-construal might blur the boundaries between self and others, and therefore, be more likely to experience self-oriented empathy-related personal distress (Batson, Fultz, & Schoenrade, 1987; Decety & Lamm, 2006). Genuine empathy, however, should be other-oriented (Decety & Lamm, 2006). Moreover, recently, researchers have found positive correlations between self-report scores on interdependent self-construal and empathy in Western populations (Varnum, Blais, Hampton, & Brewer, 2015); whereas, in Asian populations, positive correlations were found between scores on empathy and independent self-construal (Kaelber & Schwartz, 2014). These findings further illustrate the cultural influence on empathy and suggest a potential mediating effect of self-construal on culture as a predictor of empathy.

**Empathy-related personal distress.** Recently, researchers began to pay attention to the correlations between empathy-related personal distress and empathy.
Empathy-related personal distress is the self-oriented aversive feelings incurred through witnessing others’ suffering (Davis, 1980; López-Pérez, Carrera, Ambrona, & Oceja, 2014). Negative correlations between personal distress and empathy have been mentioned frequently in previous publications based on both Western and Asian participants (Melchers et al., 2015; Neumann et al., 2016). Researchers have argued that individuals with high empathy-related personal distress may feel overwhelmed by the negative emotions surrounding them, and to protect themselves from feeling emotional exhaustion they will avoid taking the perspective of others (López-Pérez et al., 2014). Moreover, there is evidence to support that Asians self-reported a higher value on empathy-related personal distress than Westerners (Cassels et al., 2010; de Greck et al., 2012; Melchers et al., 2015). These results imply that empathy-related personal distress may be a factor to explain Western–Asian cross-cultural differences in empathy, and this topic requires further investigation.

**Measuring Empathy**

A range of approaches can be used to measure empathy in different populations (for a review see Neumann, Chan, Boyle, Wang, & Westbury, 2015). Self-report questionnaires are frequently used in cross-cultural comparison studies of empathy (see Table II. 1). The EQ is a self-report questionnaire designed to measure empathy as a single component, with a higher total score reflecting higher overall empathy (Baron-Cohen & Wheelwright, 2004). In contrast, the Interpersonal Reactivity Index (IRI; Davis, 1980) measures the theoretical components of empathy separately utilising four subscales: perspective-taking (IRI-PT), empathic concern (IRI-EC), fantasy (IRI-FS), and personal distress (IRI-PD). The IRI-PT and IRI-EC are the subscales for measuring cognitive and emotional empathy respectively, with a higher subscale value reflecting higher empathy in the particular component (Davis, 1980). Nevertheless, In terms of the
definition of empathy, some researchers deem that IRI-FS and IRI-PD do not measure empathy *per se* (Baron-Cohen & Wheelwright, 2004; Jolliffe & Farrington, 2004). The concern was raised because the IRI-FS is designed to measure a person’s tendency to appreciate the emotions of fictitious characters, and it is not an interpersonal activity; while the IRI-PD measures empathy-related personal distress, which is other-orientated (Davis, 1980). In this thesis, EQ, IRI-PT, IRI-EC, and IRI-PD were used to measure the participants’ overall empathy, cognitive empathy, emotional empathy, and empathy-related personal distress (i.e., a proposed mediator of culture as a predictor of empathy), respectively.

Behavioural tasks have also been used by researchers to examine cultural differences in behavioural responses of empathy to emotional stimuli (see Table II. 2). To measure behavioural responses of empathy, a researcher may ask participants to watch videos (e.g., Atkins et al., 2016) or pictures (e.g., Neumann et al., 2013) depicting different emotions and to evaluate their empathy-related emotional responses to the targets. For example, after watching a stimulus of a happy face at a picnic, participants were requested to report to what degree they shared the happiness of that person on a Likert scale (e.g., Neumann et al., 2013). Among studies published in this area, some researchers tested empathy for a specific emotion (e.g., anger; de Greck et al., 2012), while some others examined empathy for a group of emotions with a similar characteristic (e.g., positive emotions; Neumann et al., 2013). Some researchers presented the emotion within an emotional context (e.g., a picnic; Neumann et al., 2013), while some others presented the emotion before a plain backdrop (e.g., de Greck et al., 2012). In this thesis, cultural differences in empathy for five basic emotions (viz., happiness, surprise, fear, anger, and sadness) were tested individually, and both emotional stimuli with and without the emotional context were administered.
Researchers have also used neurophysiological or brain imaging techniques to study empathy. For example, participants’ skin conductance responses (Hein, Lamm, Brodbeck, & Singer, 2011), heart rates (Chiao & Mathur, 2010), muscle-specific motor-evoked potentials (Chiao & Mathur, 2010), eye-movements (Masuda et al., 2012), and brain activations (Xu et al., 2009), have been recorded as relevant neurophysiological signals by researchers while participants were doing empathy-related tasks. The experimental paradigms in neurophysiological and brain imaging studies are usually similar to those used in the behavioural tasks as introduced before. Very few researchers have collected the neurophysiological technique or brain imaging data to investigate cross-cultural differences in empathy between Western and Asian participants (see Table II. 3).

Cross-Cultural Research

Status and trend. Cross-cultural psychology is a discipline that systematically examines similarities and differences in human behaviour and psychological function among people from various cultural backgrounds (Berry, 1997; Howard, 1991; Kagitcibasi & Poortinga, 2000; Triandis & Brislin, 1984). The goal of conducting cross-cultural studies is to increase understanding of human behaviour and to improve overall human well-being (Kagitcibasi & Poortinga, 2000). The results of cross-cultural psychological studies have the potential to benefit human development, public health, youth education, and the global economy (Kagitcibasi & Poortinga, 2000). Currently, cross-cultural studies have been carried out to investigate Western–Asian cultural differences in empathy, using self-report questionnaires (see Table II. 1), computer-based tasks (see Table II. 2), and brain imaging techniques (see Table II. 3). The current knowledge of Western–Asian cross-cultural differences in empathy, however, is limited and inconsistent.
A trend of cross-cultural studies of human cognition is that most comparisons were conducted between Westerners and East Asians (Han & Northoff, 2008). The Westerners recruited in these studies were American, British, or Australian Caucasians, and the East Asians included Chinese, Korean, and Japanese individuals (Han & Northoff, 2008). Western and Asian cultures are believed to be significantly different in the individualism-collectivism construct, a key dimension of culture (Kashima et al., 1995; Triandis, 2018). However, researchers have noted that cultural backgrounds are still heterogeneous within the groups of “Western” and “East Asian” cultures (Han & Northoff, 2008). For example, Melchers et al. (2016) found that there were significant cultural differences in self-report empathy between American, German, and Spanish Caucasians. Moreover, with a unique historical and geographic history, Chinese populations can be divided into, such as Mainland Chinese, Hong Kong Chinese, and Taiwanese. These Chinese populations have cultural differences in language (Cheng, Huang, Li, & Tang, 1997; Erbaugh, 2002), the construct of individualism-collectivism (Lau, 1992), and emotional expression and emotional communication (Fung & You, 2011). Future researchers should pay closer attention to identifying a participant’s cultural background.

**Complexities.** “Our brains and minds are shaped by our experiences, which mainly occur in the context of the culture in which we develop and live.” (Han & Northoff, 2008, p. 646). As introduced in previous sections, both culture and empathy are complex concepts, and because of this, investigating cultural differences in empathy is difficult. In the previous cross-cultural comparisons of empathy, researchers defined participant cultural groups according to participants’ nationality (e.g., Kaelber & Schwartz, 2014), ethnicity (e.g., Xu et al., 2009), or country of origin (e.g., Cassels et al., 2010). Each of the characteristics is necessary but not sufficient to define a culture
because researchers have found that participants with the same ethnicity but from different countries differed in self-report empathy score (Melchers et al., 2016). Meanwhile, it was also found that major and minor ethnicities in the same country might have different social expectations in the exhibition of empathy (Teague, 2014), and that Asians born in Western countries might report empathy scores in between the Asians and Westerners born in their heritage countries (Cassels et al., 2010). Cassels et al. (2010) deemed that the cultural backgrounds of both the family and society may have an impact on individual empathy responses. Thereby, future researchers of cultural differences in empathy ought to consider defining participant cultural groups using multidimensional criteria (e.g., nationality, ethnicity, and country of origin).

Empathy is deemed to correlate with not only individual cultural backgrounds but also personal characteristics (Zhao et al., 2017). Personal characteristics that influence empathy may include biological sex (e.g., Baron-Cohen, 2002), sex role (e.g., Karniol, Gabay, Ochion, & Harari, 1998; Sergeant, Dickins, Davies, & Griffiths, 2006), mental health condition (e.g., Bora, Gökçen, & Veznedaroglu, 2008), history of drug abuse (e.g., Ferrari, Smeraldi, Bottero, & Politi, 2014), hormonal level (e.g., Hurlemann et al., 2010), and gene (e.g., Huetter et al., 2016). These factors could be confounding variables for investigating cross-cultural differences in empathy, and ideally, all of these factors should be matched between cultural groups or be treated as covariates in the analysis. Moreover, researchers found that participants’ demographic characteristics might interact with their cultural backgrounds in influencing empathy responses, for example, a culture–sex interaction was found in self-report empathy score (Melchers et al., 2015). This suggests that cross-cultural differences in empathy could differ between the same pair of cultural groups but with different demographic characteristics.
Issues that need attention. To conduct a good cross-cultural comparison of empathy, several issues should be attended to. First, even though researchers have acknowledged that participants’ biological sex has an impact on individual empathy responses (e.g., Baron-Cohen, 2002), few researchers have controlled the sex ratio in studies of cross-cultural comparisons of empathy (one exception is Melchers et al., 2016). This issue has attracted increasing attention in recent years since researchers found significant culture–sex interactions in self-report empathy (Melchers et al., 2015). This finding illustrates that the sex ratio of cultural groups could be a confounding factor in investigating cross-cultural differences in empathy. The variation in sex ratio among previous studies of cultural differences in empathy might explain the inconsistency of findings in the literature (see Table II 1 to 3 and a literature review in the next section). It is therefore recommended that future investigations should examine the culture–sex interaction in empathy.

Second, a validated measurement is essential for cross-cultural comparisons. For example, researchers have used the English version of a self-report questionnaire of empathy for both Western and Asian participants and found that Westerners had higher self-report empathy than Asians (Kaelber & Schwartz, 2014). Nevertheless, Kaelber and Schwartz (2014) were concerned that familiarity with English could be a confounding factor in the results. That is, the Asian participants who were less familiar with English may interpret the items differently from native speakers (including the authors of the scales). Therefore, one essential consideration in cross-cultural comparison studies is to have a valid measurement in both languages; if necessary, researchers should validate the measurement in the culture/s, following guidelines for cross-cultural adaptation of self-report measures (Beaton, Bombardier, Guillemin, & Ferraz, 2000). However, to
date, the full-length version of the EQ (60 items) has not been validated in the Mainland Chinese context, and this task should be undertaken in future research with priority.

**Literature Review of Western–Asian Empathy Comparisons**

**Self-report studies.** Seven studies have been found in the literature for comparing self-report empathy between Western and Asian participants (see Table II. 1). In one study, Xu et al. (2009) found that both IRI-PT and IRI-EC scores were higher for university students from six Western countries ($n = 16, 50\%$ males) than those from Mainland China ($n = 17, 47\%$ males). Similarly, Kaelber and Schwartz (2014) found both IRI-PT and IRI-EC scores were significantly higher for American counsellor trainees ($n = 53, 19\%$ males) than those from Thailand ($n = 48, 31\%$ males). Cassels et al. (2010) compared the IRI-EC scores between Western ($n = 32$, multi-nationalities, unknown\% males) and Asian ($n = 74$, multi-nationalities, unknown\% males) students from secondary schools and tertiary institutions in Canada. They found that the IRI-EC score was significantly higher in the Western than the Asian group (Cassels et al., 2010). De Greck et al. (2012) found that German university students had higher IRI-EC scores than Mainland Chinese university students, but these two groups had similar IRI-PT scores ($n = 16$ per group, $38\%$ males). In contrast, Jiang, Varnum, Hou, and Han (2014) found that neither IRI-PT nor IRI-EC scores significantly differed between a group of Mainland Chinese university students and a group of Western university students from English-, German-, and Spanish-speaking countries ($n = 18$ per group, $0\%$ males). Studies reviewed above only administered the IRI to investigate the cross-cultural differences in empathy.

In two other studies, both the EQ and IRI were administered. Melchers et al. (2015) compared the EQ, IRI-PT, and IRI-EC scores of Mainland Chinese university students ($n = 438, 62\%$ males) with German university students ($n = 202, 25\%$ males).
In a subsequent study by Melchers et al. (2016), the three scores were compared between university students from Mainland China ($n = 438$, 62% males), Germany ($n = 304$, 24% males), Spain ($n = 62$, 44% males), and the United States ($n = 92$, 39% males). In both studies, the German group was found to have a significantly higher EQ score but similar IRI-PT and IRI-EC scores compared with the Mainland Chinese group (Melchers et al., 2015; Melchers et al., 2016). Melchers et al. (2016) also found that none of the three scores reflected a significant Western–Asian cultural difference in empathy between Mainland Chinese and Spanish or U.S. groups. These results suggest that the Western–Asian cultural differences in empathy might depend on the specific cultural groups investigated.

It is interesting to note that in both Melchers et al. (2015) and Melchers et al. (2016), researchers found Western–Asian cultural differences while using the EQ but not the IRI. This inconsistency suggests that cross-cultural differences in empathy may be also dependent on the actual scale administered, potentially, because of the different theoretical framework underlying each scale (i.e., EQ measures the overall empathy, while IRI measures emotional and cognitive empathy separately). Moreover, attention should be given to the Chinese translations of the EQ and IRI used in these two studies. First, it is unclear which the Chinese version of the EQ was administered in the two studies. Second, the Chinese version of the IRI administered in the two studies was the one validated in a group of Cantonese speaking Chinese (Siu & Shek, 2005). The official language of Mainland China is Mandarin. Researchers have pointed out that there are some linguistic differences between Cantonese and Mandarin languages (Cheng et al., 1997; Erbaugh, 2002), and have expressed concerns that the familiarity with the language of a scale may influence ones’ self-report evaluation of empathy (Kaelber & Schwartz, 2014). Instead, researchers should use simplified Chinese-
translated versions of the scales that have been validated in Mainland China, such as the simplified Chinese-translated version of the IRI (Chan, 1986; Wang et al., 2013). Currently, the full-length version of the EQ (60 items) has not been properly translated and validated in Mainland China, and therefore, one aim of in this thesis was to provide a valid simplified Chinese translation of EQ (Chapter IV).

**Behavioural studies.** Four studies have been found in the literature that investigated Western–Asian differences in empathy using behavioural tasks (see Table II. 2). Cheon et al. (2011) compared the overall empathy between Korean (n = 13, 62% males) and American Caucasian university students (n = 14, 50% males). Participants were asked to watch targets expressing emotions naturally in either an emotionally painful scene (e.g., in the midst of a natural disaster) or a non-painful scene (e.g., attending an outdoor picnic). The targets were either Caucasian or Asian. In the study, participants were requested to rate their empathy for each target on a Likert scale ranging from 1 (*not at all*) to 4 (*very much*). Results showed that the Korean group had an in-group bias in empathy for the suffering of the targets (i.e., they showed more empathy for the suffering of Korean than American targets), whereas the American group did not (Cheon et al., 2011). For the pictures of the non-painful scenes, neither groups showed in- or out-group bias (Cheon et al., 2011).

In another study, de Greck et al. (2012) compared overall empathy for anger between German and Mainland Chinese university students (n = 16 per group, 38% males per group). Participants were asked to watch pictures with either a Caucasian or Asian target expressing anger before a plain backdrop (de Greck et al., 2012). De Greck et al. only administered three types of stimuli, including in-group angry faces, in-group neutral faces, and out-group neutral faces. After watching each stimulus, participants were requested to rate “I was able to empathize with the shown person” (p. 2873) on a
visual analog scale continuously ranging from not at all to totally (de Greck et al., 2012). Results showed that for the stimuli of out-group neutral, the German group showed more empathy than the Mainland Chinese group. No other contrast was found to be significant.

Neumann et al. (2013) compared both emotional and cognitive empathy between Caucasian (from 13 countries; n = 99 per group, 26% males) and Chinese university students (n = 99 per group, 29% males). Stimuli presented were pictures of a Caucasian or Asian target in either a positive or negative affect scene (e.g., a party or a natural disaster, correspondingly), and all targets expressed emotions naturally. Participants were requested to rate three questions testing affect sharing, perspective-taking, and emotion understanding, respectively (Neumann et al., 2013). Neumann et al. found that for targets in the negative affect scenes, both the Caucasian and Chinese groups had an in-group bias in all of the three dependent variables (viz., affect sharing, perspective-taking, and emotion understanding). In contrast, for stimuli of positive affect scenes, the Chinese group had an out-group bias in the affect sharing of the targets while the Caucasian group had an in-group bias for emotion understanding of the targets. None of the other contrasts was found to be significant.

Atkins et al. (2016) performed a cross-cultural comparison of emotional and cognitive empathy between two groups of university students: British Caucasians (n = 47, 17% males) and Hong Kong Chinese (n = 47, 28% males). Participants were instructed to watch four videos of a Caucasian or an Asian female describing her negative social experience. Participants were requested to evaluate how much they felt empathic concern with the targets (i.e., emotional empathy) and to identify the emotion of the targets (i.e., cognitive empathy). No in-group bias in empathy was found in the study. However, Atkins et al. found that British participants showed more emotional
empathy than the Hong Kong participants for both Caucasian and Chinese targets.

Participants from Hong Kong had higher cognitive empathy than British participants for Chinese targets, but two participant groups had similar responses to Caucasian targets. When explaining the results, Atkins et al. referred to the Western–Asian cultural differences in emotional display rules; that is, relatively speaking, Westerners are more tolerant to express their emotions, while Asians are more likely to be required to suppress their emotions. As a result, British participants might be more likely to express their emotional empathy with others than Hong Kong participants did. In contrast, as Asians are asked to be aware of others’ unspoken feelings (Atkins et al., 2016), Hong Kong participants’ cognitive empathy ability could be stronger than British participants.

It can be noted that the existing findings of Western–Asian cross-cultural differences in behavioural responses of empathy are inconsistent. This inconsistency might be related to the variation in methodologies among these studies. First, some researchers investigated only one type of emotion (e.g., anger; de Greck et al., 2012), while others combined different emotions into a general group (e.g., negative emotions; Neumann et al., 2013). Second, some researchers only reported the results of in- or out-group biases in empathy, while others only reported the cross-cultural differences in empathy (see Table II. 2). This renders the findings from different studies difficult to compare. Third, the emotional stimuli were presented with an emotional background in some studies (e.g., a natural disaster; Neumann et al., 2013), but not in the others (e.g., a plain backdrop; de Greck et al., 2012), but none of the previous studies administered both types of stimuli. Researchers found that Asians could be more influenced by emotional backgrounds than Westerners (e.g., Ko, Lee, Yoon, Kwon, & Mather, 2011). Therefore, one concern is that Western–Asian cross-cultural differences in empathy
might be modulated by whether a stimulus was with an emotional background or not. The above methodological issues should be considered in future research.

**Brain imaging studies.** Two studies have been found in the literature, which has examined differences in brain activation of empathy between Western and Asian participants using functional magnetic resonance imaging (fMRI; see Table II. 3). Cheon et al. (2011) investigated brain activations of in-group bias in empathy with Korean (n = 13, 62% males) and American Caucasian university students (n = 14, 50% males). Participants were asked to watch pictures depicting Caucasian or Asian targets in either an emotionally painful or non-painful scene (e.g., during a natural disaster or an outdoor picnic, respectively). Cheon et al. found that watching the in-group relative to the out-group pain induced higher neural activations at right and left TPJ (BA40), middle cingulate cortex (MCC; BA24), left middle temporal gyrus (MTG; BA19), and left ITG (BA37), but lower activations in the right lingual gyrus (LG; BA19), in the Korean than American group (Cheon et al., 2011). Cheon et al. reckoned that the Korean participants might take more the perspective of the in-group than out-group targets in pain, relative to the American group, because the TPJ is related to cognitive empathy and perspective-taking. This could be a reason that the Korean group showed an in-group bias in their behavioural rating of empathy while the American group did not.

De Greck (2012) compared brain activation of overall empathy for anger between German and Mainland Chinese university students (n = 16 per group, 38% males per group). Participants were asked to watch pictures with Caucasian or Asian facial expressions of anger before a plain backdrop and report their empathy for the target person (de Greck et al., 2012). De Greck et al. found that empathy for in-group anger incurred higher activation in the left DLPFC (BA9) in the Mainland Chinese than
the German participant group, whereas incurred higher activations in the right TPJ (BA40), right inferior temporal gyrus (ITG; BA20), right superior temporal gyrus (STG; BA22), and MI (BA13) in the German than the Mainland Chinese participant group. De Greck et al. considered that the DLPFC is the key brain region for emotional control and is also related to personal distress. Mainland Chinese might suffer more personal distress during the empathic tasks and they might try to inhibit these negative feelings while watching the targets’ anger. In contrast, as the TPC, ITG, STG, and MI are responsible for cognitive empathy, the German participants might take the perspective of the targets and tried to emotionally understand their anger (de Greck et al., 2012).

**Limitations of Previous Studies**

Through the literature review conducted above, eight limitations were identified as the most critical issue to be addressed in the current thesis. First, the full-length version of the EQ (60 items) (Baron-Cohen & Wheelwright, 2004), the self-report empathy questionnaire that was used in previous Western–Asian cross-cultural comparison studies (see Table II. 1), had not been validated for use with Mainland Chinese participants. It was unclear if the paradoxical results of previous findings were accounted for by the unproven validity of the Chinese version of the questionnaire. Second, some evidence from the literature indicated that the self-report items for measuring emotional and cognitive empathy might be psychometrically dissociable for Westerners (Lawrence et al., 2004) but not for Asians (Guan et al., 2012). Nevertheless, few researchers have examined the Western–Asian cross-cultural differences of the psychometric characteristics in self-report empathy.

Third, one group of researchers (Melchers et al., 2015) found a significant culture–sex interaction in self-report empathy, implying that Western–Asian cultural differences in empathy between the female groups from these two cultures could be
different from that between the two male groups. However, this issue has not been investigated by other researchers who usually reported the cultural difference in empathy based on participant groups with different sex ratios (see Table II. 1 to 3).

Fourth, there were some theoretical hypotheses suggesting cultural differences in self-construal (de Greck et al., 2012; Kaelber & Schwartz, 2014; Xu et al., 2009) and in empathy-related personal distress (Melchers et al., 2015; Neumann et al., 2016) could be used to explain cultural differences in empathy. Nonetheless, empirical evidence supporting these hypotheses had not been found. To answer this question, further study could examine the mediating effects of these two empathy-related traits on culture as a predictor of empathy.

Fifth, emotion recognition is an important process during empathy (Gery, Miljkovitch, Berthoz, & Soussignan, 2009); however, few researchers controlled the accuracies of emotion recognition of stimuli before investigating the cultural differences. Moreover, researchers have noted that there could be Western–Asian cross-cultural differences in recognising emotions. For example, Atkins et al. (2016) found that Asians might have a higher accuracy of emotion recognition of sufferings than Westerners. Similarly, Moriguchi et al. (2005) found that when asked both Caucasian and Japanese participants to watch facial expression of fear, all Japanese (i.e., 100%) reported that they saw a surprise in these faces; in contrast, most of the Caucasian participants (i.e., 88%) identified the same faces as depicting fear. Meanwhile, the amygdala—a crucial brain region related to process fearful information (Wilensky, Schafe, Kristensen, & LeDoux, 2006) —was more activated in the Caucasian group than in the Japanese group (Moriguchi et al., 2005). Therefore, it is unclear whether the cultural differences in empathy reported in the literature reviewed were due to cultural differences in recognising these emotions. Similarly, it is unclear whether the in-group bias in
empathy occurred because of the in-group bias in recognising these emotions. The above findings indicate the importance of testing and controlling emotion recognition before investigating cross-cultural differences in empathy.

Sixth, in behavioural investigations, some researchers only reported in-group/out-group bias in participant responses of empathy (Neumann et al., 2013), while others reported only the Western–Asian cross-cultural differences in empathy (de Greck et al., 2012). In fact, both aspects are critical to understanding the cultural impact on empathy, and thereby, future researchers should report both. Seventh, another possible limitation is related to the emotional stimuli used in the reviewed literature. Currently, researchers have acknowledged that Asians are more likely to be influenced by contexts than Westerners while processing emotional stimuli (e.g., Ko et al., 2011). However, while studying cultural differences in empathy, none of the researchers has administered stimuli both with and without emotional contexts in one study.

Finally, researchers using a group of Chinese international students found that with increasing contact with Caucasians, participants showed a reduced in-group bias in empathy for pain (Cao, Contreras-Huerta, McFadyen, & Cunnington, 2015). Currently, it is unclear that whether Western and Asian populations have comparable social experience of encounter with the out-group. If there are cultural differences, the characteristic of contact with the out-group could be a confounding factor in comparing in-group bias in empathy between Western and Asian participants. However, to date, the out-group encounter has not been tested nor controlled in the literature reviewed before. This issue should be carefully addressed in the future research.

**Importance of Conducting Further Research**

Empathy is important for successful social interactions because it helps an individual to appreciate others’ emotions, to acknowledge their intentions, and to
predict their behaviours (Berthoz, Wessa, Kedia, Wicker, & Grèzes, 2008; Hirosawa et al., 2012; Preti et al., 2011). More importantly, sociologists reckon that there will be a global empathic civilisation in the forthcoming future (Jakovljevic & Tomic, 2016), and the coming era is the “age of empathy” (Waal, 2009; Zink, 2008). In the new era, society will become empathy-oriented (Zink, 2008), and empathic ability will become one of the most important characteristics of successful individuals (Jakovljevic & Tomic, 2016). Therefore, research into empathy will become increasingly important. Moreover, factors that may influence empathy, such as cultural background and personality, are worthy of investigation using cross-cultural research methodologies.

Furthermore, three important theoretical questions of empathy have not been answered. First, researchers have theorized that emotional and cognitive empathy are functionally and neuropsychologically dissociable (Shamay-Tsoory et al., 2009). This notion has been supported by the finding that psychometric properties of items measuring emotional empathy and measuring cognitive empathy are dissociable in Western populations (Lawrence et al., 2004). Nevertheless, whether these two components of empathy are psychometrically dissociable (Kim & Lee, 2010) or indissociable (Guan et al., 2012; Siu & Shek, 2005) in Asian populations is under debate. Further research is required to clarify this issue with Asian participants. Second, some theoretical proposals have suggested that Western–Asian cultural differences can be explained by cultural differences in self-construal (de Greck et al., 2012; Kaelber & Schwartz, 2014; Xu et al., 2009) and empathy-related personal distress (Cassels et al., 2010; de Greck et al., 2012; Melchers et al., 2015). However, empirical evidence to support these propositions has not been found. The mediating effects of the two factors on culture as a predictor of empathy should be tested in future research. Third, three different theories have been proposed by researchers to explain the in-group bias found
in empathy; namely, “in-group love” (Mathur, Harada, Lipke, & Chiao, 2010), “out-group hate” (Avenanti, Sirigu, & Aglioti, 2010), and “reciprocal altruism” (Mathur et al., 2010). It is still unknown which theory is more accurate in explaining in-group bias in empathy found in both Western and Asian populations. This interesting theoretical issue is worth further investigating.

The central mission of conducting cross-cultural research is to understand the impact of culture on human behaviour and to increase overall human well-being (Kagitcibasi & Poortinga, 2000). Investigating cultural differences in empathy has both scientific and social importance (e.g., Cheon et al., 2011). Nevertheless, currently, the number of cross-cultural studies of empathy is small (see Table II. 1 to 3), and the knowledge on the topic is under-developed (Jami et al., 2018). Moreover, the aforementioned limitations of the reviewed publications left 10 important research questions unanswered (Chapter III). This thesis was aimed at answering these important questions using Australian and Mainland Chinese participants. Besides addressing the limitations in the reviewed literature, three empirical studies of this thesis were planned to bring new insight into the relationship between empathy and culture, and to discuss possible solutions to increase individual and cross-cultural empathy. In the next chapter, the research questions and the research plan of the current thesis are presented.
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CROSS-CULTURAL COMPARISON OF EMPATHY

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### Table II. 1

**Western–Asian Cross-Cultural Comparisons of Self-Report Empathy**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Scales</th>
<th>Asian participants</th>
<th>Western participants</th>
<th>Western–Asian comparison*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Culture (n)</td>
<td>Male%</td>
<td>Age (M)</td>
</tr>
<tr>
<td>1 Xu et al. (2009)</td>
<td>IRI</td>
<td>Mainland Chinese (17)</td>
<td>47</td>
<td>23</td>
</tr>
<tr>
<td>2 Cassels et al. (2010)</td>
<td>IRI</td>
<td>Asian* (74)</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>3 de Greck et al. (2012)</td>
<td>IRI</td>
<td>Mainland Chinese (16)</td>
<td>38</td>
<td>23</td>
</tr>
<tr>
<td>4 Kaelber and Schwartz (2014)</td>
<td>IRI</td>
<td>Thar* (48)</td>
<td>31</td>
<td>32</td>
</tr>
<tr>
<td>5 Jiang et al. (2014)</td>
<td>IRI</td>
<td>Mainland Chinese (18)</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>7 Melchers et al. (2016)</td>
<td>EQ, IRI</td>
<td>Mainland Chinese (438)</td>
<td>62</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mainland Chinese (438)</td>
<td>62</td>
<td>20</td>
</tr>
</tbody>
</table>

Note. EQ = Empathy Quotient; EQ-40 = total score for the 40-item EQ; IRI = Interpersonal Reactivity Index; IRI-PT = total score for the IRI’s perspective-taking items; IRI-EC = total score for the IRI’s empathic concern items; IRI-PD = total score for the IRI’s personal distress items; IRI-FS = total score for the IRI’s fantasy items.

*In the Western–Asian comparison, A = Asians and W = Westerners. *Participants were multi-nationalities. *Participants were Caucasians. *Participants were multi-ethnicities.
Table II. 2

*Western–Asian Cross-Cultural Comparisons of Empathy using Behavioural Tasks*

<table>
<thead>
<tr>
<th>Reference</th>
<th>Stimulus</th>
<th>Emphy</th>
<th>Asian participants</th>
<th>Western participants</th>
<th>Results(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Culture</td>
<td>Male</td>
<td>Age (M)</td>
</tr>
<tr>
<td>Cheon et al. (2011)</td>
<td>Suffering</td>
<td>OM</td>
<td>Korean (13)</td>
<td>62</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OM</td>
<td>Korean (13)</td>
<td>62</td>
<td>23</td>
</tr>
<tr>
<td>de Greck et al. (2012)</td>
<td>In-group angry</td>
<td>OM</td>
<td>Mainland Chinese (16)</td>
<td>38</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OM</td>
<td>Mainland Chinese (16)</td>
<td>38</td>
<td>23</td>
</tr>
<tr>
<td>Neumann et al. (2013)</td>
<td>Positive emotions</td>
<td>EM</td>
<td>Mainland Chinese (99)</td>
<td>29</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CM</td>
<td>Mainland Chinese (99)</td>
<td>29</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PT</td>
<td>Mainland Chinese (99)</td>
<td>29</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Negative emotions</td>
<td>EM</td>
<td>Mainland Chinese (99)</td>
<td>29</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CM</td>
<td>Mainland Chinese (99)</td>
<td>29</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PT</td>
<td>Mainland Chinese (99)</td>
<td>29</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EM</td>
<td>Hong Kong Chinese (47)</td>
<td>28</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CM</td>
<td>Hong Kong Chinese (47)</td>
<td>28</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CM</td>
<td>Hong Kong Chinese (47)</td>
<td>28</td>
<td>21</td>
</tr>
</tbody>
</table>

Note. OM = overall empathy; EM = emotional empathy; CM = cognitive empathy; PT = perspective-taking;

\(^a\)In the results, A = Asians; W = Westerners; ✓ = show; × = non-show. \(^b\)Participants were multi-nationalities.
Table II. 3

**Western–Asian Cross-Cultural Comparisons of Empathy using fMRI**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Stimulus</th>
<th>Asian participants</th>
<th>Western participants</th>
<th>Results*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Culture (n)</td>
<td>Male % (M)</td>
<td>Culture (n)</td>
</tr>
<tr>
<td>Cheon et al. (2011)</td>
<td>In- &gt; out-group suffering</td>
<td>Korean (13) 62</td>
<td>23</td>
<td>American Caucasian (14) 50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MCC (BA24)</td>
</tr>
<tr>
<td>de Greck et al. (2012)</td>
<td>In-group angry &gt; baseline</td>
<td>Mainland Chinese (16) 38</td>
<td>23</td>
<td>German Caucasian (16) 38</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>right ITG (BA20)</td>
</tr>
<tr>
<td></td>
<td>In-group neutral &gt; baseline</td>
<td>Mainland Chinese (16) 38</td>
<td>23</td>
<td>German Caucasian (16) 38</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>left MI (BA13)</td>
</tr>
</tbody>
</table>

*Note. TPJ = temporo-parietal junction; MCC = middle cingulate cortex; MTG = middle temporal gyrus; ITG = inferior temporal gyrus; LG = lingual gyrus; DLPFC = dorsolateral prefrontal cortex; STG= superior temporal gyrus; MI = middle insula.

*In the results, A = Asians and W = Westerners.
CHAPTER III

The Present Study

Based on the previous literature review, it is clear that the current understanding of cultural differences in empathy between Western and Asian participants is limited and the research findings are not interlinked. Three important questions have not been systematically addressed in the literature reviewed, and these are: (a) What are the distinctions between Western and Asian participants in psychometric characteristics of self-report empathy? (b) What are the distinctions between Western and Asian participants in self-report empathy score? (c) What are the distinctions between Western and Asian participants in behavioural responses of empathy? The current study was designed to answer these questions using three independent studies; namely, a Validation of the Empathy Quotient in Mainland China (Chapter IV); a Cross-Cultural Comparison of Self-Report Empathy between Australian Caucasians and Mainland Chinese (Chapter V); and a Cross-Cultural Comparison of Empathy between Australian Caucasians and Mainland Chinese (Chapter VI).

Moreover, the three studies were designed to overcome a number of limitations in the literature. First, ethnicity, nationality, and country of origin were comprehensively considered while identifying the current participants’ cultural background. Second, the culture–sex interaction in empathy was tested in both self-report and behavioural comparisons of this thesis. Third, the mediating effects of self-construal and empathy-related personal distress on culture as a predictor of self-report empathy were examined. Fourth, the accuracy of emotion recognition of each stimulus was statistically controlled before investigating the cross-cultural differences in behavioural responses of empathy. Fifth, cross-cultural differences in empathy for each type of emotion (i.e., happiness, sadness, and anger) were evaluated separately. Sixth,
an attempt to administer stimuli both with and without an emotional context was
fulfilled. Seventh, the full-length EQ (60 items) was translated and validated in the
Mainland Chinese context, following the guidelines for cross-cultural adaptation of self-
report measures (Beaton, Bombardier, Guillemin, & Ferraz, 2000).

Even though a short version of the EQ has been validated in Mainland China
(e.g., Guan, Jin, & Qian, 2012), validating the full-length EQ is essential for the
following four reasons: (1) for a comparison of psychometric characteristics of the EQ
based on Mainland Chinese participants with previous publications based on Westerners.
Researchers have provided several structural models of the EQ based on Western
populations, and most of these models were established according to the results based
on the full-length version. Therefore, to provide a valid comparison of model fit with
these published models, it requires Mainland Chinese participants to complete the full-
length version of the EQ; (2) for an examination of the correlations between items of
emotional and cognitive empathy. Guan et al. (2012) have validated a short version of
the EQ in Mainland China. They found that a one-factor model was the best-fit model
for Chinese participants, while results based on Western populations suggested that EQ
items for measuring emotional empathy and those for cognitive empathy were
psychometrically dissociated (Lawrence, Shaw, Baker, Baron-Cohen, & David, 2004).
Because Guan et al. only administered 22 items of the EQ, it is indeterminate whether
their one-factor model reflected only characteristics of these selected items. The full-
length version of the EQ should be validated to further examine this issue; (3) for a
preparation of testing materials for conducting cross-cultural comparisons. Researchers
usually do not use scores on a short version of the EQ (e.g., Guan et al., 2012) to
examine cultural differences in self-report empathy between Western and Asian
participants, as the short version of the EQ might only be suitable for one culture but not
the other; (4) for conducting comparisons between publications. A large number of publications of the EQ were based on the total score of the full-length version (Groen, Fuermaier, Den Heijer, Tucha, & Althaus, 2015). Therefore, validation of a full-length of the EQ based on Mainland Chinese participants could also contribute to further literature reviews or meta-analysis studies.

**Research Questions**

The core research question of the entire thesis is: what are the cultural differences in empathy between Australians and Mainland Chinese? This research question was examined in the current thesis on three dimensions; namely, psychometric characteristic of self-report (Chapter IV), self-report empathy score (Chapter V), and behavioural responses of empathy responses (Chapter VI). Furthermore, as cultural differences in empathy are highly correlated with other important phenomena, including sex differences, culture–sex interactions, and in-group bias in empathy, ten research questions were examined across the three studies of this thesis.

1. Are the psychometric properties of the EQ based on Mainland Chinese participants the same as those reported for Western populations? (Chapter IV)
2. Are sex differences in the EQ score based on Mainland Chinese participants the same as those reported for Western populations? (Chapter IV)
3. Is the EQ a valid and reliable self-report questionnaire to measure empathy in Mainland Chinese participants? (Chapter IV)
4. Is self-report empathy significantly different between Australian Caucasian and Mainland Chinese participants? (Chapter V)
5. Does participant sex interact with culture in self-report empathy? (Chapter V)
6. Can individual traits, such as self-construal and empathy-related personal distress, explain the cultural differences in self-report empathy score between
Australian and Mainland Chinese participants? (Chapter V)

(7) Do Australian and Mainland Chinese participants recognise basic emotions (i.e., happiness, surprise, fear, anger, and sadness) differently? (Chapter VI)

(8) Which group, Australian or Mainland Chinese, shows more empathy towards the targets? (Chapter VI)

(9) Is there any interaction effect of participant culture and participant sex on empathy responses to targets? (Chapter VI)

(10) Do both Australian and Mainland Chinese participants show an in-group bias in empathy for the targets? (Chapter VI)

Expected Results

The validity of using the EQ for measuring self-report empathy has been provided in several Western or Asian populations (Groen et al., 2015; Kim & Lee, 2010). Therefore, the validity of the simplified Chinese version of EQ in measuring self-report empathy in Mainland China was expected (see Chapter IV). Based on previous publications with Chinese participants (Guan et al., 2012; Yang, Xiao, Qian, Mo, & Zhuo, 2013), sex differences in self-report empathy were expected to be smaller than that found in Western populations (Groen et al., 2015). In addition, it was expected that the best-fit structural model of EQ might be a one-factor model (Guan et al., 2012). This prediction was made because the Chinese culture requires individuals to suppress their own emotional expression, and as a result, Chinese people are sensitive to others’ subtle emotional changes and usually need to take the perspective of others to understand others’ feelings (Ho, Fu, & Ng, 2004; Neumann, Chan, Wang, & Boyle, 2016; Siu & Shek, 2005; Wang, 2001). Therefore, emotional and cognitive empathy might be highly correlated in the Chinese population, and items testing the two components could be entangled as one factor.
Based on the literature review presented in Chapter II, there could be a significant cultural difference in self-report empathy, namely, the current Australian participants might have higher self-report emotional, cognitive, and overall empathy scores than the Mainland Chinese participants. However, it was expected that this main effect of culture might be qualified by a culture–sex interaction in these empathy scores as reported by Melchers, Li, Chen, Zhang, and Montag (2015). Melchers et al.’s results illustrated that sex differences in self-report empathy were smaller for the Asian than the Western participants (Groen et al., 2015). According to the above findings, it was expected that the cultural difference in self-report empathy between Western and Asian females might differ from the one between Western and Asian males. According to theoretical concepts (de Greck et al., 2012; Kaelber & Schwartz, 2014; Neumann et al., 2016; Xu, Zuo, Wang, & Han, 2009), it was expected that a part of the cultural difference in self-report empathy between the Australian and Mainland Chinese groups could be explained by their cultural differences in two empathy-related traits; namely, self-construal and personal distress.

As reported by Tottenham et al. (2009) in the original validation study of the NimStim Set of Facial Expressions (i.e., all facial expressions were depicted before a plain backdrop), the accuracy of participants’ emotion recognition of different stimuli was varied depending on the emotions depicted by the stimuli. While the accuracies for happiness, anger, and neutral emotions were relatively high (i.e., ≥ 82%), the accuracies for sadness, fear, and surprise were relatively low (i.e., from 47 to 81%). As the above results were based on American participants (i.e. 81% Caucasians), similar accuracies were expected to be found in the current Australian group. Nevertheless, it was expected that the accuracies might be lower in the Mainland Chinese group because researchers have pointed out that emotion recognition of facial expressions of basic
emotions, such as fear and surprise, were different between Western and Asian participants (Moriguchi et al., 2005; Russell, Suzuki, & Ishida, 1993). In contrast, for the stimuli that included an emotional context, it was expected that both cultural groups would show relatively high accuracies in emotion recognition (i.e., > 80%).

Finally, because empathy is an interpersonal activity (Siu & Shek, 2005), results were expected to reflect impacts on behavioural responses of empathy from not only the traits of the participants (e.g., culture and sex), but also the traits of the targets (e.g., culture and emotion), and the relationship between participants and targets (i.e., in-group and out-group). Specifically, cultural differences in behavioural responses of empathy for negative emotions (e.g., anger and sadness) were expected, even though the direction of the cultural main effect was unclear with the current Australian and Mainland Chinese participants (de Greck et al., 2012). In addition, the two-way interaction of participant culture and sex, like that found for self-report empathy (Melchers et al., 2015), was expected to be shown on participants’ behavioural responses of empathy. Furthermore, the cultural differences in empathy for emotional stimuli with and without emotional contexts were expected to be different (e.g., Ko, Lee, Yoon, Kwon, & Mather, 2011). Lastly, in line with previous findings, both in-group bias in empathy for negative emotions (Cheon et al., 2011; Neumann, Boyle, & Chan, 2013) and out-group bias in empathy for positive emotions was expected (Neumann et al., 2013).
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Kim, J., & Lee, S. J. (2010). Reliability and validity of the Korean version of the


CHAPTER IV.

Validation of the Empathy Quotient in Mainland China

The overall aim of this thesis was to address cultural differences in empathy between Western and Asian participants in three aspects: namely, psychometric property, self-report score, and behavioural response. The first study in this thesis was the beginning of the journey in an investigation of Western–Asian cross-cultural differences in empathy. In this study, the psychometric properties of the EQ scale were examined in a sample of Mainland Chinese participants and the findings compared with the previous results based on Western populations to identify potential cross-cultural differences.

Moreover, according to the literature review (Chapter II), it was noted that the full-length EQ scale (60 items) was not validated in Mainland China. Therefore, another purpose of this study was to cross-culturally validate the EQ in the Mainland Chinese population. This validated scale was utilised in both the following two studies (Chapters V and VI) to investigate the cultural impact on self-report empathy with Australian and Mainland Chinese participants. Finally, the third purpose of this study was to establish a Mainland Chinese database of self-report empathy, and data drawn from this database was used in the next study (Chapter V) for cross-cultural comparisons.

As introduced in Chapter III, this study was conducted to answer the following three questions:

- Are the psychometric properties of the EQ based on Mainland Chinese participants the same as those reported for Western populations?
- Are sex differences in the EQ score based on Mainland Chinese participants the same as those reported for Western populations?
- Is the EQ a valid and reliable self-report questionnaire to measure empathy in
Mainland Chinese participants?

Chapter IV was published in the Journal of Personality Assessment in 2017. I designed the research, translated questionnaires, developed and ran the online survey, collected all the data, conducted data analyses, and wrote the manuscript. In this chapter, the post-print version of the article is presented. Ethical approval was granted by Griffith University Ethics Committee (PSY/28/14/HREC).

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Validation of the Empathy Quotient in Mainland China

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Abstract

This research aims to validate a simplified Chinese version of the Empathy Quotient (EQ) (60 items) for use with Mainland Chinese people. The original English version of the EQ was translated into simplified Chinese. Through an online survey, 588 Mainland Chinese participants completed the EQ and three other questionnaires: the Interpersonal Reactivity Index (IRI), the Autism-Spectrum Quotient (AQ), and the 20-item Toronto Alexithymia Scale (TAS-20). Thirty-five participants completed retesting of the EQ 3 to 4 weeks later. Sex differences on the EQ scores and psychometric properties of the EQ items were examined. Confirmatory factor analysis (CFA) suggested that an EQ-15-item structural model fitted the data quite well. Self-report empathy, as assessed by the present simplified Chinese version of the EQ, appeared to relate to participants’ autistic and alexithymic traits but not sex.

Keywords: empathy, Mainland Chinese, Empathy Quotient, validation, Autism-Spectrum Quotient, Interpersonal Reactivity Index, Toronto Alexithymia Scale
Validation of the Empathy Quotient in Mainland China

Introduction

The Empathy Quotient (EQ) is a self-report instrument developed by Baron-Cohen and Wheelwright (2004) to measure empathy in both healthy individuals and those with autism spectrum conditions (ASC). To date, the original English version of the EQ has been translated into a number of languages and validated in different cultures and populations (Dimitrijević, Hanak, Vukosavljević-Gvozden, & Opačić, 2012; Groen, Fuermaier, Den Heijer, Tucha, & Althaus, 2015; Kim & Lee, 2010; Lepage, Lortie, Taschereau-Dumouchel, & Théoret, 2009). Scores on the EQ have been found to have good reliability and validity across these linguistic and cultural differences in measuring self-report empathy (Groen et al., 2015). However, a full-length (60 items) version of the EQ has not been adapted or fully validated for use in Mainland China.

Empathy is “understanding and sharing in another’s emotional state or context” (Cohen & Strayer, 1996, p. 988). It is an essential social communication skill (Baron-Cohen & Wheelwright, 2004) and consists of two main components (Cohen & Strayer, 1996; Lawrence, Shaw, Baker, Baron-Cohen, & David, 2004; Shamay-Tsoory, 2011). One is emotional or affective empathy (Decety & Moriguchi, 2007), which is sharing and responding to another person’s emotional state with an appropriate emotion (Baron-Cohen & Wheelwright, 2004; Smith, 2006). The other is cognitive empathy, which is the ability to recognise another person’s mental state, including their emotions, thoughts, intentions, and perceptions (Baron-Cohen & Wheelwright, 2004; Shamay-Tsoory, 2011; Smith, 2006). There is some evidence that these two components have dissociated brain networks (Cox et al., 2012; Fan, Duncan, de Greck, & Northoff, 2011; Shamay-Tsoory, 2011; Shamay-Tsoory, Aharon-Peretz, & Perry, 2009).
The original EQ (60 items) has 40 items which measure empathy as a single construct and another 20 filler items (Baron-Cohen & Wheelwright, 2004). Each item is rated on a 4-point Likert scale. The 20 filler items, which are not scored, were designed by the authors of the EQ to prevent participants from constantly answering empathy questions (Baron-Cohen & Wheelwright, 2004). Examples of the 40 empathy items include: “I can tell if someone is masking their true emotion” (EQ #55), “Seeing people cry doesn’t really upset me” (EQ #32, reverse item), and “I find it hard to know what to do in a social situation” (EQ #8, reverse item) (Baron-Cohen & Wheelwright, 2004). According to the instruction given by Baron-Cohen and Wheelwright (2004), each empathy item is scored on a reduced basis (viz., from 0, 1, to 2 points). For a forward item (e.g., EQ #55), 2 points are provided for strong agreement, 1 point for mild agreement, and 0 point for both mild and strong disagreement; while for a reverse item (e.g., EQ #32), the above four conditions are scored with 0, 0, 1, and 2 points respectively (Baron-Cohen & Wheelwright, 2004). The total score of the EQ ranges from 0 to 80, with higher scores reflecting greater empathy. Subsequent research has suggested different structural models for the EQ. Some have identified emotional and cognitive empathy as two factors (Andrew, Cooke, & Muncer, 2008; Lawrence et al., 2004; Muncer & Ling, 2006), whereas others have found empathy as measured by the EQ items to be unidimensional (Allison, Baron-Cohen, Wheelwright, Stone, & Muncer, 2011; Guan, Jin, & Qian, 2012; Wakabayashi et al., 2006).

Lawrence et al. (2004) validated the EQ in a group of British participants (N = 172, mean age = 34.1 years, SD = 10.4). Factor analyses indicated that EQ items loaded on three factors; namely, cognitive empathy (11 items, e.g., EQ #55), emotional reactivity (11 items, e.g., EQ #32), and social skills (6 items, e.g., EQ #8). The first two factors were used to measure cognitive and emotional empathy separately (Lawrence et
The three-factor model has been found to have a good fit to the observed data in several EQ validation studies based on different populations and translated versions, such as Dutch (Groen et al., 2015) and French (Berthoz, Wessa, Kedia, Wicker, & Grèzes, 2008).

Allison et al. (2011) tested the EQ in a group of ethnically diverse participants ($N = 5,377$, age range = 16 to 78 years). Results of factor analyses indicated that EQ items loaded on two factors. The two factors were grouped according to the items’ response directions; namely, items requiring agreement (13 items, e.g., EQ #55) and items requiring disagreement (13 items e.g., EQ #32) to indicate empathy (Allison et al., 2011). Wakabayashi et al. (2006) found with a group of British university students ($N = 1,761$, age range = 18 to 26 years) that the EQ items did not separate in terms of the theoretical components of empathy nor in terms of the items’ response directions, and thus recommended a one-factor model.

To date, the best-fit structural model of the EQ in the Mainland Chinese context is unclear. There have been two attempts to validate the EQ in Mainland China, with inconsistent results: Yang, Xiao, Qian, Mo, and Zhuo (2013) aimed to validate a full-length EQ (60 items) with a group of Mainland Chinese participants ($N = 426$, mean age = 35.1 years, $SD = 4.6$). However, Yang et al. did not follow a standard translation and validation process in validating the EQ for use in Mainland China. Firstly, they did not provide any information about their translation process, which is required to be reported according to a standard cross-cultural validation process (Beaton, Bombardier, Guillemin, & Ferraz, 2000). Secondly, they did not conduct a confirmatory factor analysis (CFA), which is a procedure required to check the fit of previously established structural models to a new dataset (Burnett & Dart, 1997; Levine, 2005). In all, Yang et
al. considered their study as an early exploratory investigation and suggested that the formal validation of the EQ in a Chinese context requires further study.

Guan et al. (2012) validated a short version of the EQ (22 items) in Mainland China using a group of healthcare trainees or professionals \((N = 840, \text{ age range } = 17 \text{ to } 52 \text{ years})\). They confirmed that the best-fit model for their translated version was a one-factor model with 15 EQ items (Guan et al., 2012). However, it should be noted that health-care training and work environments can change individuals’ self-reported empathy levels (Dehning et al., 2013; Nunes, Williams, Sa, & Stevenson, 2011; Penprase, Oakley, Ternes, & Driscoll, 2013). Furthermore, the one-factor model provided by Guan et al. only summarised the psychometric properties of the items of the short version of the EQ. Therefore, further investigation is needed to test the psychometric properties of the full-length version of the EQ items in a Mainland Chinese sample.

In addition to the factor structure of the EQ, sex differences in empathy are relevant to validation of the EQ (Baron-Cohen & Wheelwright, 2004). Females on average score higher than males on self-report empathy (Baron-Cohen & Wheelwright, 2004; Groen et al., 2015). This may reflect prenatal biological influences on the sexes, including genetics (Wu, Li, & Su, 2012), hormone modulation (Hurlemann et al., 2010), and neural differences (Derntl et al., 2010; Rueckert & Naybar, 2008; Schulte-Rüther, Markowitsch, Shah, Fink, & Piefke, 2008). It may also be related to postnatal experiences, such as cultural influences (Dehning et al., 2013) and social expectations (Ickes, Gesn, & Graham, 2000). However, previous self-report studies of empathy based on Chinese populations have not found the expected sex difference on the EQ scores (Guan et al., 2012; Yang et al., 2013). These studies can be questioned in that Guan et al. (2012) used a short version of the EQ with healthcare professionals, while
Yang et al. (2013) did not validate the EQ using a standard translation and validation process. These limitations might conceal a genuine sex difference in empathy for the Mainland Chinese participants, and point to the need to validate the full-length EQ (60 items) in Mainland China following a recommended cross-cultural validation procedure (Beaton et al., 2000).

The current study aims to validate a full-length (60 items) simplified Chinese version of the EQ in Mainland China. There are two forms of Chinese written text, traditional and simplified. The former has a longer history and is used in Hong Kong, Macau and Taiwan and the latter is used in Mainland China and Singapore. The factor structure, internal consistency, and test-retest coefficients of the EQ scores were assessed, and sex differences were examined. Finally, three other self-report scales were selected with reference to previous EQ validation studies to provide evidence to support the construct validity of the simplified Chinese version of the EQ scores in measuring self-report empathy of the Mainland Chinese participants (Baron-Cohen & Wheelwright, 2004; Groen et al., 2015; Lawrence et al., 2004; Preti et al., 2011). The three scales included an empathy scale, namely, the Interpersonal Reactivity Index (IRI) (Chan, 1986; Davis, 1980; Melchers, Montag, Markett, & Reuter, 2015; Siu & Shek, 2005), an autism scale, namely, the Autism-Spectrum Quotient (AQ) (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001), and an alexithymia scale, namely, the 20-item Toronto Alexithymia Scale (TAS-20) (Bagby, Parker, & Taylor, 1994; Zhu et al., 2007). We predicted significant positive correlations between scores on the EQ and the IRI perspective-taking (IRI-PT) and empathic concern (IRI-EC) subscales (Dimitrijević et al., 2012; Kim & Lee, 2010; Lawrence et al., 2004; Preti et al., 2011), and significant negative correlations between scores on the EQ and the AQ and the TAS-20 subscales (Baron-Cohen & Wheelwright, 2004; Bird et al., 2010; Jonason & Krause, 2013;
Lombardo, Barnes, Wheelwright, & Baron-Cohen, 2007; Melchers et al., 2015; Preti et al., 2011; Wheelwright et al., 2006; Williams & Wood, 2010).

Method

Participants

Participants voluntarily completed an anonymous online survey on the Sojump platform (http://www.sojump.com) in Mainland China. Advertisements were broadcast through two Mainland Chinese popular online chat tools (Wechat and QQ Software), three Mainland Chinese popular public information websites (taobao.com, weibo.com, and qq.com), and several online forums. Ethical approval was granted by the first author’s institution. All participants provided their informed consent online prior to taking part in the study. A 25 RMB cash (about 4 US dollars) or equivalent gift was provided to each participant to compensate for his/her time.

The current study included a test and a re-test phase. During the first administration, participants were informed that the current study was restricted to individuals who satisfied the following inclusion criteria: (1) nationality is Chinese; (2) ethnicity is Han Chinese or minority Chinese; (3) place of birth was Mainland China; (4) primary residence while growing up was Mainland China; (5) current primary residence is Mainland China; and (6) was 18 years or older. At the end of the first administration, each participant was asked to provide a six-digit password. Re-test participants were randomly selected from the individuals who finished the first administration. During the re-test administration, participants were asked to meet two additional criteria: (7) a valid password consistent with that created at their first administration; and (8) the time interval between the test and the re-test phase was within 3 to 4 weeks.

In all, 634 participants ($N = 588$ final participants – see below) completed the first administration. Of the original sample, 40 participants were randomly selected and
invited to take part in the re-test administration, and 38 of them (n = 35 final participants – see below) completed the re-test administration. Demographic information for the final participants of the test and re-test phase is provided in Table IV. 1. The primary residences reported by the 588 final participants were 30 out of the 31 provinces of Mainland China. The only province not represented was the Tibet Autonomous Region. Among the 588 final participants, 560 (95.2%) were Han Chinese and 28 (4.8%) were minority Chinese. The 28 minority Chinese participants came from 12 different ethnic minorities in Mainland China, including 6 Zhuang Chinese, 5 Manchu Chinese, 4 Uygur Chinese, 3 Hui Chinese, 2 Bai Chinese, 2 Gelo Chinese, 1 Bouyei Chinese, 1 Hani Chinese, 1 Li Chinese, 1 Mongolian Chinese, 1 Tibetan Chinese, and 1 Yi Chinese.

**Excluded and Missing Data**

For the first administration, 46 participants were excluded for the following five reasons: cultural background was not Mainland Chinese (2 participants); age was younger than 18 years (8 participants); if multiple questionnaires were submitted by any one participant using the same IP address and with the same demographic information, only one of the questionnaires (the one with the longest finishing time) was included and the others were excluded (5 participants); if individuals selected the same answer for all items on a questionnaire, they were excluded (6 participants); and individuals who finished their first administration in less than 15 minutes were excluded (25 participants). For the re-test administration, three participants were excluded. These three participants did not provide valid passwords (their passwords and demographic information in the re-test administration did not match those submitted in the first administration).
The online survey was designed in such a way that participants could not submit their results if any of the questions had not been answered. Therefore, there were no missing data. However, one participant answered “drop out” for the education level question and did not give any further explanation. Therefore, the education level of this participant was coded as missing. All analyses involving education level were based on the other 587 final participants of the first administration or the 35 final re-test responses. All of the other analyses were based on the 588 final participants of the first administration or the 35 final re-test responses.

**Measures**

**Empathy Quotient (EQ).** The EQ consists of 60 items, including 40 that measure empathy and 20 filler items (Baron-Cohen & Wheelwright, 2004). Each item is rated on a 4-point Likert scale ranging from 1 (*strongly agree*) to 4 (*strongly disagree*). The 40 empathy items were scored according to the original instructions; namely, for a forward item (e.g., EQ #55), 2 points are provided for a record of “strongly agree”, 1 point for “slightly agree”, and 0 point for both “slightly disagree” and “strongly disagree”; while for a reverse item (e.g., EQ #32), these four records are scored with 0, 0, 1, and 2 points respectively (Baron-Cohen & Wheelwright, 2004). The 20 filler items were designed by the authors of the EQ to prevent participants from constantly answering empathy questions and these were not scored (Baron-Cohen & Wheelwright, 2004). The total EQ score ranges from 0 to 80, with higher scores reflecting greater empathy. The Cronbach’s α for scores on the 40 empathy items of the original version of the EQ was .92 (Baron-Cohen & Wheelwright, 2004). According to Groen et al. (2015), the Cronbach’s α reported for other validation studies using other populations ranged from .78 to .89. The Cronbach’s α for the scores of the 40 empathy items of the simplified Chinese version of EQ based on the final sample of this study was .86.
Permission for translation for this cross-cultural adaptation of the EQ into simplified Chinese is based on the Autism Research Centre terms and conditions (www.autismresearchcentre.com). The overall validation processes followed the guidelines for cross-cultural adaptation of self-report measures (Beaton et al., 2000). The original English version of the EQ was translated into simplified Chinese by an English–Chinese bilingual researcher. The translated version was proof-read by another two English–Chinese bilingual researchers. A third independent English–Chinese bilingual researcher back-translated the simplified Chinese statements into English. The simplified Chinese version of the EQ and its English back-translation were provided to the EQ’s original author for checking. The final translation was approved by all members of the translation panel and was tested in a pilot study with 10 Mainland Chinese participants. All reported that the simplified Chinese version was clear and readable.

**Interpersonal Reactivity Index (IRI).** The IRI includes 28 items and measures an individual’s empathy based on four subscales (7 items each); namely, perspective-taking (IRI-PT), empathic concern (IRI-EC), personal distress (IRI-PD), and fantasy (IRI-FS) (Davis, 1980). Each item is rated on a 5-point Likert scale ranging from 0 (does not describe me well) to 4 (describes me very well). The IRI items were scored and the values for the four subscales were computed according to the original instruction (Davis, 1980). The total score on each subscale ranges from 0 to 28 with higher scores reflecting greater empathy. The IRI has been translated into traditional (Chan, 1986; Siu & Shek, 2005) and simplified Chinese (Huang, Li, Sun, Chen, & Davis, 2012). In Mainland China, researchers have frequently adapted the Chan (1986) traditional Chinese version into simplified Chinese to measure empathy, as it was the first available translation of the IRI (Neumann, Chan, Wang, & Boyle, 2016; Y. Wang
et al., 2013; Yang et al., 2013; F. Zhang, Dong, Wang, Zhan, & Xie, 2010; Q. Zhang et al., 2014). Permission was obtained from the corresponding author (Raymond C. K. Chan) of the Y. Wang et al. (2013) study to use their adapted simplified Chinese version of the IRI in this study. The Cronbach’s αs for the scores on the four IRI subscales (viz., IRI-PT, IRI-EC, IRI-PD, and IRI-FS) for our final participants \((N = 588)\) were .66, .69, .79, .72, respectively. These values are consistent with the original English and previous Chinese versions of IRI (Cronbach’s α ranged from .68 to .79) (Davis, 1980; Y. Wang et al., 2013).

**Autism-Spectrum Quotient (AQ).** The AQ consists of 50 items and assesses an individual’s autistic traits (Baron-Cohen et al., 2001). It includes five subscales (10 items each); namely, poor social skills (AQ-SS), poor communication skills (AQ-CM), exceptional attention to detail (AQ-AD), poor imagination (AQ-IM), and poor attention switching (AQ-AS) (Baron-Cohen et al., 2001). Each item is rated on a 4-point Likert scale ranging from 1 (definitely agree) to 4 (definitely disagree). According to the original instructions, each item “scores 1 point if the respondent records the abnormal or autistic-like behavior either mildly or strongly” (Baron-Cohen et al., 2001, p. 6). The total score on each subscale of AQ ranges from 0 to 10, with higher scores suggesting stronger autistic traits.

The cross-cultural translation of the AQ into simplified Chinese was based on the Autism Research Centre terms and conditions (www.autismresearchcentre.com). The overall translation process of the AQ was identical to that of the EQ. The final translation was approved by all members of the translation panel. The final version of the AQ was tested with seven Mainland Chinese participants, and all of them reported that the translation was clear and readable. The Cronbach’s αs for the five subscales as reported by Baron-Cohen et al. (2001) were .77, .65, .63, .65, and .67, respectively. The
Cronbach’s αs calculated based on our final participants (N = 588) were .69, .57, .63, .33, and .32, respectively. Given the low values of alpha for AQ-IM and AQ-AS in this study and given that these two scales do not relate theoretically to empathy, they were not used in subsequent analyses.

**The 20-item Toronto Alexithymia Scale (TAS-20).** The TAS-20 has 20 items and assesses an individual’s alexithymic traits. The TAS-20 has three subscales; namely, difficulties in identifying one’s own feelings (TAS-IF, 7 items), difficulties in describing one’s feelings to other people (TAS-DF, 5 items), and externally oriented thinking (TAS-EOT, 8 items) (Bagby et al., 1994). Each item is rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The TAS-20 was scored according to the original instructions (Zhu et al., 2007). The total scores on the three subscales of TAS-20 range from 7 to 35, 5 to 25, and 8 to 40, respectively, with higher scores indicating stronger alexithymic traits (Zhu et al., 2007).

The TAS-20 has been translated into simplified Chinese for university students to self-report their alexithymic traits (Zhu et al., 2007). Cronbach’s αs for scores on the three subscales of TAS-20 reported by Zhu et al. (2007) were .77, .65, and .52, respectively. These values were lower than in the original English version (Cronbach’s αs were .80, .76, and .71, respectively) (Parker, Taylor, & Bagby, 2003). Two English–Chinese bilingual researchers in the current study proof-read the Zhu et al. (2007) translation and agreed that seven translated items (viz., #1, #3, #8, #10, #12, #16, and #20) needed to be modified. The seven items were re-translated by the current study panel using the same process as described for the EQ.

The modified translation of the TAS-20 and its back-translation were provided to both the original English author (Graeme J. Taylor) and the corresponding author of Zhu et al. (2007) (Shuqiao Yao). Both provided their permission to use the modified
version of the TAS-20 in the current study. The final translation was approved by all members of the translation panel. The final translation of the TAS-20 was tested with seven Mainland Chinese participants, and all of them reported that the translation was clear and readable. The Cronbach’s αs for the scores on the three subscales of TAS-20 based on the final participants \(N = 588\) were .83, .70, and .55, respectively.

Considering the TAS-EOT is not theoretically correlated with the EQ and has a very low Cronbach’s α, it was not used in subsequent analyses.

**Demographic information questionnaire.** A demographic questionnaire was designed to collect the following information: personal demographic characteristics (date of birth, sex, education level), cultural background (nationality, place of birth and childhood, and primary residence), and occupation (employee or student). Type of work and academic major were also asked of the employees and students, respectively.

**Procedure**

All participants were instructed to read the introduction to the study and the inclusion criteria at the beginning of testing. It was explained that the current study expected them to satisfy all the inclusion criteria, provide their demographic information honestly, and complete the whole task carefully. Next, participants were asked to provide their informed consent. Following that, participants began to answer the questionnaires.

During the first administration, data for nine questionnaires were collected. The first five questionnaires were the demographic questionnaire, the EQ, the IRI, the AQ, and the TAS-20. The other four questionnaires were included for use as part of another study. At the end of the first administration, each participant was required to leave a six-digit password. During the re-test administration, participants were only asked to enter their date of birth, sex, and their six-digit password in a short demographic
questionnaire. With the exception of the demographic questionnaire, the other eight questionnaires included in the re-test administration were identical to those in the first administration.

Data Analysis

The CFA was conducted using Mplus 7.4 (Muthén & Muthén, 1998-2012). The weighted least squares with mean and variance adjustment (WLSMV) estimation method was used. The WLSMV is a robust estimator and appropriate for ordered categorical data (Sass, 2011). The best-fit parameters of CFA were set as comparative fit index (CFI) ≥ .95; Tucker-Lewis index (TLI) ≥ .90; root mean square error of approximation (RMSEA) ≤ .08; and weighted root mean square residual (WRMR) ≤ 1.00 (J. Wang & Wang, 2012).

Internal consistency of the EQ scores was calculated using Cronbach’s α. The stability of the EQ scores was examined using the two-way, random-effects, single measure intraclass correlation coefficient (ICC type 2, 1) (Shrout & Fleiss, 1979) between participants’ test and re-test responses. The ICC is a ratio reflecting the proportion of total variance that is due to the variance between participants, and it is more sensitive to systematic error than Pearson’s correlation coefficient (Bédard, Martin, Krueger, & Brazil, 2000; Weir, 2005). The ICC (type 2, 1) with 95% confident intervals (CI) is frequently used for reporting the test-retest coefficients of scores on self-report questionnaires (Fritz & Irgang, 2001; Gremigni, Damásio, & Borsa, 2013; Hart, 2003). A single measure ICC of equal to or greater than .75 is considered excellent reliability (Fleiss, 1999).

Bivariate linear correlation coefficients were calculated between scores on the EQ and the other three scales (viz., IRI, AQ, and TAS-20) to provide evidence of construct validity. The Pearson correlation coefficient (r) was chosen after linear
relationships were confirmed by scatter plot inspection. Independent samples *t*-tests were used to test for sex differences in empathy (viz., EQ and IRI subscales scores) and other scales. Cohen’s *d* was calculated as an effect size. To control for the possible impact of age and education level on empathy, sex differences were also checked using these two variables as covariates in the univariate analyses. Apart from the CFAs, all statistical analyses were conducted using SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.).

**Results**

**Demographic Information**

The demographic information for the final participants of the test and the re-test phase are shown in Table IV. 1. For the first administration, 28.6% of participants were employed (*N* = 168) in 12 different types of work (e.g., office workers, public servants). The other 71.4% of participants were students (*N* = 420) studying 23 different academic majors (e.g., aerospace, medicine).

**Confirmatory Factor Analysis**

Six structural models have been reported for the EQ. The model description and CFA results for each model are provided in Table IV. 2. Results showed that Guan et al.’s (2012) 15-item one-factor model is a reasonable fit to the current data. The model modification indices suggested that the Guan et al. model might provide a better fit to the data if a covariance were added between EQ #43 (i.e., Friends usually talk to me about their problems as they say that I am very understanding) and #36 (i.e., Other people tell me I am good at understanding how they are feeling and what they are thinking). With the pair of residuals correlated, the final modified model showed a good fit to the data (see Table IV. 2). The CFA standardized estimates of the 15-item model are illustrated in Figure IV. 1. The standardized factor loading regression weights (*b*) of
the 15 items ranged from .33 to .82. The squared multiple correlations ($R^2$) of these items ranged from .11 to .68. For the subsequent analyses, the total scores on the 40 items of the EQ (EQ-40) and on the 15 items of the Guan et al. (EQ-15) were calculated. The EQ-40 was calculated to provide comparability with previous studies (e.g., Groen et al., 2015).

**Internal Consistency and Test-Retest Coefficients**

Cronbach’s $\alpha$ for the scores on the EQ-40 and EQ-15 were both .86. Cronbach’s $\alpha$ for the scores on the other EQ models are provided in Table IV. 2. The ICC (type 2, 1) between participants’ test and re-test total scores on the EQ-40 was .82 ($p < .001$), 95% CI [.67 to .90] and on the EQ-15 was .68 ($p < .001$), 95% CI [.45 to .82].

**Evidence of Construct Validity**

The intercorrelations between scores on the scales are shown in Table IV. 3.

Both EQ-40 and EQ-15 were positively correlated with IRI-PT, IRI-EC, and AQ-AD. Both of the EQ scores were negatively correlated with AQ-SS, AQ-CM, TAS-IF, and TAS-DF.

**Sex Differences**

Mean scores on all scales for the final participants ($N = 588$) and the mean scores by sex are provided in Table IV. 4. The female group was found to have a significantly higher EQ-40 score, but a similar EQ-15 score compared with the male group. It was found that participants’ age and education level correlated significantly with the scales used in the study. Therefore, the comparisons between males and females on these scales were conducted again by controlling these variables as covariates. Results of the analyses with and without the covariates were similar and led to the same conclusions for the sex comparisons.
Discussion

A simplified Chinese version of the EQ (60 items) was validated in the current study with a Mainland Chinese sample. The one-factor model with 15 EQ items (Guan et al., 2012) described the psychometric properties of the EQ based on the current Mainland Chinese participants quite well. Significant sex differences on EQ scores were found. The construct validity found in the current study supports that the underlying concept measured by the EQ scores is empathy.

The current study suggests using the EQ-15-item model provided by Guan et al. (2012) as the structural model for the current simplified Chinese version of the EQ. This one-factor model supports the original proposal that Baron-Cohen and Wheelwright (2004) made for the EQ; namely, “an initial attempt to separate items into purely affective and cognitive categories was abandoned because in most instances of empathy, the affective and cognitive components co-occur and cannot be easily disentangled” (p. 166). This study, along with previous studies based on Chinese populations (Guan et al., 2012; Siu & Shek, 2005), provides evidence to support the notion of co-occurring emotional and cognitive empathy. However, this finding is different from several previous EQ validation studies based on other populations, such as British (Lawrence et al., 2004) and Italian (Preti et al., 2011). These previous validation studies reported that EQ items could be psychometrically divided according to emotional and cognitive empathic components (Lawrence et al., 2004).

Researchers have considered that the blurring of the line between emotional and cognitive empathy found in the Chinese samples may be an adaptation to their cultural requirements for emotional communication (Neumann et al., 2016; Siu & Shek, 2005). On the one hand, Chinese people may be influenced by Confucius’ “Golden Mean” philosophy and this may lead to the control of emotional expression (Bond, 1993; Frijda
Furthermore, Chinese people are not encouraged to express their feelings verbally (Zhu et al., 2007). On the other hand, Chinese are expected to empathise with and respond to other persons’ inner emotions and needs, using perspective-taking, and being aware of other peoples’ subtle emotional changes (Ho et al., 2004; Siu & Shek, 2005; Q. Wang, 2001). The current study found there is a positive correlation between participants’ EQ scores and their traits concerning exceptional attention to detail (i.e., AQ-AD). As a consequence, the dissociation between emotional and cognitive empathy may be attenuated in Chinese populations (Siu & Shek, 2005). Nevertheless, the direct correlation between empathy and emotional suppression needs more investigation.

In the current study, female Mainland Chinese were found to have a significantly higher score on the EQ-40 than male Mainland Chinese. This is consistent with the commonly reported sex difference for the EQ-40 in Western cultures (Baron-Cohen & Wheelwright, 2004; Groen et al., 2015). However, the current effect size for the sex difference was small (Cohen’s $d = 0.24$), which was only larger than that for the Korean version (Cohen’s $d = 0.11$) (Kim & Lee, 2010), and was lower than those for the original and for the other translated versions of the EQ (Cohen’s $d$ range = 0.39 to 0.88) (Groen et al., 2015). In contrast, the current study did not find a significant sex difference based on the best-fit EQ-15 model (Cohen’s $d = -0.02$). The finding of no significant sex difference on self-report empathy is consistent with previous findings in Chinese populations using both EQ and IRI (Guan et al., 2012; Siu & Shek, 2005; Yang et al., 2013). Results of the current study seem to indicate a culture and sex interaction in self-report empathy. A cross-cultural comparison study confirmed the interaction in German and Mainland Chinese participant groups (i.e., the sex difference was larger in the former than the latter group) (Melchers et al., 2015). Further study is required to
explore the possible explanations for the culture and sex interaction in self-report empathy.

The mean value of the EQ-40 items for the current Mainland Chinese participants was $38.67 \pm 10.42$. This value was lower than the one reported in the original study conducted with British participants (Baron-Cohen & Wheelwright, 2004), and lower than most of the values reported for participants from other Western countries/cultures (Groen et al., 2015), but similar to those of East Asians, including Koreans (Kim & Lee, 2010) and Japanese (Wakabayashi et al., 2007). The Western–Asian differences on the EQ scores can be further investigated using a meta-analysis. These cultural differences on scores of self-report empathy might reflect that these cultures have different social expectations or requirements for empathy (Dehning et al., 2013).

Researchers have provided cutoffs of the total EQ score to provide the best discrimination point to separate clinical individuals (e.g., ASC) from general populations (Baron-Cohen & Wheelwright, 2004). The values of cutoffs were different between populations; less than 30 for British (Baron-Cohen & Wheelwright, 2004) and less than 33 for French Canadian populations (Lepage et al., 2009). Without including a group of clinical participants, the current study cannot provide a value of the best cutoff for Mainland Chinese people. However, it should be noted that empathy is a trait that is continuously distributed in the general population (Chakrabarti, Bullmore, & Baron-Cohen, 2006). When researchers have tried to apply any specific cutoffs, they found that 12% to 54% of typical controls were defined as low-EQ, whereas 19% to 59% of individuals with ASC were categorized as high-EQ (Baron-Cohen & Wheelwright, 2004; Groen et al., 2015; Lepage et al., 2009). An increasing number of researchers has recommended not using cutoffs to divide behaviours into psychologically healthy and
unhealthy (Keyes, 2002; Lichtenberg, Cassetta, & Scanlon, 1960; Melchers et al., 2015). Rather they recommend using a concept of the mental health continuum. Therefore, it might be more meaningful to treat the EQ score as a continuous variable rather than as a taxonomic index.

This validation study has several limitations. The current study was based on a convenience sample recruited online. It was not recruited based on census data in terms of proportional representation on ethnicity, age, sex, province, and so forth. As such, it is not a representative sample of Mainland Chinese. Nevertheless, our sample included participants from all but one of the 31 provinces in Mainland China and included 28 minority Chinese from 12 ethnic groups. Further study is recommended to investigate empathy using a representative sample of Mainland Chinese. The present sample also did not include a group of clinical participants. Further research is needed to investigate the utility and validity of scores on this translated version of the EQ in measuring self-report empathy in Chinese clinical populations (e.g., ASC). However, this study adopted the AQ and the TAS-20 to measure participants’ autistic and alexithymic traits and found scores on these two scales were both negatively correlated with the EQ. The sample size of the re-test administration was small and the test-retest duration was short. Therefore, more evidence on the stability of EQ scores in Mainland Chinese samples is required.

Due to the unavailability of Chinese indigenous supporting scales to validate the EQ, the current study used a set of questionnaires originally developed in Western cultures. Some subscales were found to have low reliability based on the current sample. This is a limitation of this study because the concept of empathy may not be equivalent between Mainland Chinese and Western cultures. Therefore, a concern might be raised that whether the current study imposed on Mainland Chinese participants to self-
evaluate on a concept of empathy which is more suitable for Western culture than their own. Empirical cross-cultural comparison studies are needed to further answer this important question; namely, whether empathy measured by the EQ scores has the same meaning across cultures.

A further limitation is that the current study did not test the best-fitting models for each of the supporting scales (viz., IRI, AQ, and TAS-20). The official scoring recommendations of these supporting scales were used instead. The correlations between scores on these supporting scales and the EQ were consistent with our hypothesis, research theories, and previous findings. However, the structural models of these three supporting scales need further investigation in a Mainland Chinese context.

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CROSS-CULTURAL COMPARISON OF EMPATHY

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doi: 10.3928/01484834-20130314-02


Table IV. 1

Demographic Information for Test and Re-test Participants

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>First administration (N = 588)</th>
<th>Re-test (n = 35)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (n for males, male %)</td>
<td>213 (36.2%)</td>
<td>12 (34.3%)</td>
</tr>
<tr>
<td>Student or employee (n for student, student %)</td>
<td>420 (71.4%)</td>
<td>15 (42.9%)</td>
</tr>
<tr>
<td>Mean age (years, SD)</td>
<td>24.12 (6.20)</td>
<td>30.14 (8.70)</td>
</tr>
<tr>
<td>Mean education (years, SD)</td>
<td>15.43 (2.22)</td>
<td>16.91 (1.88)</td>
</tr>
</tbody>
</table>

Note. *n = 587. One participant's education level was indicated as "drop out" without a further explanation. This participant's education level was treated as missing.
### Table IV. 2

**Descriptions of EQ Structural Models and CFA Results Based on a Mainland Chinese Sample (N = 588)**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Model</th>
<th>Factors (item n for each factor)</th>
<th>CFA results</th>
<th>Cronbach’s α for each factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Baron-Cohen and Wheelwright (2004)</td>
<td>EQ-40-item one-factor</td>
<td>EM (40)</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>Lawrence et al. (2004)</td>
<td>EQ-28-item three-factor</td>
<td>CE (11)</td>
<td>ER (11)</td>
<td>SS (6)</td>
</tr>
<tr>
<td>Wakabayashi et al. (2006)</td>
<td>EQ-22-item one-factor</td>
<td>EM (22)</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>Muncer and Ling (2006)</td>
<td>EQ-15-item three-factor</td>
<td>CE (5)</td>
<td>ER (5)</td>
<td>SS (5)</td>
</tr>
<tr>
<td>Allison et al. (2011)</td>
<td>EQ-26-item two-factor</td>
<td>AG (13)</td>
<td>DI (13)</td>
<td>/</td>
</tr>
<tr>
<td>Guan et al. (2012)</td>
<td>EQ-15-item one-factor</td>
<td>EM (15)</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>The current study</td>
<td>Modified Guan et al. model&lt;sup&gt;a&lt;/sup&gt;</td>
<td>EM (15)</td>
<td>/</td>
<td>/</td>
</tr>
</tbody>
</table>

**Note.** EQ = Empathy Quotient; CFA = confirmatory factor analysis; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; WRMR = weighted root mean square residual; EM = empathy; CE = cognitive empathy, ER = emotional reactivity; SS = social skills; AG = agreement; DI = disagreement.

<sup>a</sup>In the modified Guan et al. model, a covariance was added between the errors of EQ 43 and 36.
Table IV. 3

*Pearson Correlation Coefficients between the EQ, IRI, AQ and TAS-20 Scores Based on a Mainland Chinese Sample (N = 588)*

<table>
<thead>
<tr>
<th>Scale</th>
<th>EQ-40</th>
<th>EQ-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRI-PT</td>
<td>.48</td>
<td>.38</td>
</tr>
<tr>
<td>IRI-EC</td>
<td>.34</td>
<td>.17</td>
</tr>
<tr>
<td>IRI-FS</td>
<td>.29</td>
<td>.20</td>
</tr>
<tr>
<td>IRI-PD</td>
<td>-.26</td>
<td>-.24</td>
</tr>
<tr>
<td>AQ-SS</td>
<td>-.40</td>
<td>-.42</td>
</tr>
<tr>
<td>AQ-CM</td>
<td>-.45</td>
<td>-.34</td>
</tr>
<tr>
<td>AQ-AD</td>
<td>.24</td>
<td>.32</td>
</tr>
<tr>
<td>TAS-IF</td>
<td>-.29</td>
<td>-.16</td>
</tr>
<tr>
<td>TAS-DF</td>
<td>-.36</td>
<td>-.26</td>
</tr>
</tbody>
</table>

*Note.* EQ = Empathy Quotient; IRI = Interpersonal Reactivity Index; AQ = Autism-Spectrum Quotient; TAS-20 = 20-item Toronto Alexithymia Scale; EQ-40 = total score for the 40-item EQ; EQ-15 = total score for the 15-item EQ based on the Guan et al. (2012) model; IRI-PT = total score for the IRI’s perspective-taking items; IRI-EC = total score for the IRI’s empathic concern items; IRI-FS = total score for the IRI’s fantasy items; IRI-PD = total score for the IRI’s personal distress items; AQ-SS = total score for the AQ’s social skill items; AQ-CM = total score for the AQ’s communication skill items; AQ-AD = total score for the AQ’s exceptional attention to detail; TAS-IF = total score for the TAS’s identifying feeling items; TAS-DF = total score for the TAS’s describing feeling items.

All correlations are significant at $p < .001$. 
**Table IV. 4**

*Descriptive Statistics and t-Test Results for Males and Females on the EQ, IRI, AQ and TAS-20 Scores*

<table>
<thead>
<tr>
<th>Scale</th>
<th>Overall (N = 588)</th>
<th>Females (n = 375)</th>
<th>Males (n = 213)</th>
<th>t</th>
<th>p</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>EQ-40</td>
<td>38.67</td>
<td>39.57</td>
<td>37.08</td>
<td>2.80</td>
<td>.005</td>
<td>0.24</td>
</tr>
<tr>
<td>EQ-15</td>
<td>14.70</td>
<td>14.66</td>
<td>14.76</td>
<td>-0.20</td>
<td>.839</td>
<td>-0.02</td>
</tr>
<tr>
<td>IRI-PT</td>
<td>17.27</td>
<td>17.19</td>
<td>17.42</td>
<td>-0.77</td>
<td>.440</td>
<td>-0.07</td>
</tr>
<tr>
<td>IRI-EC</td>
<td>18.63</td>
<td>18.93</td>
<td>18.10</td>
<td>2.65</td>
<td>.008</td>
<td>0.23</td>
</tr>
<tr>
<td>IRI-FS</td>
<td>19.06</td>
<td>19.66</td>
<td>18.00</td>
<td>4.82</td>
<td>&lt; .001</td>
<td>0.41</td>
</tr>
<tr>
<td>IRI-PD</td>
<td>13.59</td>
<td>14.36</td>
<td>12.24</td>
<td>5.79</td>
<td>&lt; .001</td>
<td>0.50</td>
</tr>
<tr>
<td>AQ-SS</td>
<td>4.34</td>
<td>4.43</td>
<td>4.19</td>
<td>1.11</td>
<td>.266</td>
<td>0.10</td>
</tr>
<tr>
<td>AQ-CM</td>
<td>2.74</td>
<td>2.61</td>
<td>2.97</td>
<td>-2.02</td>
<td>.044</td>
<td>-0.18</td>
</tr>
<tr>
<td>AQ-AD</td>
<td>5.07</td>
<td>4.99</td>
<td>5.20</td>
<td>-1.04</td>
<td>.300</td>
<td>-0.09</td>
</tr>
<tr>
<td>TAS-IF</td>
<td>18.14</td>
<td>18.29</td>
<td>17.87</td>
<td>0.94</td>
<td>.346</td>
<td>0.08</td>
</tr>
<tr>
<td>TAS-DF</td>
<td>13.62</td>
<td>13.63</td>
<td>13.59</td>
<td>0.16</td>
<td>.875</td>
<td>0.01</td>
</tr>
</tbody>
</table>

*Note.* EQ = Empathy Quotient; IRI = Interpersonal Reactivity Index; AQ = Autism-Spectrum Quotient; TAS-20 = 20-item Toronto Alexithymia Scale; EQ-40 = total score for the 40-item EQ; EQ-15 = total score for the 15-item EQ based on the Guan et al. (2012) model; IRI-PT = total score for the IRI’s perspective-taking items; IRI-EC = total score for the IRI’s empathic concern items; IRI-FS = total score for the IRI’s fantasy items; IRI-PD = total score for the IRI’s personal distress items; AQ-SS = total score for the AQ’s social skill items; AQ-CM = total score for the AQ’s communication skill items; AQ-AD = total score for the AQ’s exceptional attention to detail; TAS-IF = total score for the TAS’s identifying feeling items; TAS-DF = total score for the TAS’s describing feeling items.

*Equal variances between sex groups could be assumed for most t-tests (df = 586), except the one of the AQ-CM (df = 368.34).*
CFA standardized estimates of the EQ 15-item one-factor model. The EQ-15 model is based on Guan et al. (2012). Values to the left of the observed item variables represent standardized factor loading regression weights ($b$). Value to the right of the observed item variables represent the squared multiple correlations ($R^2$). The Value to the far right on the error covariance pathway represents the correlation coefficient ($r$).

Figure IV.1 The CFA model.
CHAPTER V.

Cross-Cultural Comparison of Self-Report Empathy between Australian Caucasians and Mainland Chinese

In the previous chapter, self-report empathy was investigated in a group of Mainland Chinese. Results demonstrated that relative to the findings reported in the literature for Western populations, the Mainland Chinese participants exhibited a lower EQ score and a smaller sex difference in the score. This observation implied a Western–Asian cross-cultural difference in self-report empathy, and also suggested a two-way interaction of culture and sex on the score. Nevertheless, in the previous chapter, any conclusion of cultural differences in self-report empathy was made based on the comparisons between the current data and those reviewed in the literature. Whether there are cultural differences and culture–sex interactions in the empathy between Western and Asian participants should be investigated using empirical comparisons.

The aim of this study is to examine Western–Asian cross-cultural differences in self-report empathy using Australian and Mainland Chinese participants. In reference to the limitations in the literature summarised in Chapter II, the main effects of culture, the main effects of sex, and the culture–sex interaction effects in the self-report empathy scores were all investigated in this study. Furthermore, mediating effect analyses were conducted to test whether individual traits of self-construal and empathy-related personal distress could be used to explain any cultural differences in self-report empathy between the Australian and Mainland Chinese participant groups.

As described in Chapter III, the main research questions of this study are:

• Is self-report empathy significantly different between Australian Caucasian and Mainland Chinese participants?

• Does participant sex interact with culture in self-report empathy?
Can individual traits, such as self-construal and empathy-related personal distress, explain the cultural differences in self-report empathy score between Australian and Mainland Chinese participants?

Chapter V was submitted for publication in 2018. My contribution to this study included the research design, questionnaire translations, Australian and Mainland Chinese online survey developing and running, all the data collecting, data analyses, and the manuscript writing. In this chapter, the submitted article is presented. Griffith University Ethics Committee granted ethical approval for this study (PSY/E4/14/HREC).
Submitted Manuscript

Cross-Cultural Comparison of Self-Report Empathy between Australian Caucasians and Mainland Chinese

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Abstract

Empathy is the ability to understand and share other people’s emotions. Researchers have debated whether Western and Asian populations differ in their self-report empathy. In this study, scores on two self-report questionnaires of empathy, namely, the Empathy Quotient (EQ) and the Interpersonal Reactivity Index (IRI), were compared between 192 Australian Caucasian (101 males) and 211 Mainland Chinese (59 males) university students. The interaction effects between culture and sex in self-report empathy were examined, as well as the mediating effects of two proposed mediators (viz., self-construal and empathy-related personal distress) on cultural differences in empathy. Results illustrated that cross-cultural differences in empathy scores were not significant for males but were significant for females (i.e., Australian females had higher self-report empathy scores than Chinese females). Moreover, mediation analyses based on the two female groups revealed that their differences in self-report empathy may be attributed to the tendency for Australian females to have more independent self-construal and in turn lower empathy-related personal distress than the Mainland Chinese females. Findings of this study add new insight into Western–Asian cross-cultural differences in empathy. Specifically, the results suggest that cross-cultural differences in empathy are dependent on the sex of the individuals, and, for women, the differences may be attributed to empathy-related social and personality characteristics.

Keywords: empathy, cross-cultural, Australian, Mainland Chinese, Empathy Quotient
Cross-Cultural Comparison of Self-Report Empathy between Australian Caucasians and Mainland Chinese

**Introduction**

“Empathy is the lens through which we view others’ emotion expressions, and respond to them” (Sucksmith, Allison, Baron-Cohen, Chakrabarti, & Hoekstra, 2013, p. 98). However, the “lens” of empathy that Sucksmith et al. (2013) referred to may be coloured by a person’s cultural background (Atkins, Uuskul, & Cooper, 2016; Cassels, Chan, & Chung, 2010). Culture is a complex construct and in this study, it is defined as a string of simple proxies, including nationality (e.g., Kaelber & Schwartz, 2014), ethnicity (e.g., Xu, Zuo, Wang, & Han, 2009), and country of origin (e.g., Cassels et al., 2010). Empathy is an essential social communication skill that enables the sharing and understanding of others’ emotional states and experiences (Baron-Cohen & Wheelwright, 2004). To date, research on Western–Asian cross-cultural differences in self-report empathy is limited, and the results are equivocal (e.g., Melchers, Li, Chen, Zhang, & Montag, 2015; Melchers et al., 2016). The aim of this study is to investigate Western–Asian cross-cultural differences in self-report empathy using Australian and Mainland Chinese individuals.

Overall, empathy can be divided into an automatic process called emotional empathy and a conscious process called cognitive empathy (Shamay-Tsoory, Aharon-Peretz, & Perry, 2009). Emotional empathy is the vicarious sharing of another person’s emotions, while cognitive empathy is the understanding of others’ emotions using the cognitive process, such as inference based on background information (Shamay-Tsoory et al., 2009). These two components of empathy were found to share anatomical overlaps (Blair, 2005) but also implicate dissociated brain networks (Fan, Duncan, de Greck, & Northoff, 2011; Shamay-Tsoory, 2011; Shamay-Tsoory et al., 2009). One
anatomical overlap between emotional and cognitive empathy is in the superior temporal sulcus (STS; BA21/22; Blair, 2005), which is the brain region that manages action representation (Carr, Iacoboni, Dubeau, Mazziotta, & Lenzi, 2003; Schulte-Rüther et al., 2011; Shamay-Tsoory et al., 2009). In contrast, lesions in the mirror neuron system (i.e., Brodmann area 44) and in the ventromedial prefrontal cortex (i.e., Brodmann areas 10 and 11) have been found to exclusively associate with functional deficiencies in emotional empathy and cognitive empathy, respectively (Shamay-Tsoory et al., 2009).

To date, there is an increasing interest in studying Western–Asian cultural differences in empathy. Using eye-tracking techniques, researchers found that while watching others’ emotions, Western participants paid more attention to the facial expressions of the target, while Asians paid more attention to the background (Masuda, Wang, Ishii, & Ito, 2012). Therefore, Asians are more likely to be influenced by background information (Masuda et al., 2012). Using behavioural investigations, researchers found that Western participants reported more emotional empathy for the suffering of others but were less accurate in identifying the targets’ emotions (i.e., cognitive empathy) than Asian participants did (Atkins et al., 2016). Therefore, Atkins et al. (2016) reckoned that Westerners might have higher emotional empathy, while Asians might have higher cognitive empathy. Using psychometric analyses of self-report data, researchers found that items measuring emotional and cognitive empathy showed distinct psychometric characteristics based on Western participants, and therefore, could be regarded as two independent factors (e.g., Lawrence, Shaw, Baker, Baron-Cohen, & David, 2004); however, the psychometric characteristics of the two item groups were found to be indissociable in Asian participants (e.g., Zhao et al., 2017).
These results suggested that emotional and cognitive empathy might be more strongly correlated for Asians than Westerners (Zhao et al., 2017).

Currently, Western–Asian cross-cultural differences in empathy have been examined using self-report questionnaires, such as the Empathy Quotient (EQ; Baron-Cohen & Wheelwright, 2004) and the Interpersonal Reactivity Index (IRI; Davis, 1980). The EQ is a self-report questionnaire designed to assess overall empathy as a single component (Baron-Cohen & Wheelwright, 2004). The use of the IRI, in contrast, is to separately measure theoretical components of empathy using different subscales; namely, perspective-taking (IRI-PT), empathic concern (IRI-EC), fantasy (IRI-FS), and personal distress (IRI-PD) (Davis, 1980). The first two subscales (viz., IRI-PT and IRI-EC) are used to measure cognitive and emotional empathy, respectively (Davis, 1980). The other two subscales (viz., IRI-FS and IRI-PD) are used to evaluate a person’s tendency to appreciate emotions of fictitious characters and self-oriented aversive feelings while witnessing others’ suffering, correspondingly (Davis, 1980). In applying the definition of empathy, some researchers are concerned that the IRI-FS and IRI-PD do not measure empathy as such (Baron-Cohen & Wheelwright, 2004; Jolliffe & Farrington, 2004).

Five studies that examined Western–Asian cross-cultural differences in empathy using the EQ and IRI scales have been found in the literature (de Greck et al., 2012; Jiang, Varnum, Hou, & Han, 2014; Melchers et al., 2015; Melchers et al., 2016; Xu et al., 2009). All of the five studies used university students as participants, but their findings are inconsistent. Xu et al. (2009) found that both IRI-PT and IRI-EC scores were significantly higher for Western participants from six different countries (n = 16, 50% males) than for Mainland Chinese participants (n = 17, 47% males). Nevertheless, de Greck et al. (2012) found that when compared to Mainland Chinese participants (n =
German participants ($n = 16, 38\%$ males) had higher IRI-EC scores but similar IRI-PT scores. In contrast, Jiang et al. (2014) did not find either IRI-PT or IRI-EC scores to be significantly different between participants from Mainland China ($n = 18, 0\%$ males) and those from English-, German- and Spanish-speaking countries ($n = 18, 0\%$ males). In another two studies conducted by Melchers et al. (2015) and Melchers et al. (2016), the cross-cultural differences in both IRI and EQ scores were investigated. In the former study, participants were Mainland Chinese ($n = 438, 62\%$ males) and Germans ($n = 202, 25\%$ males), and in the subsequent study, participants were from Mainland China ($n = 438, 62\%$ males), Germany ($n = 304, 24\%$ males), Spain ($n = 62, 44\%$ males), and the US ($n = 92, 39\%$ males). In both studies, the German group was found to have a significantly higher EQ score than the Mainland Chinese group, but similar IRI-PT and IRI-EC scores to that of the Mainland Chinese group (Melchers et al., 2015; Melchers et al., 2016). Except for the German group, Melchers et al. (2016) found that none of the three empathy scores significantly differed between the Mainland Chinese and any of the remaining Western groups (i.e., American and Spanish).

The inconsistent results might have arisen for a number of reasons. For example, the diverse nationalities of Westerners investigated in these studies and the different components of empathy (e.g., overall, emotional, or cognitive empathy) measured in each study should be of concern. In addition, the sample sizes in some studies (e.g., de Greck et al., 2012; Jiang et al., 2014; Xu et al., 2009) were very small (i.e., < 30), and this might have limited the statistical power of these studies. Moreover, it is unclear which version of the IRI (i.e., English or translated) was administered to the non-English speaking participants in some studies, including Xu et al. (2009) (i.e., Mainland Chinese and Westerners from non-English speaking countries), de Greck et al. (2012)
CROSS-CULTURAL COMPARISON OF EMPATHY

(i.e., Mainland Chinese and Germans), and Jiang et al. (2014) (i.e., Mainland Chinese, and Westerners from German- and Spanish-speaking countries). One concern is that participants may interpret the items differently from the original author and other native speakers if they are required to respond to items written in a foreign language (Kaelber & Schwartz, 2014).

Furthermore, it is noteworthy to note that both Melchers et al. (2015) and Melchers et al. (2016) found Western–Asian cross-cultural differences in empathy as measured by the EQ but not by the IRI. On the one hand, this inconsistency suggests that cross-cultural differences in empathy may be dependent on the actual scale used. On the other hand, the validity of the EQ and IRI administered to the Mainland Chinese group in the two studies is unclear. First, it is unclear which Chinese-translated version of the EQ was administered in the two studies (Melchers et al., 2015; Melchers et al., 2016). Second, the Chinese-translated version of the IRI (i.e., Siu & Shek, 2005) administered in the two studies was validated in Hong Kong (i.e., Cantonese-speaking) rather than in Mainland China (i.e., Mandarin-speaking). Researchers have pointed out that there are some linguistic differences between Cantonese and Mandarin languages (Cheng, Huang, Li, & Tang, 1997; Erbaugh, 2002), and some other researchers have argued that linguistic differences may reduce the validity of the self-report empathy scale (Kaelber & Schwartz, 2014). To ensure scale validity, the simplified Chinese-translated scales that have been validated in Mainland China, such as the EQ by Zhao et al. (2017) and the IRI by Wang et al. (2013), should be used in further research with Mainland Chinese participants.

Most important, the inconsistent results of Western–Asian cross-cultural differences in empathy may be related to the different sex ratios of participants in each study (de Greck et al., 2012; Jiang et al., 2014; Melchers et al., 2015; Melchers et al.,
While Western females typically exhibit a higher level of self-report empathy than Western males (e.g., Groen, Fuermaier, Den Heijer, Tucha, & Althaus, 2015), Asian females and males have been found to show similar scores on self-report empathy (Guan, Jin, & Qian, 2012; Kim & Lee, 2010; Siu & Shek, 2005). These results suggest that the Western–Asian cross-cultural differences in empathy could be dependent on the sex of the individuals, and in turn, studies based on different sex ratios may reach different conclusions regarding cross-cultural differences in empathy. Among the aforementioned studies, only Melchers et al. (2015) tested the culture and sex interaction using German and Mainland Chinese participants and found it was significant. However, Melchers et al. (2015) did not carry out any analysis to test the cultural differences in empathy separately for males and females, leaving an important research subject for future researchers. To form a clear understanding of the Western–Asian cross-cultural differences in empathy, future researchers should investigate the culture–sex interaction and also test the cultural differences separately in female and male participants.

Currently, factors that could account for the Western–Asian differences in empathy are under discussion. Some researchers (e.g., Cheon et al., 2013; de Greck et al., 2012; Kaelber & Schwartz, 2014) proposed that self-construal might be one factor that could explain the cultural differences in empathy found between the two groups. Self-construal is the image of self in relation to the boundary and distance between self and others, divided into independent and interdependent types (Singelis, 1994). Independent self-construal emphasises autonomy, uniqueness, and separation from others (Cheon et al., 2013; Singelis, 1994). In contrast, interdependent self-construal stresses harmonising interpersonal relationships, sacrificing personal benefit for the
group, and believing that lives are strongly intertwined (Cheon et al., 2013; Singelis, 1994).

Self-construal is considered to be a pillar of individual perception and behaviours (Singelis, 1994). Moreover, self-construal is considered to be influenced by cultural background and is deemed as the main difference between Western and Asian culture (Cheon et al., 2013; Kashima et al., 1995; Singelis, 1994; Triandis, 2018). Generally, Western cultures represent the independent self-construal, while Asians cultures represent interdependent self-construal (Cheon et al., 2013; Singelis, 1994). As such, self-construal may be a mediator between culture and social behaviour. To date, however, the mediating effect of self-construal on culture as a predictor of empathy has not been tested.

Moreover, in the literature, two opinions on the relationship between self-construal and empathy are held. Some researchers have reckoned that empathy ought to be negatively correlated with independent self-construal and positively correlated with interdependent self-construal (Kaelber & Schwartz, 2014). This is because individuals need to take the perspective of others and suppress egocentric feelings in order to feel empathic towards others (Cheon et al., 2013). In contrast, other researchers have highlighted the importance of keeping some self–other differentiation in empathy (Decety & Lamm, 2006). As such, Decety and Lamm (2006) argued that independent self-construal might be positively correlated with empathy, while interdependent self-construal might be negatively correlated with empathy. This is because individuals with highly interdependent self-construal might blur the boundary between self and others; and in this way, interdependent self-construal might lead to a type of self-oriented response, called empathy-related personal distress, rather than to other-oriented empathy (Batson, Fultz, & Schoenrade, 1987; Decety & Lamm, 2006).
Empathy-related personal distress might be another factor that could explain Western–Asian cross-cultural differences in empathy because of the following reasons. *Empathy-related personal distress* is a self-oriented negative feeling elicited when an individual witnessing the suffering of others (Batson et al., 1987; Davis, 1980). Self-report scores on personal distress have been found to be negatively correlated with self-report overall empathy and cognitive empathy (Melchers et al., 2015; Neumann, Chan, Wang, & Boyle, 2016). Researchers have considered that individuals with high personal distress might avoid taking the perspective of others in order to protect themselves from being emotionally overwhelmed (Batson et al., 1987; Cassels et al., 2010; López-Pérez, Carrera, Ambrona, & Oceja, 2014). Moreover, some researchers (Cassels et al., 2010; de Greck et al., 2012; Jiang et al., 2014) found that Asians experienced more personal distress than Westerners. These findings imply a possible mediating effect of personal distress on culture as a predictor of empathy. Moreover, researchers suggested that individuals’ self-construal types might predict their level of personal distress (Batson et al., 1987; Decety & Lamm, 2006), so self-construal and personal distress might have interacted mediating effects on cultural differences in empathy. Given these proposals for the mediating effects of self-construal and personal distress lack empirical evidence in the reviewed literature, the current authors are intended to bridge the gap.

The current study was conducted to compare self-report empathy between individuals from Australia and Mainland China. Participants were restricted to those belonging to the main ethnic groups of the two cultures (viz., Australian Caucasians and Mainland Chinese Hans). A set of self-report questionnaires were administered, including two measures of empathy; namely, the EQ (Baron-Cohen & Wheelwright, 2004) and the IRI (Davis, 1980), and one scale of self-construal (Self-Construal Scale; SCS) (Singelis, 1994). Participants’ empathy-related personal distress was measured by
the IRI-PD subscale of the IRI (Davis, 1980). It was predicted that Australian participants would have higher self-report empathy (i.e., EQ, IRI-PT, and IRI-EC scores) than Mainland Chinese participants (e.g., Melchers et al., 2016); however, the differences should be modulated by sex as suggested by Melchers et al. (2015). In other words, the nature of Western–Asian cross-cultural differences in self-report empathy examined using females could differ from the results found by using males. Finally, it was expected that cross-cultural differences in empathy between these two cultural groups could be explained, separately, by the cultural differences in self-construal (Cheon et al., 2013; de Greck et al., 2012; Kaelber & Schwartz, 2014), and in empathy-related personal distress (Melchers et al., 2015; Neumann et al., 2016). Moreover, as researchers proposed a close relationship between a person’s self-construal type and the level of empathy-related personal distress, it was expected that significant double-mediating effects would be found when the two mediators (viz., self-construal and personal distress) were simultaneously considered (Batson et al., 1987; Decety & Lamm, 2006).

Method

Participants

The current Mainland Chinese participants were drawn from a participant pool established in a previous study by Zhao et al. (2017). The participant pool was made up of individuals recruited online from Mainland China; these participants were either professionals or full-time students; the participants’ ages ranged from 18 to 56 years; all participants had completed an online survey of empathy; and each participant was given a 25 RMB (about AU$5) cash or a gift equivalent in value for participating (Zhao et al., 2017).
From the participant pool, 211 first- or second-year university students were identified as satisfying the inclusion criteria of this study. The inclusion criteria were (seven points) Han Chinese, born in Mainland China, mainly grown up in Mainland China, 18 years or older, without any history of brain injury, without any history of drug or alcohol abuse, and without mental or neurological illness. In the Mainland Chinese sample, no univariate outlier (z-scores > 3.29) of self-report scores was found according to the distribution of each variable, and neither multivariate outlier was identified according to the value of Mahalanobis distance. These 211 Mainland Chinese (39.3% first-year students, 28.0% males, mean age = 19.54 years, SD = 1.02) were completing one of 18 different undergraduate majors (the largest group was psychology students, including 48.0% females and 33.9% males).

Australian participants were recruited from two resources; namely, a participant pool of university students who were undertaking a selective or compulsory course in psychology and the university email system covering both staffs and university students. An AU$10 gift card or a course credit was provided for the Australian participants. In total, 390 Australian first- or second-year university students took part, and of that total, 238 satisfied the inclusion criteria of this study. The Australian inclusion criteria were (seven points) Australian Caucasians, born in Australia, mainly grown up in Australia, and the other four criteria were as listed for the Mainland Chinese group. To ensure the two cultural groups were similar in age, Australian participants who were older than 23 years were excluded (42 excluded). Furthermore, three univariate outliers (z-scores > 3.29) of self-report scale variables were identified; namely, an outlier for each of IRI-EC, IRI-PT, and Independent subscale of SCS (SCS-ID). After excluding all of these three outliers, another outlier of IRI-EC was identified. After excluding the four univariate outliers, all of the scores measured in this study were normally distributed,
and no multivariate outlier was identified according to the value of Mahalanobis distance. The final Australian participants included 192 university students (76.0% first-year students, 52.6% males, mean age = 19.34 years, SD = 1.29) who were completing one of 17 different undergraduate majors (the largest group was psychology students, including 63.7% females and 56.4% males). All participants provided their informed consent online before taking part in the study. Ethical approval was granted by the first author’s institution.

Measures

**Demographic information questionnaire.** A questionnaire was used to collect the following information: personal demographic characteristics (date of birth, sex, and education level), cultural background (nationality, place of birth, and main place of residence), drug and mental health background (histories of alcohol and drug abuse, and personal neurological and mental illness), and general occupation (professional or full-time student). For students, a question asked them to report their study major (e.g., psychology or mathematics). Furthermore, students were requested to categorise their study major into five types: namely, 1 = pure art, 2 = partial art, 3 = half art and half science, 4 = partial science, and 5 = pure science. Responses to this question were recoded to reflect the level of science (i.e., 1 = no science, 2 = minority science, 3 = half science, 4 = majority science, and 5 = all science). The last question was not compulsory, while the others were. English and simplified Chinese versions of the demographic questionnaire were used in the Australian and the Mainland Chinese online surveys, respectively. Simplified Chinese is the official written text used in Mainland China. Demographic information of the final participants is summarised in Table V. 1.
Empathy Quotient (EQ). The EQ is a self-report measure of overall empathy (Allison, Baron-Cohen, Wheelwright, Stone, & Muncer, 2011; Baron-Cohen & Wheelwright, 2004). It is composed of 60 items, including 40 items measuring empathy and 20 filler items (Baron-Cohen & Wheelwright, 2004). The filler items are not scored; they were designed by the original author so participants did not have to constantly answer items measuring empathy (Baron-Cohen & Wheelwright, 2004). An example of the 40 empathy items is, “I can tell if someone is masking their true emotion” (i.e., EQ 55). EQ items are rated on 4-point Likert scales ranging from 1 (strongly agree) to 4 (strongly disagree) (Baron-Cohen & Wheelwright, 2004). In this study, the 40 empathy items were scored according to the standard instruction given by Baron-Cohen and Wheelwright (2004), resulting in a total EQ score ranging from 0 to 80, with higher scores reflecting greater empathy. The English version (Baron-Cohen & Wheelwright, 2004) and a simplified Chinese-translated version of the EQ (Zhao et al., 2017) were used for the Australian and the Mainland Chinese participants, respectively. Cronbach’s αs for the EQ scale were .85 for the current Australian group (n = 192) and .86 for the current Mainland Chinese group (n = 211), with the similar values as reported in previous studies (range = .84 to .92) (Baron-Cohen & Wheelwright, 2004; Melchers et al., 2016).

Interpersonal Reactivity Index (IRI). The IRI consists of 28 items and measures different components of empathy using different subscales, which are the IRI-PT, IRI-EC, IRI-PD, and IRI-FS (Davis, 1980). The IRI items are equally clustered into the four subscales (viz., 7 items each), and each item of IRI is rated on a 5-point Likert scale ranging from 0 (does not describe me well) to 4 (describes me very well) (Davis, 1980). The total score for each subscale ranges from 0 to 28 (Davis, 1980). A higher score on the IRI-PT reflects greater cognitive empathy, and an item example (i.e., IRI
11) is, “I sometimes try to understand my friends better by imagining how things look from their perspective” (Davis, 1980). A higher score on the IRI-EC reflects greater emotional empathy, and “I often have tender, concerned feelings for people less fortunate than me” (i.e., IRI 2) is an item example (Davis, 1980).

To date, researchers have commented on that neither IRI-PD nor IRI-FS measures empathy per se (Baron-Cohen & Wheelwright, 2004; Jolliffe & Farrington, 2004). IRI-PD measures empathy-related personal distress, or one’s self-oriented negative feelings while witnessing others’ sufferings (Davis, 1980). IRI-FS measures ones’ tendency to share the feelings while appreciating movies, plays, or books (Davis, 1980). Item examples for these two subscales, respectively, are, “When I see someone who badly needs help in an emergency, I go to pieces” (i.e., IRI 27 for IRI-PD), and “After seeing a play or movie, I have felt as though I were one of the characters” (i.e., IRI 16 for IRI-FS).

In this study, the IRI items were scored and the subscale scores were calculated according to the standard instruction of the scale (Davis, 1980). IRI-PT and IRI-EC scores were used to reflect participants’ self-report cognitive and emotional empathy, correspondingly. IRI-FS was not a relevant variable in this study, and therefore, was not included in the following data analyses. In contrast, IRI-PD measures empathy-related personal distress, with a higher score reflecting more empathy-related personal distress (Davis, 1980). As the personal distress was proposed as a mediator in the current study, IRI-PD was included in data analyses of this study.

The English version of the IRI (Davis, 1980) was administered to the Australian participants, and a simplified Chinese version of the IRI (Wang et al., 2013) was administered to the Mainland Chinese participants. This Chinese-translated version of the IRI showed good validity in previous investigations based on Mainland Chinese
participants (e.g., Neumann et al., 2016; Wang et al., 2013). In this study, Cronbach’s α values for the scores on IRI-PT, IRI-EC, and IRI-PD for the Australian participants were .68, .77, and .71, and for the Mainland Chinese participants were .66, .72, and .79, respectively. These values were similar to those reported in previous studies (ranging from .68 to .78) (Davis, 1980; Wang et al., 2013).

**Self-Construal Scale (SCS).** The SCS is a self-report scale designed to assess an individual’s independent and interdependent self-construals (Singelis, 1994). It comprises 30 items that are equally divided into two subscales: independent self-construal (SCS-ID) and interdependent self-construal (SCS-IT) (Singelis, 1994). “I do my own thing, regardless of what others think” (i.e., SCS 5 for SCS-ID) and “My happiness depends on the happiness of those around me” (i.e., SCS 21 for SCS-IT) are respective examples. Each item is rated on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) (Singelis, 1994). In this study, according to the instructions of Singelis (1994), the SCS items were scored, and the mean scores (i.e., ranging from 1 to 7) of the two subscales were calculated; the higher values on the two subscales reflect greater independent or interdependent self-construal, correspondingly (Singelis, 1994).

For the Australian participants, the English version of the SCS (Singelis, 1994) was administered. Cronbach’s αs of the SCS-ID and SCS-IT scores were both .75 for the current Australian participants, and these are similar values to those reported by the developer of the scale (from .69 to .74) (Singelis, 1994). For the Mainland Chinese participants, a simplified Chinese version of the SCS was administered, which was translated by the current research team. The whole translation followed a standard cross-cultural validation process (Beaton, Bombardier, Guillemin, & Ferraz, 2000). First, the current research team contacted the original author of the SCS (Theodore M.
Singelis), who provided permission and supplied four Chinese translations (either in simplified or traditional Chinese characters) as references. Second, an English–Chinese bilingual researcher from the current research team translated the English version of the SCS into simplified Chinese based on the four references. Third, another independent English–Chinese bilingual researcher back-translated the simplified Chinese statements into English. Fourth, both the simplified Chinese version of the SCS and its English back-translation were provided to Dr Singelis. Finally, all three researchers agreed on the final translation. Based on the current Chinese participants, the Cronbach’s α values for SCS-ID and SCS-IT of the simplified Chinese version were .61 and .77, respectively. These results were similar to those reported by a previous international examination of 33 nations (Cronbach’s α ranged from .53 to .80) (Cheng, Cheung, & Montasem, 2016).

**Procedure**

All participants were instructed to read the introduction to the study and the inclusion criteria prior to participating. It was explained that the current study expected them to satisfy all of the inclusion criteria, and they were required to provide their informed consent before completing the questionnaires. In addition, participants were instructed to be honest when providing their demographic information and to complete the whole task carefully. Data for nine questionnaires were collected, including the demographic questionnaire, the EQ, IRI, Autism-Spectrum Quotient (AQ; Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001), 20-item Toronto Alexithymia Scale (TAS-20; Bagby, Parker, & Taylor, 1994), Berkeley Expressivity Questionnaire (BEQ; Gross, John, & Richards, 1995), Emotion Regulation Questionnaire (ERQ; Gross & John, 2003), SCS, and Hypercompetitive Attitude Scale (HCA; Ryckman, Hammer, Kaczor, & Gold, 1990). All Australian and Mainland Chinese participants completed the above questionnaires in the same sequence. The AQ, TAS-20, BEQ, ERQ, and HCA
were included in the survey for another study and were not included in the following analyses of this study. Most of the questions were compulsory (i.e., no missing value), except the question enquiring about students’ major types in the Art–Science categories (18 missing values). The 18 missing values included seven female and 10 male Australians who had not decided on their major, and one male Mainland Chinese who considered his major could not be categorised into the five types. These missing values were replaced using the Expectation-Maximization (EM) method.

**Data Analysis**

All analyses were conducted based on the sample with the univariate outliers excluded. To check whether participant groups significantly differed in basic demographic information, ANOVAs were conducted to compare age and students’ major types in the Art–Science categories among the four culture–sex groups (viz., Australian female, Australian male, Mainland Chinese female, and Mainland Chinese male). The education category (0 = first-year or 1 = second-year of college) was compared among the four culture–sex groups using Chi-square test of contingencies. For self-report empathy and other test scores, a set of 2 (culture) × 2 (sex) between-group ANCOVAs (Sum of Squares Type II) were performed to investigate the main and interaction effects of culture and sex. In these ANCOVAs, participants’ age, education, and their major types in the Art–Science categories were set as covariates. For each significant interaction effect detected by the ANCOVA procedure, further analyses were carried out to identify the source of the interaction using t-tests with Bonferroni adjustments to account for inflated Type I error.

Mediating effect analyses of single mediator and double mediators on cultural differences in empathy were conducted. First, mediating effects of each proposed single mediator (i.e., SCS-ID, SCS-IT, and IRI-PD) on culture as a predictor of three empathy
scores (viz., EQ, IRI-PT, and IRI-EC) were tested. A single mediator (i.e., the third variable) would formulate an indirect pathway between culture (i.e., the independent variable) and the score on an empathy scale (i.e., the dependent variable). If the addition of the third variable significantly reduces the magnitude of the prediction from the independent to the dependent variables, it is considered as having a mediating effect, and as accounting for part or all of the relationship of the prediction (MacKinnon, Krull, & Lockwood, 2000). For the current analyses, a meaningful mediator is identified according to the direction of the indirect effect (i.e., positive), whether zero is outside the 95% CI of the indirect effect, and whether all regressions of the indirect pathway remain statistically significant (Field, 2013).

Second, because researchers proposed that individual self-construal type might predict their personal distress level (Batson et al., 1987; Decety & Lamm, 2006), double-mediator models including both self-construal and personal distress were examined. In total, there could be six double-mediator models; namely, two pairs of double mediators (viz., SCS-IT and IRI-PD or SCS-ID and IRI-PD) for each of the three empathy scores (viz., EQ, IRI-PT, and IRI-EC). Nevertheless, the final models tested in the current study were identified according to the results of the previous single mediator analyses; that is, double-mediator models were only conducted for the empathy scores in which a pair of mediators showed a significant single mediating effect. In each of the double-mediator models, self-construal and personal distress would formulate an indirect pathway by themselves, and a regression from self-construal on personal distress would be added. The overall indirect effect on culture as a predictor of self-report empathy would be examined as previously reported for the single mediator analysis.
Moreover, if there were significant culture–sex interactions on empathy scores as revealed by the results of the ANCOVAs, the mediating effects would be tested separately for females and males, and would only be tested for the groups between which significant cross-cultural differences were found. The relevant correlations between a pair of scores on self-report empathy, self-construal, and personal distress were examined using Pearson’s correlation coefficients (r). The mediating effects (bias-corrected bootstrapping with 5,000 resamples) were tested using Mplus 7.4 (Muthén & Muthén, 1998–2012), and all the other analyses were conducted using SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.).

Results

Comparison of Impacts of Culture and Sex on Measures

Table V.1 presents participant demographic information for the four culture–sex participant groups (viz., Australian female, Australian male, Mainland Chinese female, and Mainland Chinese male). Table V. 2 summarises means and standard deviations for the three empathy scales (viz., EQ, IRI-PT, and IRI-EC) and the three empathy-related traits (viz., IRI-PD, SCS-ID, and SCS-IT) for the four culture–sex participant groups. The results of 2 (culture) × 2 (sex) between-group ANCOVAs for the six variables are also presented in Table V. 2. Participants’ age, education, and study majors types were controlled. The main effects of culture were significant for all of the six scores (all ps ≤ .001), and the main effects of sex were significant for three scores (viz., EQ, IRI-EC, and IRI-PD; all ps ≤ .001).

Significant two-way interactions between culture and sex were found for all three empathy scores (all ps ≤ .003). Pairwise analyses revealed that all three empathy scores were significantly higher in the Australian female group than that of the
Mainland Chinese female group (p < .001, d = 0.71, for the EQ, p < .001, d = 0.56, for the IRI-PT, and p < .001, d = 0.63, for the IRI-EC), but the cultural differences were not significant between the two male groups (p = .292, d = 0.11, for the EQ, p = .424, d = 0.08, for the IRI-PT, and p = .423, d = 0.08, for the IRI-EC). Meanwhile, sex differences for all three empathy scores were found to be significant in the Australian participants (females > males; p < .001, d = 0.51, for EQ, p = .031, d = 0.22, for IRI-PT, and p < .001, d = 0.51, for IRI-EC). In contrast, no significant sex difference for the EQ or IRI scores was found in Mainland Chinese participants (p = .674, d = -0.04, for the EQ and p = .998, d < 0.01, for the IRI-EC); moreover, for the IRI-PT, the Mainland Chinese males reported a higher score than did the Mainland Chinese females (p = .038, d = 0.21).

No significant two-way interaction between culture and sex was found for scores on the three empathy-related traits (viz., IRI-PD, SCS-ID, and SCS-IT). Results of the main effect of culture revealed that, compared with Australian participants, Mainland Chinese participants had higher IRI-PD (F (1, 396) = 11.98, p = .001, \( \eta_p^2 = .03 \)), lower SCS-ID (F (1, 396) = 32.97, p < .001, \( \eta_p^2 = .08 \)), and higher SCS-IT (F (1, 396) = 16.83, p < .001, \( \eta_p^2 = .04 \)). Results of the main effect of sex indicated that females overall had higher IRI-PD than males overall did (F (1, 396) = 21.33, p < .001, \( \eta_p^2 = .05 \)), but similar SCS-ID (F (1, 396) = 3.78, p = .053, \( \eta_p^2 = .01 \)) and SCS-IT (F (1, 396) = 0.40, p = .525, \( \eta_p^2 < .01 \)) to the overall males did.

**Mediating Effects on Predicting Empathy with a Single Mediator**

Mediating effects were tested based on Australian and Mainland Chinese females only because there was no cross-cultural difference in empathy found for males. The final mediation analyses were conducted based on 243 female participants (91 Australian and 152 Mainland Chinese females). Correlations between the scores on
empathy (i.e., EQ, IRI-PT, and IRI-EC) and empathy-related traits (i.e., IRI-PD, SCS-ID, and SCS-IT) are presented for Australian females and Mainland Chinese females separately in Table V.3.

Before taking into account any mediating effects, all simple relationships of culture as a predictor of empathy scores were found to be significant (all ps < .001; for EQ, see Figure V.1 a, for IRI-PT, see Figure V.2 a, and for IRI-EC, see Figure V.3 a). SCS-ID was found to have a significant mediating effect on culture as a predictor of EQ (b = 1.32, 95% CI [0.42, 2.65], see Figure V.1 b) and IRI-PT (b = 0.47, 95% CI [0.19, 0.89], see Figure V.2 b), but not of IRI-EC because the prediction from SCS-ID to IRI-EC was not significant (b = 0.82, p = .055; see Figure V.3 b). Similarly, IRI-PD was found to be a significant mediator in the prediction function of EQ (b = 0.76, 95% CI [0.21, 1.74], see Figure V.1 c) and IRI-PT (b = 0.27, 95% CI [0.07, 0.63], see Figure V.2 c), but not of IRI-EC because the prediction from IRI-PD to IRI-EC was no longer significant (b = 0.08, p = .238, see Figure V.3 c). In contrast, SCS-IT was not a significant mediator for any of the three empathy scores because the prediction from culture to SCS-IT was no longer significant (b = -0.18, p = .085; see Figure V.1 to 3 d).

**Mediating Effects on Predicting Empathy with Double Mediators**

Because both SCS-ID and IRI-PD, as a single mediator, had significant mediating effects on culture as a predictor of EQ and IRI-PT, mediating effects of two double-mediator models were examined in this study (see Figure V.4 a and b). Results showed that the double mediators (viz., SCS-ID and IRI-PD) overall had significant mediating effects on the prediction from culture to both EQ (b = 1.77, 95% CI [0.73, 3.23], see Figure V.4 a) and IRI-PT (b = 0.63, 95% CI [0.29, 1.09], see Figure V.4 b). Moreover, it can be seen that in both double-mediator models the direct prediction from
culture to IRI-PD was no longer significant ($b = -1.16, p = .065$, see Figure V. 4 a and b).

**Discussion**

The current study was conducted to investigate the impact of culture on self-report empathy, and to identify factors that could account for the cultural differences, by using Australian and Mainland Chinese participants. Australian Caucasian and Mainland Chinese Han university students were recruited, and their self-report scores on three aspects of empathy (emotional, cognitive, and overall empathy) were investigated and compared. Results showed that even though the Australian participants overall reported higher scores on all of the three aspects of empathy than did the Mainland Chinese participants, all of these cultural main effects were qualified by a significant culture–sex interaction. Further analyses revealed that the cultural differences only existed between the two female groups (i.e., the Australian females reported higher scores than did the Mainland Chinese females), but there was no cultural difference between the two male groups; meanwhile, the impact of participant sex on self-report empathy scores was found to differ between Australian participants (i.e., females reported higher scores than did males for all empathy scores) and Mainland Chinese participants (i.e., for cognitive empathy, males reported higher scores than females, while for emotional and overall empathy, no significant sex difference was found). Moreover, the current results illustrate that some Western–Asian cross-cultural differences in empathy could be accounted for by that Asian females relative to Western females have a less clear differentiation between self and others, and as such, they experience more empathy-related personal distress, which prevents them from being as empathic as Western females.
Sucksmith et al. (2013) drew an analogy by saying that empathy is a “lens” through which individuals view others’ emotions. The results of this study suggest that this lens may be coloured by two interacting “filters”—culture and sex. Significant culture and sex interactions were found in emotional, cognitive, and overall empathy scores investigated in this study. The cultural differences in all of the three empathy scores were significant between Australian females and Mainland Chinese females (effect size $d$ ranged from 0.56 to 0.71), but not between Australian males and Mainland Chinese males (effect size $d$ ranged from 0.08 to 0.11). This finding provides a possible explanation for the inconsistency in the results of Western–Asian cross-cultural differences in self-report empathy (effect size $d$ ranged from -0.46 to 1.76) among the previous studies based on samples with different sex ratios (male% ranged from 0% to 62%) (Cassels et al., 2010; de Greck et al., 2012; Jiang et al., 2014; Kaelber & Schwartz, 2014; Melchers et al., 2015; Melchers et al., 2016; Xu et al., 2009).

Among previous cross-cultural comparison studies, Melchers et al. (2015) also noted significant culture–sex interactions on overall and emotional empathy scores for samples of German and Mainland Chinese university students. Moreover, they were concerned that the interaction might reflect a smaller sex difference in the empathy scores found in the Mainland Chinese participants, relative to that found in the German participants; however, they did not report cross-cultural differences in empathy scores separately for two sexes. This gap was bridged in this study. Moreover, Melchers et al. did not find a significant culture–sex interaction in the cognitive empathy score (i.e., measured by IRI-PT); nonetheless, it was found in the current study. On the one hand, this inconsistency suggests that cross-cultural differences in empathy may be dependent on the actual populations tested (i.e., Mainland Chinese versus Germans or Mainland Chinese versus Australians) (also see Melchers et al., 2016). On the other hand, it
should be noted that Melchers et al. used a Chinese-translated version of IRI that was validated for Hong Kong Chinese (Siu & Shek, 2005); while in the current study, another version which has been validated in Mainland China was administered (Chan, 1986; Wang et al., 2013). Researchers have pointed out that there are some linguistic differences between Cantonese and Mandarin (i.e., Chinese dialects used in Hong Kong and Mainland China, respectively) (Cheng et al., 1997; Erbaugh, 2002). Moreover, researchers are concerned that linguistic issues may be a confounding factor in investigating cross-cultural differences in empathy (Kaelber & Schwartz, 2014). The influence of linguistic differences on self-report empathy score is an interesting and important research topic for further research.

To date, reasons for the culture–sex interaction in self-report empathy have not been fully investigated. Nevertheless, some researchers have noted that both culture and sex differences in empathy may reflect the different social expectations of each group (Dehning et al., 2013; Ickes, Gesn, & Graham, 2000). That is, the group which is expected to have more empathy is likely to show more empathy (Ickes et al., 2000). For example, females may be expected to show more empathy and therefore perform accordingly (Ickes et al., 2000). Nevertheless, it is considered that the sex stereotype is more polarised in Western than in Asian cultures (Cuddy et al., 2015; Fischer & Manstead, 2000). While Western females are expected to be affective and to take care of others (Brody, 1997), Western males are expected to be independent and tough (Costa Jr., Terracciano, & McCrae, 2001; Jaggar, 1989). In contrast, the social norms for male and female Asians may have more overlap, resulting in less distinction between sex roles (Costa Jr. et al., 2001). A case in point is the Chinese culture: in pursuing Confucius’ values, both male and female Chinese are expected to behave according to the “Golden Mean” and suppress their emotional expressions (including
empathy) in order to maintain harmonious interpersonal relationships (Atkins et al., 2016; Chu, 2015). Therefore, one possible explanation for the culture–sex interaction in self-report empathy found in this study is that Australian females may have the highest social expectation of showing empathy among the four culture–sex participant groups (i.e., the other three groups are Australian male, Mainland Chinese male, and Mainland Chinese female); and the social expectation of showing empathy for the latter three groups might be very close. Nevertheless, the current authors did not measure social expectations regarding empathy and therefore could not fully corroborate this explanation.

The current Australian and Mainland Chinese female participants differed significantly in overall, cognitive, and emotional empathy scores (i.e., the Australian females had higher scores than those of the Mainland Chinese females). Some researchers proposed that such differences could be explained by Western–Asian cross-cultural differences in self-construal (Cheon et al., 2013; de Greck et al., 2012; Kaelber & Schwartz, 2014), even though researchers did not agree on the direction of the correlations between self-construal and empathy (Decety & Lamm, 2006; Kaelber & Schwartz, 2014). Because empathy requires taking other’s perspective and suppressing egocentric feelings (Cheon et al., 2013), some researchers predicted that empathy could be positively correlated with interdependent self-construal, while negatively correlated with independent self-construal (Kaelber & Schwartz, 2014). In contrast, other researchers predicted that independent self-construal could be positively correlated with the empathy score, concerning the need to keep self–other differentiation in empathy so as to avoid emotional exhaustion (Decety & Lamm, 2006).

The above hypotheses regarding the mediating effects of self-construal on cultural differences in empathy and the relationship between self-construal and empathy
were examined in this study. Consistent with previous reports (Cheon et al., 2013; Singelis, 1994), the current results illustrated that the Australian female participants had higher independent self-construal than Mainland Chinese female participants; nevertheless, the culture was not a significant predictor of interdependent self-construal based on these two female groups. Furthermore, based on the female participants, it was found that independent self-construal had a significant mediating effect on culture as a predictor of the overall and the cognitive empathy scores. This suggested that cultural differences in independent self-construal could account, in part, for the cultural differences in self-report empathy found between Australian and Mainland Chinese females. Moreover, according to the regression paths of the mediating models, the independent self-construal score was found to positively predict the cognitive and overall empathy scores, as forecasted by Decety and Lamm (2006). Therefore, the current results suggest that keeping a clear differentiation between the self and others (i.e., independent self-construal) is essential for empathy (Decety & Lamm, 2006). Meanwhile, the current authors recommend that individuals such as Mainland Chinese females should learn to keep some distance between self and others in order to experience a stronger empathy.

At the beginning of this study, it was proposed that empathy-related personal distress might be another factor explaining the Western–Asian cross-cultural differences in empathy. Consistent with previous findings (Cassels et al., 2010; de Greck et al., 2012; Jiang et al., 2014), the current Mainland Chinese females were found to experience higher empathy-related personal distress than Australian females. Moreover, mediating effects of empathy-related personal distress in the models of culture as a predictor of overall and cognitive empathy were found to be significant. These results suggested that Mainland Chinese females who displayed lower cognitive and overall
empathy might be due to feelings of more personal distress during the empathic process than Australian females. Furthermore, it was found that personal distress was a negative predictor of cognitive and overall empathy scores according to the regression paths in the mediating models. These findings were consistent with previous researchers’ concerns that individuals with high empathy-related personal distress might avoid taking the perspective of others (i.e., cognitive empathy; Davis, 1980) in order to prevent themselves from feeling exhausted (Batson et al., 1987; López-Pérez et al., 2014).

Moreover, Decety and Lamm (2006) have predicted that keeping some self–other distance is essential for empathy because it protects individuals from feeling empathy-related personal distress. This prediction suggests that self-construal and personal distress might interact when mediating culture as a predictor of empathy. This proposal was tested in this study. Results showed that these two mediators together had a significant mediating effect on cultural differences in cognitive and overall empathy. The results of the path models further revealed that whereas empathy-related personal distress had negative impacts on cognitive and overall self-report empathy, independent self-construal had positive impacts on these empathy domains. Moreover, independent self-construal could inhibit the negative impacts of empathy-related personal distress on empathy. Furthermore, after accounting for the prediction from independent self-construal to empathy-related personal distress, the direct prediction from culture to personal distress was no longer significant. Researchers considered that self-construal is a key dimension of culture (Jami et al., 2018) and is the most important characteristic distinguishing Western and Asian cultures (Kashima et al., 1995; Triandis, 2018). The current results suggest that the Western-Asian cultural difference in cognitive and
overall empathy is relevant to participants’ independent self-construal type, which highly correlates with individual personal distress level in influencing empathy.

It is interesting to note that the results of the mediation analyses were different for cognitive and emotional empathy. *Emotional empathy* is an automatic response to another’s emotions and can be already observed in infancy (Shamay-Tsoory et al., 2009). In contrast, *cognitive empathy* is a deliberate cognitive response to others’ emotions and it develops during childhood and early adolescence (Shamay-Tsoory et al., 2009). Researchers have found evidence suggesting that emotional empathy and cognitive empathy are dissociated in brain network systems, and that the inferior frontal gyrus and medial prefrontal cortex were the key brain regions, respectively, of these two components of empathy (Shamay-Tsoory et al., 2009). From a psychometric perspective, the results of this study may provide new evidence that supports the dissociation between emotional and cognitive empathy. That is, some factors investigated in this study (i.e., independent self-construal and empathy-related personal distress) might have a specific mediating effect on the late (i.e., cognitive empathy), but not on the early stage of empathy (i.e., emotional empathy). This consideration is in line with previous researchers’ understanding that high empathy-related personal distress may specifically prevent individuals taking the perspective of others (Batson et al., 1987; López-Pérez et al., 2014), but both empathy-related personal distress and emotional empathy are vicarious emotional responses to others’ emotions (López-Pérez et al., 2014). Consistently, researchers found that self-report scores on personal distress and on cognitive empathy tended to be negatively correlated, but the score on personal distress and on emotional empathy could be positively correlated (Melchers et al., 2015; Neumann et al., 2016). The possibility that emotional and cognitive empathy may be mediated by different psychological pathways is worthy of further investigation.
Nevertheless, the limitations of this study should be noted while interpreting the results. The current study used only first- and second-year university students; therefore, the current results might not generalise to the general populations in Australia and Mainland China. In addition, the effect sizes of group differences found in the current study were small to medium, and therefore, any interpretations of the results should be made with care. It also should be noted that the participant numbers of the four culture–sex groups were unequal; especially, the number of Mainland Chinese male participants was less than that of the other three groups. This might have limited the power of the comparisons, even though the sample sizes of the four groups were relatively large (> 30). Therefore, the current authors conducted the ANCOVAs using Sum of Squares Type II to statistically handle the issue of unequal participant numbers between subgroups. In this study, students’ age, year of college, and study major were controlled; nevertheless, there could be some other confounding factors, such as students’ socioeconomic status or work experience. Future researchers may consider controlling for socioeconomic status and work experience as well, especially if participants are to be recruited from the general population. This question should be investigated further. Most important, the difference in participant recruiting methods for the two cultural groups is an issue of concern. For example, there were more Mainland Chinese participants recruited online than Australian participants, and this may be a confounding factor for investigating cross-cultural differences.

Finally, not all variance for cross-cultural differences in empathy found in this study has been explained by the two empathy-related traits tested in the current study. Some other empathy-related personal characteristics could contribute to these differences, such as autism traits (e.g., Baron-Cohen, Knickmeyer, & Belmonte, 2005), “brain-types” of empathising and systemising dimensions (e.g., Baron-Cohen, 2002),
hormonal levels (e.g., Van Honk et al., 2011), and genotypes (e.g., Chakrabarti et al., 2009; Huetter et al., 2016; Taschereau-Dumouchel et al., 2016). In addition, all the scales employed in the current study were originally developed based on constructs developed in Western cultures. Some researchers are concerned whether cross-cultural differences in these scores, including empathy, reflect that the constructs examined by the scales are more suitable for Western than for Chinese cultures. These factors are worth investigating in the future study of cross-cultural comparison of empathy.

Conclusions

The findings of this study have provided some new insights into Western–Asian cross-cultural differences in empathy. They suggest that the cross-cultural differences in empathy might only be significant between Australian and Mainland Chinese females but not between males. Moreover, these cross-cultural differences in empathy between Australian and Mainland Chinese females could be, in part, attributed to the findings that Australian females had higher independent self-construal and lower empathy-related personal distress than Mainland Chinese females. On the one hand, the findings of the interaction effects (i.e., culture and sex interaction in self-report empathy) and the mediating effects (i.e., the mediating effects of self-construal and empathy-related personal distress on culture as a predictor of empathy) bring fresh understanding to this research area. On the other hand, the current findings also provide some suggestions for individuals to achieve higher empathy, that is, individuals ought to keep some self and other differentiation in order to empathise with others without feeling personal distress. Finally, results of this study indicate the need for future studies to explore other mediating variables (e.g., social expectation, emotion regulation, and emotional expression) that could be used to explain the cross-cultural differences in empathy.
Acknowledgment

We are grateful to all the participants who took part in this study and would like to thank Dr. Xiaoyan Cao and Dr. Yuna Wang for assisting with data collection. We thank Prof Theodore M. Singelis for his help and permission for us to adapt the Self-Construal Scale (SCS) into simplified Chinese. Finally, we thank Prof John O’Gorman for his valuable feedback on our manuscript.

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References


CROSS-CULTURAL COMPARISON OF EMPATHY


Kim, J., & Lee, S. J. (2010). Reliability and validity of the Korean version of the


Table V. 1

*Demographic Information for Four Culture–Sex Groups*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Australian females (n = 91)</th>
<th>Australian males (n = 101)</th>
<th>Chinese females (n = 152)</th>
<th>Chinese males (n = 59)</th>
<th>p-value</th>
<th>F/Chi²</th>
<th>η²/ Cramer’s V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (years, SD)</td>
<td>19.07 (1.36)</td>
<td>19.58 (1.18)</td>
<td>19.45 (0.92)</td>
<td>19.76 (1.22)</td>
<td>.001</td>
<td>5.38</td>
<td>.04</td>
</tr>
<tr>
<td>The first- or second-year of college</td>
<td>69 (75.8%)</td>
<td>77 (76.2%)</td>
<td>58 (38.2%)</td>
<td>25 (42.4%)</td>
<td>&lt; .001</td>
<td>55.51</td>
<td>.37</td>
</tr>
<tr>
<td>Study major (Art–Science types)*</td>
<td>3.57 (1.10)</td>
<td>3.80 (0.94)</td>
<td>3.20 (0.98)</td>
<td>3.22 (0.95)</td>
<td>&lt; .001</td>
<td>9.01</td>
<td>.06</td>
</tr>
</tbody>
</table>

*Note. Age ranged from 18 to 23. The study major (Art–Science types) had five categories, including 1 = pure art, 2 = partial art, 3 = half art half science, 4 = partial science, and 5 = pure science.*

*A group of students (n = 18) did not answer this question, as they either had not decided their major yet (seven Australian females and 10 Australian males) or considered their majors could not be categorised into the five Art–Science categories (one Mainland Chinese male). These missing values were replaced using the Expectation-Maximization (EM) method.
### Table V. 2

**Descriptive Statistics, ANCOVA Results, and Effect Sizes on the Scales Values for Four Culture–Sex Groups**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Australian females</th>
<th>Australian males</th>
<th>Chinese females</th>
<th>Chinese males</th>
<th>ANCOVA†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 91)</td>
<td>(n = 101)</td>
<td>(n = 152)</td>
<td>(n = 59)</td>
<td>Culture</td>
</tr>
<tr>
<td></td>
<td><strong>M</strong></td>
<td><strong>SD</strong></td>
<td><strong>M</strong></td>
<td><strong>SD</strong></td>
<td><strong>M</strong></td>
</tr>
<tr>
<td>EQ</td>
<td>48.42</td>
<td>9.77</td>
<td>40.73</td>
<td>9.75</td>
<td>37.89</td>
</tr>
<tr>
<td>IRI-PT</td>
<td>19.82</td>
<td>3.13</td>
<td>18.58</td>
<td>3.81</td>
<td>16.90</td>
</tr>
<tr>
<td>IRI-EC</td>
<td>21.59</td>
<td>3.57</td>
<td>18.64</td>
<td>4.00</td>
<td>18.24</td>
</tr>
<tr>
<td>IRI-PD</td>
<td>13.47</td>
<td>4.20</td>
<td>11.48</td>
<td>3.90</td>
<td>15.01</td>
</tr>
<tr>
<td>SCS-ID</td>
<td>4.66</td>
<td>0.74</td>
<td>4.82</td>
<td>0.63</td>
<td>4.34</td>
</tr>
<tr>
<td>SCS-IT</td>
<td>4.92</td>
<td>0.72</td>
<td>4.82</td>
<td>0.58</td>
<td>5.14</td>
</tr>
</tbody>
</table>

*Note.* EQ = total score for the items of Empathy Quotient; IRI = Interpersonal Reactivity Index; IRI-PT = total score for the IRI perspective-taking items; IRI-EC = total score for the IRI empathic concern items; IRI-PD = total score for the IRI empathy-related personal distress items; SCS = Self-Construal Scale; SCS-ID = total score for the SCS independent items; SCS-IT = total score for the SCS interdependent items.

†In the ANCOVAs, participants’ age, education, and study majors were controlled.

*"p < .05. ""p < .01.
Table V. 3

Pearson’s Correlation Coefficients between Scale Scores Based on a Sample of Australian Caucasian Females (n = 91, Above Diagonal) and Mainland Chinese Females (n = 152, Below Diagonal)

<table>
<thead>
<tr>
<th>Scale</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. EQ</td>
<td>-</td>
<td>.55</td>
<td>.66</td>
<td>-.14</td>
<td>.35</td>
<td>.31</td>
</tr>
<tr>
<td>2. IRI-PT</td>
<td>.48</td>
<td>-</td>
<td>.62</td>
<td>-.17</td>
<td>.29</td>
<td>.26</td>
</tr>
<tr>
<td>3. IRI-EC</td>
<td>.46</td>
<td>.30</td>
<td>-</td>
<td>-.08</td>
<td>.19</td>
<td>.36</td>
</tr>
<tr>
<td>4. IRI-PD</td>
<td>-.23</td>
<td>-.23</td>
<td>.17</td>
<td>-</td>
<td>-.24</td>
<td>.26</td>
</tr>
<tr>
<td>5. SCS-ID</td>
<td>.09</td>
<td>.14</td>
<td>.10</td>
<td>-.14</td>
<td>-</td>
<td>.07</td>
</tr>
<tr>
<td>6. SCS-IT</td>
<td>.36</td>
<td>.25</td>
<td>.43</td>
<td>.13</td>
<td>.26</td>
<td>-</td>
</tr>
</tbody>
</table>

Note. EQ = total score for the items of Empathy Quotient; IRI = Interpersonal Reactivity Index; IRI-PT = total score for the IRI perspective-taking items; IRI-EC = total score for the IRI empathic concern items; IRI-PD = total score for the IRI personal distress items; SCS = Self-Construal Scale; SCS-ID = total score for the SCS independent items; SCS-IT = total score for the SCS interdependent items.

In the Australian female group, |r| ≥ .24, p < .05; |r| ≥ .29, p < .01. In the Mainland Chinese female group, |r| ≥ .17, p < .05; |r| ≥ .23, p < .01.
Figure V.1 Mediation models of culture as a predictor of EQ.

Models of culture as a predictor of EQ for the basic relationship (a), mediated by independent self-construal (SCS-ID; b), mediated by empathy-related personal distress (IRI-PD; c), and mediated by interdependent self-construal (SCS-IT; d). The confidence interval for the indirect effects was calculated based on bias-corrected bootstrapping with 5,000 resamples. Culture group 1 represents Australian Caucasian females \((n = 91)\), and Culture group 0 represents Mainland Chinese females \((n = 152)\). Age, education (first- or second-year of college), and study major (Art–Science types) were controlled. Solid and dotted arrows indicate significant and insignificant paths, respectively.
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Figure V. 2 Mediation models of culture as a predictor of IRI-PT.

Models of culture as a predictor of IRI-PT for the basic relationship (a), mediated by independent self-construal (SCS-ID; b), mediated by empathy-related personal distress (IRI-PD; c), and mediated by interdependent self-construal (SCS-IT; d). The confidence interval for the indirect effects was calculated based on bias-corrected bootstrapping with 5,000 resamples. Culture group 1 represents Australian Caucasian females (n = 91), and Culture group 0 represents Mainland Chinese females (n = 152). Age, education (first- or second-year of college), and study major (Art–Science types) were controlled. Solid and dotted arrows indicate significant and insignificant paths, respectively.
Figure V. 3 Mediation models of culture as a predictor of IRI-EC.

Models of culture as a predictor of IRI-EC for the basic relationship (a), mediated by independent self-construal (SCS-ID; b), mediated by empathy-related personal distress (IRI-PD; c), and mediated by interdependent self-construal (SCS-IT; d). The confidence interval for the indirect effects was calculated based on bias-corrected bootstrapping with 5,000 resamples. Culture group 1 represents Australian Caucasian females \((n = 91)\), and Culture group 0 represents Mainland Chinese females \((n = 152)\). Age, education (first- or second-year of college), and study major (Art–Science types) were controlled. Solid and dotted arrows indicate significant and insignificant paths, respectively.
Figure V. 4 Mediation models of culture as a predictor of EQ and IRI-PT with double mediators.

Models of culture as a predictor of EQ (a) and IRI-PT (b), mediated by both independent self-construal (SCS-ID) and empathy-related personal distress (IRI-PD). The confidence interval for the indirect effects was calculated based on bias-corrected bootstrapping with 5,000 resamples. Culture group 1 represents Australian Caucasian females \( (n = 91) \), and Culture group 0 represents Mainland Chinese females \( (n = 152) \). Age, education (first or second-year of college), and major types (Art–Science types) were controlled. Solid and dotted arrows indicate significant and insignificant paths, respectively.

Direct effect, \( b = 8.35, p < .001 \)
Total indirect effect, \( b = 1.77, 95\% \text{ CI} [0.73, 3.23] \)
CHAPTER VI.

Cross-Cultural Comparison of Empathy between Australian Caucasians and Mainland Chinese

The results from Chapter IV of this thesis implied that there could be Western–Asian cross-cultural differences or a culture–sex interaction in self-report empathy scores. These expectations were examined in Chapter V, and results confirmed a culture–sex interaction in self-report emotional, cognitive, and overall empathy. Further analyses of the interactions revealed that cultural differences in the self-report empathy scores existed only between Australian and Mainland Chinese females but not between the two male groups. Nevertheless, both of the two previous chapters (Chapters IV and V) were based on self-report empathy. The next research question examined in this thesis was whether there are Western–Asian cross-cultural differences in behavioural responses of empathy.

As reviewed in Chapter II, some studies have investigated Western–Asian cross-cultural differences in empathy using behavioural tasks, but results have been inconsistent. Moreover, the culture–sex interaction related to empathy was not investigated in these studies. Furthermore, the possible individual differences in emotion recognition—an essential component of empathy in a broad sense—were not controlled in the literature for investigating the cultural impact on behavioural responses of empathy. These issues were addressed in this study.

In this chapter, four computerised tasks were used to assess behavioural responses of empathy with both Australian Caucasian and Mainland Chinese participants. The accuracy of emotion recognition for each stimulus was checked and statistically controlled in this study. Cultural differences, sex differences, culture–sex interactions, and in-group/out-group biases in empathy were also investigated. An in-
group bias means individuals may show more empathy towards their in-group than their out-group targets, with the opposite responses displaying out-group bias; note that these phenomena could not be investigated by the self-report scales administered in the preceding chapters of this thesis.

As introduced in Chapter III, this study aims to answer the following four research questions:

- Do Australian and Mainland Chinese participants recognise basic emotions (i.e., happiness, surprise, fear, anger, and sadness) differently?

- Which group, Australian or Mainland Chinese, shows more empathy towards the targets?

- Is there any interaction effect of participant culture and participant sex on empathy responses to targets?

- Do both Australian and Mainland Chinese participants show an in-group bias in empathy for the targets?

Ethical approvals for the current study were granted by Griffith University Ethics Committee (GU Ref No: 2015/777) and by East China Normal University Ethics Committee (HR2016/03001). The manuscript of this study is presented as a style to be submitted as a peer-reviewed journal article.
Abstract

Empathy is defined as the sharing and understanding of others’ emotions. Previous self-report studies found that while Western females reported a higher level of empathy than Asian females, no significant cultural difference was found between Western and Asian males. To date, findings of cross-cultural empathy comparison studies using behavioural tasks are limited and inconsistent. In this study, four computerised behavioural tasks related to empathy were used to test empathy for a target (i.e., either Caucasian or Asian) showing an emotion (i.e., happiness, sadness, surprise, anger, fear, or neutral) with or without an emotional background (e.g., a wedding scene or a plain backdrop). In total, 61 Australian Caucasians (29 males) and 69 Mainland Chinese (32 males) completed the behavioural tasks and two self-report scales of empathy (viz., Empathy Quotient and Interpersonal Reactivity Index). Results for self-report empathy showed significant culture–sex interactions in the scores, as reported in the literature. Results of the behavioural tasks revealed a three-way interaction (participant culture, participant sex, and target culture) in cognitive empathy for anger with the emotional background. Further investigations of the interaction revealed a cultural difference only between Australian and Mainland Chinese females for Caucasian targets, an in-group bias only in the Australian females, and sex differences only by using the Australian participants. In addition, the current behavioural results also illustrated that generally there were in-group biases in empathy for negative emotions, but out-group biases in empathy for positive emotions. The current results demonstrate that empathy is a complex interpersonal activity, modulated not only by the characteristics of participants, but also by the characteristics of targets, and the relationship between them.

Keywords: cross-cultural, empathy, Australians, Mainland Chinese, behavioural tasks
Cross-Cultural Comparison of Empathy between Australian Caucasians and Mainland Chinese

Introduction

“Empathy is love in action” (Shek & Li, 2015, p. 321). Researchers consider empathy an essential social skill for vicariously experiencing and cognitively appreciating others’ emotions during social activities (Baron-Cohen & Wheelwright, 2004). The need to understand, investigate, and increase empathy in humankind has become a heated issue all over the world, and sociologists have named the coming era of human civilisation as “the Age of Empathy” (Matusall, 2013; Waal, 2009). One among many important research topics of empathy is its relationship with culture.

Cultural differences in empathy between Western and Asian populations have been found using self-report scales (e.g., Melchers et al., 2016) and behavioural tasks (e.g., Atkins, Uskul, & Cooper, 2016). However, the accumulated knowledge of Western–Asian cross-cultural differences in empathy is limited, with some results suggesting Westerners might have a higher self-report empathy than Asians (e.g., Melchers et al., 2016), some stating that Asians have higher cognitive empathy than Westerners (e.g., Atkins et al., 2016), and some others indicating a two-way interaction of participant culture and sex (e.g., Melchers, Li, Chen, Zhang, & Montag, 2015). This study was conducted to improve understanding of cross-cultural differences in empathy using a sample of Australian Caucasians and Mainland Chinese.

In order to provide a better understanding of Western–Asian cross-cultural differences in behavioural responses of empathy, further investigations are required. There are several reasons for this need. First, the number of research studies on this topic is small (Atkins et al., 2016; Cheon et al., 2011; Neumann, Boyle, & Chan, 2013). Second, among these few studies, researchers investigated two related but different
topics; namely, cultural differences (e.g., Atkins et al., 2016) and in-group/out-group bias (e.g., Neumann et al., 2013). The former topic involves comparisons between Western and Asian participants’ responses of empathy for the same targets, while the latter topic involves testing the differences between participants’ empathy for in-group and out-group targets. An in-group bias refers to a phenomenon when participants tend to show more empathy for in-group than out-group targets, whereas an out-group bias refers to the reverse trend (Cheon et al., 2011; Neumann et al., 2013). Both research topics (i.e., cultural differences and in-group bias) are important but rarely understood.

Third, researchers have pointed out possible culture–sex interactions in empathy according to self-report data (e.g., Melchers et al., 2015). However, none of the previous studies has tested this two-way interaction using behavioural tasks. Finally, emotion recognition and empathy are highly correlated (Gery, Miljkovitch, Berthoz, & Soussignan, 2009). Moreover, researchers pointed out that there could be Western–Asian cross-cultural differences in emotion recognition of basic emotions (Moriguchi et al., 2005). Nevertheless, only one previous study has tested emotion recognition (i.e., Atkins et al., 2016), but none of the aforementioned studies tried to control this confounding factor before investigating cultural differences in empathy.

Empathy (i.e., the overall empathy) has been divided into two main components: emotional empathy and cognitive empathy (Cohen & Strayer, 1996; Lawrence, Shaw, Baker, Baron-Cohen, & David, 2004; Shamay-Tsoory, 2011). Automatically sharing another person’s emotional states and responding with an appropriate emotion is defined as emotional empathy, and the ability to recognise and understand another person’s emotions and intentions is defined as cognitive empathy (Baron-Cohen & Wheelwright, 2004; Shamay-Tsoory, 2011; Smith, 2006). The dissociation between emotional and cognitive empathy has been supported by findings of psychometric
mediating effect analyses of self-report data (e.g., Lawrence et al., 2004), pathology (e.g., Shamay-Tsoory, Aharon-Peretz, & Perry, 2009), and brain imaging (e.g., Carr, Iacoboni, Dubeau, Mazziotta, & Lenzi, 2003). For example, researchers consider that emotional empathy to be related to the function of the mirror neuron system (MNS) or the inferior frontal gyrus (IFG; BA44/45; Shamay-Tsoory et al., 2009); in contrast, cognitive empathy has been found to be related to brain regions involved in perspective-taking and theory of mind, including the medial prefrontal cortex (mPFC; BA9/10/11; Decety, 2011; Schulte-Rüther et al., 2011), temporo-parietal junction (TPJ; BA40/42; Cheon et al., 2011; Lawrence et al., 2006), and inferior temporal gyrus (ITG; BA20; Cheon et al., 2011; de Greck et al., 2012).

Moreover, researchers considered that cultural impact on emotional empathy and on cognitive empathy might be different (Atkins et al., 2016). For example, researchers found that the differences in psychometric characteristics of emotional and cognitive empathy were distinct for Westerners, but were indistinct for Asians (Chapter IV; Zhao et al., 2017). For another example, researchers considered that cultural characteristics (e.g., independent self-construal) could modulate cognitive empathy (i.e., the late stage of empathy involving cognitive processes) but not emotional empathy (i.e., the early stage of empathy involving automatical processes) (Chapter V; Zhao et al., submitted). For another instance, Atkins et al. (2016) found that Westerners might respond to others’ emotions using more emotional empathy, but Asians might respond to the emotions using more cognitive empathy. Therefore, further research should consider separately testing cultural differences in the two components of empathy.

Currently, the understanding of the cultural impact on empathy is very limited. In the literature, three groups of researchers investigated Western–Asian cross-cultural differences in empathy using behavioural tasks. All of these studies were conducted
with university students, but other participant information and paradigms used in these studies were different. Atkins et al. (2016) conducted a study to test cultural differences and in-group bias in emotional and cognitive empathy with British Caucasians (n = 47, 17.0% males) and Hong Kong Chinese (n = 47, 27.7% males). They asked participants to watch videos of a female target (either Caucasian or Asian) describing a negative social experience, and to rate their emotional empathy on a 5-point Likert scale (1 = very slightly or not at all to 5 = extremely). Moreover, Atkins et al. asked participants to judge each target’s emotions and these judgements were compared with the target’s self-report as a measure of cognitive empathy. Neumann et al. (2013) conducted an investigation to test in-group/out-group bias in both emotional and cognitive empathy with Caucasians (from 13 countries, n = 99, 26.3% males) and Chinese (n = 99, 29.3% males). They asked participants to watch Caucasian and Asian targets naturally expressing emotions in two types of scene (viz., either positive, such as at a party, or negative, such as in a natural disaster), and then to rate their affect sharing (i.e., emotional empathy), emotion understanding (i.e., cognitive empathy), and perspective-taking on a 9-point Likert scale (0 = difficult to 8 = easy). Cheon et al. (2011) investigated in-group bias in overall empathy with Korean participants (n = 13, 61.5% males) and American Caucasian participants (n = 14, 50.0% males). They asked participants to watch Asian or Caucasian targets naturally express emotions in two types of scenes (viz., either emotionally painful, such as amid a natural disaster, or neutral, such as at an outdoor picnic), and to rate their overall empathy toward the targets on a 4-point Likert scale (1 = not at all to 4 = very much).

Only Atkins et al. (2016) reported cultural differences in empathy. They found that British participants reported a higher level of emotional empathy, while Hong Kong participants had a higher empathic accuracy, or cognitive empathy (Atkins et al., 2016).
According to Atkins et al., their results might reflect the cultural difference in emotional expressions, that is, British Caucasians are more likely to externalise their emotions (including emotional empathy), while Asian individuals are asked to suppress their emotions in order to maintain interpersonal harmony. In turn, Asians might pay greater attention to others’ subtle emotional changes, and as a result, have a better empathic accuracy than Westerners (Atkins et al., 2016). Nevertheless, Atkins et al.’s results were for mixed negative emotions in general, and cultural differences for each basic emotion (e.g., happiness, sadness, anger, and fear) are unknown.

Regarding in-group/out-group bias in empathy, the findings are inconsistent in the literature as follows: Atkins et al. (2016) found there was no group bias for either the British Caucasian or the Hong Kong Chinese participants in emotional or cognitive empathy for the female targets’ negative emotions. However, it should be noted that Atkins et al. used only female targets, and this could be a confounding factor in their study. Neumann et al. (2013) found that for negative emotions, in-group biases were found with all of the three empathy questions (i.e., emotional empathy, cognitive empathy, and perspective-taking) in both Western and Asian participant groups. In contrast, for positive emotions, there was an out-group bias towards emotional empathy in the Chinese group and an in-group bias towards cognitive empathy in the Caucasian group (Neumann et al., 2013). Nevertheless, it should be noted that Neumann et al. used a mixed set of emotions (i.e., positive or negative emotions), and therefore, the group biases in empathy for basic emotions (e.g., happiness or sadness) are unclear. Results of Cheon et al. (2011) showed that Korean participants exhibited an in-group bias in overall empathy for targets in emotional pain, while American Caucasian participants did not. Moreover, Cheon et al. examined brain activation related to empathy and found that relative to out-group targets, watching in-group targets in pain caused higher
activation in the TPJ (BA40; cognitive empathy-related) in the Koreans than in the Americans. Cheon et al. reasoned that compared to Americans, Koreans might devote more cognitive empathy to negative emotions of in-group than out-group targets, and therefore, showed an in-group bias in the behavioural rating of overall empathy. Nonetheless, Cheon et al. tested only overall empathy, and the in-group biases for emotional and cognitive empathy, separately, are still unknown.

More importantly, none of the three studies discussed the possibility of a culture–sex interaction in empathy. To date, two groups of researchers have reported significant culture–sex interactions for self-report empathy: one was with Mainland Chinese \( (n = 438, \ 61.6\% \ \text{males}) \) and Germans \( (n = 202, \ 24.8\% \ \text{males}) \) by Melchers et al. (2015) and the other was with Mainland Chinese \( (n = 211, \ 28.0\% \ \text{males}) \) and Australians \( (n = 192, \ 52.6\% \ \text{males}) \) by Zhao et al. (Chapter V; submitted). In the two studies, significant culture–sex interactions were found for overall empathy measured by the Empathy Quotient (EQ; Baron-Cohen & Wheelwright, 2004), and emotional and cognitive empathy measured by subscales of the Interpersonal Reactivity Index (IRI; Davis, 1980). Particularly, Zhao et al. noted that cultural differences in self-report empathy only existed between the Australian and Mainland Chinese female groups (i.e., Australian females had higher empathy scores than Mainland Chinese females did) but not the male groups. Therefore, whether there is a culture–sex interaction in behavioural responses of empathy ought to be examined in further research.

In addition, none of the three studies has controlled accuracy of emotion recognition before testing cultural differences and in-group/out-group bias in empathy. Emotion recognition is posited as an indispensable component of empathy in a broad sense (Gery et al., 2009). The brain networks of emotion recognition and empathy share overlaps in several brain areas, including the MNS (i.e., emotional empathy, Shamay-
Tsoory, 2011), amygdala (i.e., the fear matrix; Carr et al., 2003), and hippocampus (i.e., emotional memory; Strange & Dolan, 2004). Moreover, the importance of testing emotion recognition before conducting cross-cultural comparisons has been illustrated in an experiment by Moriguchi et al. (2005). Moriguchi et al. asked Caucasian and Japanese participants to watch facial expressions of fear (i.e., coded according to Ekman & Friesen, 1977) and found that the amygdala was more activated in the Caucasian than in the Japanese group. However, at the post-scan interview, these researchers discovered that 100% of the Japanese participants recognised the emotional stimuli as surprise rather than fear. In contrast, 87.5% of the Caucasian participants identified the emotional stimuli as fear. This finding highlights the importance of controlling the emotion recognition accuracy before checking the cultural differences in empathy. Moreover, the finding implies that the stimuli coded according to Ekman and Friesen (1977) might be more suited to Western than Asian participants, and as a consequence, the stimuli could not be suitable for examining the Western–Asian cross-cultural differences in empathy. Future researchers of this topic could consider using other datasets, for example, the NimStim Set of Facial Expressions (Tottenham et al., 2009). The NimStim set is expected to show a good reliability and validity for use with both Asian and Caucasian participants because all models in NimStim were requested to naturally express their emotions (Tottenham et al., 2009).

The aim of this study was to bridge the research gaps and overcome the limitations in the literature reviewed above. The cultural difference, sex differences, culture–sex interactions, and in-group biases in empathy were investigated in this study with Australian and Mainland Chinese university students through a set of behavioural and self-report measurements. Particularly, the following four questions were examined:

1. Do Australian and Mainland Chinese participants recognise basic emotions (i.e.,
happiness, surprise, fear, anger, and sadness) differently?

(2) Which group, Australian or Mainland Chinese, shows more empathy towards the targets?

(3) Is there any interaction effect of participant culture and participant sex on empathy responses to targets?

(4) Do both Australian and Mainland Chinese participants show an in-group bias in empathy for the targets?

Four computer tasks were used to answer the above questions. For each task, stimuli of six emotional states (viz., happiness, surprise, anger, fear, sadness, and neutral emotion) were presented. Half the stimuli were Caucasians, and the other half were Asians. Half the stimuli were females, and half were males. Stimuli of the first two computer tasks were with a plain backdrop, while stimuli of the latter two were with emotional contexts (e.g., reading a book). Emotion recognition for each stimulus (i.e., 48 in total) was checked and any emotions with a low accuracy of emotion recognition (i.e., < 70%) were identified and excluded from further investigation. After the computer tasks, participants were asked to complete a set of self-report scales, including a demographic scale and two empathy scales; namely, EQ (Baron-Cohen & Wheelwright, 2004) and IRI (Davis, 1980).

As per the previous results based on self-report investigations (Melchers et al., 2015; Zhao et al., submitted), significant culture and sex interactions were expected to be found with the current participants in both of their self-report and behavioural responses of empathy. More specifically, according to Zhao et al. (submitted; Chapter V), it was expected that Australian females would report higher empathy than Mainland Chinese females, but no significant cultural difference would be observed between the two male groups. It was also anticipated that there would be participant culture and
target culture interactions (i.e., in-group or out-group bias) in the behavioural responses of empathy. Specifically, in-group biases were expected to be found in empathy for negative emotions (e.g., anger and sadness) in both the Australian and Mainland Chinese participants of this study, while out-group bias in empathy for positive emotions (e.g., happiness) might be found in the Mainland Chinese participants. These predictions were based on the current knowledge in the literature; namely, currently, researchers have reported in-group biases in empathy for negative emotions (e.g., anger and sadness) in both Western and Asian participant groups (Cheon et al., 2011; Neumann et al., 2013), but an out-group bias in empathy for positive emotions (e.g., happiness) only in a Mainland Chinese group (Neumann et al., 2013).

Furthermore, the predictions of in-group bias in empathy for negative emotions and out-group bias for positive emotions are consistent with theoretical concepts. According to the theory of “reciprocal altruism” (Mathur, Harada, Lipke, & Chiao, 2010), individuals are more likely to share their resources (e.g., time, finances, emotions, and empathy) with those who are likely to reciprocate the favours. It seems that as an in-group individual has more chance of fulfilling the reciprocal altruism than an out-group does, there should be a general in-group bias in empathy. However, the different social meanings of negative and positive emotions may moderate the group bias. Negative emotions, such as sadness and anger, indicate that people are seeking or demanding of help (Domagalski, 2006; Emmerson, 2011; Tiedens, 2001). In contrast, researchers have found that positive emotions may drive individuals to be selfish, such as keeping more resources to themselves rather than sharing them with others (Tan & Forgas, 2010). Therefore, in line with in-group bias in altruism (Chiao & Mathur, 2010), individuals may have a tendency to show stronger empathy towards in-group individuals who are in need (i.e., in-group bias for negative emotions) and appear more
empathic towards out-group individuals who could be selfish (i.e., out-group bias for positive emotions).

Method

Participants

Australian participants were recruited via advertisements to a first-year psychology participation scheme and to a wider student body of a university in Queensland, Australia. A two-hour study credit or AU$15 cash was provided for their participation. Mainland Chinese participants were recruited via advertisements to a first-year psychology participation scheme and to a wider university body of a Chinese university in Shanghai, China. RMB ¥40 cash (about AU$8) was provided for each Mainland Chinese participant. Both Australian and Mainland Chinese participants were informed that this study was restricted to individuals who satisfied the following criteria: (1) nationality (Australian/Mainland Chinese); (2) ethnicity (Caucasian/Chinese Han); (3) place of birth (Australia/Mainland China); (4) main place of growing up (Australia/Mainland China); (5) main place of residence (Australia/Mainland China); (6) 18 years or older; (7) first- or second-year undergraduate student; (8) normal or corrected normal vision; (9) without any history of mental or neurological illness. All the criteria were verbally checked at the beginning of the experiment and again at the end of the experiment via a demographic questionnaire.

Among the Australian participants, five were excluded for the following reasons: (1) parents were from Asia; (2) was a 4th-year undergraduate student; (3) selected the same answer for all items on a questionnaire; (4) withdrew consent; (5) reported a history of depression. Among the Chinese participants, four participants were excluded for the following reasons: (1) reported a history of coma; (2) reported a history of depression; (3) selected the same answer for all items on a questionnaire; (4) missing
data from the final behavioural task (due to technical problem). The final sample of Australian participants consisted of 32 females (mean age = 19.37 years, \(SD = 1.39\)) and 29 males (mean age = 19.69 years, \(SD = 1.67\)), and the final Mainland Chinese group included 36 females (mean age = 19.47 years, \(SD = 0.97\)) and 32 males (mean age = 19.69 years, \(SD = 0.69\)). Australian students were completing one of nine undergraduate majors (the largest group was psychology students, including 75.0% Australian females and 65.5% Australian males), and Mainland Chinese students were completing one of five undergraduate majors (the largest group was psychology students, including 91.7% Mainland Chinese females and 87.5% Mainland Chinese males). All participants provided informed consent to a protocol approved by both an Australian and a Mainland Chinese institution’s ethics committee prior to taking part in this study.

**Measures**

**Behavioural tasks.** Four computerised behavioural tasks were administered: (1) Emotion recognition of facial expressions with no emotional background; (2) Empathic response to facial expressions with no emotional background; (3) Emotion recognition of facial expressions with the emotional background; and (4) Empathic response to facial expressions with the emotional background.

**(1) Emotion recognition of facial expressions with no emotional background.** Twenty-four stimuli (4 targets \(\times\) 6 types of facial expression) were selected from the NimStim set (Tottenham et al., 2009). The four targets (or models) chosen for this study were #09 (a Caucasian female), #19 (an Asian female), #20 (a Caucasian male), and #45 (an Asian male). The six types of facial expression selected in this study were happiness (with an opened mouth), anger (with an opened mouth), sadness (with a closed mouth), surprise (with an opened mouth), fear (with an opened mouth), and neutral emotion (with a closed mouth). Tottenham et al. (2009) reported the accuracies of emotion
recognition of the six emotions (note that the accuracy results were based on all models) as .98, .90, .83, .81, .73, and .91, respectively.

In this study, each stimulus was presented once in each task on a laptop screen. The presentation of the stimuli was pseudo-randomised in each task, without pictures of the same ethnicity or same emotion presented in succession to avoid priming effects. On the laptop screen, after each stimulus, some (i.e., four to six) questions or statements were presented one by one for participants to respond to. Participants provide their answers for all questions and statements using the laptop keyboard.

As all NimStim targets were pictured before a plain backdrop, the participants were instructed that they should answer the following six questions based on the cues depicted on the target’s face. The first question was, “What was the main emotion that the central character was feeling? 1 = happiness, 2 = surprise, 3 = neutral, 4 = fear, 5 = anger, 6 = sadness.” The six emotion options were presented for each stimulus, and the sequence of the six options remained the same at all times where relevant. The second question was, “How strongly was the central character feeling the emotion? 1 = not at all to 9 = very strongly”. The third question was, “How negative or positive did the picture seem? 1 = very negative to 9 = very positive”. The fourth question was, “Viewing the picture, what main emotion did you feel? 1 = happiness, 2 = surprise, 3 = neutral, 4 = fear, 5 = anger, 6 = sadness”. The fifth question was, “How strongly did you feel the emotion? 1 = not at all to 9 = very strongly”. The sixth question was, “Which situation do you think was the most likely experienced by the central character?”

With the last question, 18 options (e.g., A = cheering and Q = disaster) were presented, and these options and their sequence remained the same at all times where relevant. The questions of emotion recognition (i.e., questions #1 and 4) were adapted from a previous cross-cultural comparison study of emotions (Chiao et al., 2008). The other
questions were adapted from a previous cross-cultural comparison study of empathy (Neumann et al., 2013). For the current study, the dependent variable of this task was emotion recognition of the target (i.e., question #1), while the other questions were collected for the purpose of another study.

(2) **Empathic response to facial expressions with no emotional background.**

The same 24 stimuli used in the previous task (i.e., Task 1) were used in this task. After each stimulus, four statements were presented one by one on the laptop screen for participants to evaluate. The first statement was, “I felt _____ the feeling of the central character. 1 = not at all to 9 = very strongly” to measure emotional empathy. The second statement was, “I understood _____ the situation of the central character. 1 = not at all to 9 = very fully” to measure cognitive empathy. The third statement was, “Viewing the pictures, I felt _____, 1 = very calm/relaxed to 9 = very aroused/jittery”, and it was used to measure arousal elicited by the stimulus. The last statement was, “Viewing the pictures, I felt _____, 1 = very at ease/comfortable to 9 = very painful/distressed”, and it was used to gauge the distress caused by the stimulus. For the current study, the dependent variables of this task were emotional empathy and cognitive empathy (i.e., questions #1 and 2, respectively), while the other questions were collected for the purpose of another study.

(3) **Emotion recognition of facial expressions with the emotional background.**

Twenty-four pictures depicting character/s within a social or environmental context (e.g., running in a marathon or reading in a forest park) were presented as stimuli. Because 14 of the 24 pictures had two or more people in one picture, an arrow was added to each of the 24 pictures to mark the target. Among these pictures, four pictures were chosen from the International Affective Picture System (IAPS, Lang, Bradley, & Cuthbert, 1999); namely, Caucasian female neutral (i.e., IAPS2377), Caucasian male neutral (i.e.,
IAPS2102), Caucasian female fear (i.e., IPAS6313), and Caucasian male sadness (i.e., IAPS4598); two pictures (i.e., Caucasian female and male happiness) were chosen from the stimuli used by Neumann et al. (2013); and the other pictures were selected via an internet search. The ethnicity, sex, and emotion of targets in the 24 pictures were selected in the same manner as for the NimStim stimuli, and the context of each emotion was matched between Caucasian and Asian targets of the same sex. Six questions used in this task were identical to those used in the Emotion recognition of facial expressions with no emotional background task (i.e., Task 1). The dependent variable of this task for the current study was emotion recognition (i.e., question #1), while the other questions were collected for the purpose of another study.

(4) Empathic response to facial expressions with the emotional background.

The 24 pictures used for this task were the same as those used in the previous task (i.e., Task 3). Following the presentation of each picture, five statements were presented for participants to evaluate. Four of the statements were the same as those used for the Empathic response to facial expressions with no emotional background task (i.e., Task 2). An additional statement was, “I can _____ imagine myself in the situation of the central character. 1 = not at all to 9 = very easily” to measure perspective-taking. This additional statement was the third statement to present in this task (i.e., the five statements presented in this task, in sequence, were the first two statements of Task 2, the third additional statement, and the last two statements of Task 2). The dependent variables of this task for the current study were emotional empathy, cognitive empathy, and perspective-taking (i.e., questions #1 to 3, respectively), while the other questions were collected for the purpose of another study.

Self-report Questionnaires. After the four computer tasks, participants were asked to complete six self-report questionnaires, including a demographic information
questionnaire, the EQ (Baron-Cohen & Wheelwright, 2004), the IRI (Davis, 1980), the Berkeley Expressivity Questionnaire (BEQ; Gross, John, & Richards, 1995), the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003), and the Self-Construal Scale (SCS; Singelis, 1994). In the same sequence, all questionnaires were presented to Australian participants in English and to Mainland Chinese participants in simplified Chinese. The simplified Chinese is the official written text used in Mainland China. The SCS, BEQ, and ERQ were included for the purpose of another study; they will not be described further.

**Demographic information questionnaire.** This questionnaire was used to collect basic demographic information and empathy-related personal information. It covered personal demographic characteristics (i.e., date of birth, sex, and education level: first- or second-year of college), cultural background (i.e., nationality, place of birth, and main place of residence), mental health background (i.e., histories of neurological and mental illness), and study major (e.g., psychology or mathematics). Then, participants were asked to evaluate their study major according to five Art–Science categories (1 = pure art, 2 = partial art, 3 = half art and half science, 4 = partial science, and 5 = pure science). Responses to this question were recoded to reflect the level of science (i.e., 1 = no science, 2 = minority science, 3 = half science, 4 = majority science, and 5 = all science). They were also enquired to report whether they received any training in empathy, such as in psychology classes or workshops (0 = No and 1 = Yes).

Researchers have suggested that increasing ethnic out-group contact may reduce individual in-group bias in empathy (Cao, Contreras-Huerta, McFadyen, & Cunnington, 2015). Therefore, the chance to meet and communicate with the out-group was enquired for each participant; particularly, participants were requested to evaluate how many of
the out-group people they encountered (i.e., no conversation was necessary) per day on average, and evaluate how frequently they communicated with the out-group people (e.g., studying together or doing business together) on a 5-point Likert scale ranging from 1 (very occasionally) to 5 (very frequently). The two characteristics of contact with the out-group were controlled in the ANCOVAs for the behavioural responses of empathy in this study because these two characteristics might be confounding factors in testing participants’ in-group bias in behavioural responses (Cao et al., 2015). In contrast, the two characteristics of contact with the out-group were not controlled in the ANCOVAs for the self-report empathy in this study because self-report questionnaires measure an individual’s empathy for others in general (i.e. do not test in-group/out-group bias). In the current study, the out-group ethnicity for the Australian participants was restricted to East Asian (e.g., Mainland Chinese, Japanese, and Korean); while for the Mainland Chinese participants, the out-group ethnicity was restricted to Western Caucasian (e.g., Australian, American, and European Caucasians).

**Empathy Quotient (EQ).** The EQ is a self-report measure of overall empathy (Baron-Cohen & Wheelwright, 2004). EQ includes 40 items measuring empathy, with a standard scoring instruction for each item (Baron-Cohen & Wheelwright, 2004). An example of the empathy item is, “I can tell if someone is masking their true emotion” (i.e., EQ 55). Each item was rated on a 4-point Likert scale ranging from 1 (strongly agree) to 4 (strongly disagree) (Baron-Cohen & Wheelwright, 2004). In addition, to provide participants some breaks during answering these empathy questions, the original authors of the EQ added 20 filler items in the scale, and these filler items are not scored (Baron-Cohen & Wheelwright, 2004). The total EQ score ranges from 0 to 80, with higher scores reflecting greater empathy. The English version (Baron-Cohen & Wheelwright, 2004) and a simplified Chinese-translated version of the EQ (Zhao et al.,
were used for the Australian and the Mainland Chinese participants, respectively. Cronbach’s α for the EQ scale based on the Australian participants (n = 61) was .92 and based on the Mainland Chinese (n = 68) were .90, which are similar to those reported in previous studies (range = .84 to .92) (Baron-Cohen & Wheelwright, 2004; Melchers et al., 2016; Zhao et al., 2017).

**Interpersonal Reactivity Index (IRI).** The IRI measures self-report emotional and cognitive empathy separately (Davis, 1980). Twenty-eight items of the IRI are equally clustered into four subscales; namely, perspective-taking (IRI-PT), empathic concern (IRI-EC), personal distress (IRI-PD), and fantasy (IRI-FS) (Davis, 1980). Each item is rated on a 5-point Likert scale ranging from 0 (*does not describe me well*) to 4 (*describes me very well*), and is scored according to the official scoring rule (Davis, 1980). The total score for each subscale, ranging from 0 to 28, is calculated according to the official requirement (Davis, 1980). The IRI-PT and IRI-EC are used to assess participants’ cognitive and emotional empathy, respectively, with higher scores reflecting higher levels of the specific component of empathy (Davis, 1980). Item examples for these two scales are, “I sometimes try to understand my friends better by imagining how things look from their perspective” (i.e., IRI 11 for IRI-PT) and “I often have tender, concerned feelings for people less fortunate than me” (i.e., IRI 2 for IRI-EC).

The IRI-PD and IRI-FS are not relevant variables in the current study, as the IRI-PD measures self-oriented negative feelings while witnessing others’ distress, and IRI-FS measures a person’s tendency to appreciate the emotions of fictitious characters in movies, plays, or books (Davis, 1980). Examples for the two subscales are “When I see someone who badly needs help in an emergency, I go to pieces” (i.e., IRI 27 for IRI-
PD) and “After seeing a play or movie, I have felt as though I were one of the characters” (i.e., IRI 16 for IRI-FS). IRI-PD and IRI-EC were not included in further analyses.

The English version of the IRI (Davis, 1980) was administered to the Australian participants. For the Mainland Chinese participants, a simplified Chinese version of the IRI (Wang et al., 2013) was administered, which was found to have a good validity in measuring self-report empathy in Chinese participants (e.g., Neumann, Chan, Wang, & Boyle, 2016; Wang et al., 2013). The Cronbach’s αs for IRI-PT and IRI-EC for the Australian participants were .79, and .84, and for the Mainland Chinese participants were .61, and .75, respectively. These values are similar to those reported in previous studies (range from .66 to .79) (Davis, 1980; Wang et al., 2013; Zhao et al., 2017).

**Procedure**

Australian participants were recruited and took part in the study in Brisbane or Gold Coast, Australia, and Mainland Chinese participants were recruited and took part in the study in Shanghai, China. Inclusion criteria and introduction to the study were presented to all participants in their own language. All instructions and explanations of the experiment were prepared and given to participants by the same English–Mandarin bilingual researcher. It was explained to all participants that they were expected to satisfy all the inclusion criteria, honestly provide their demographic information, and carefully complete the whole task. All participants provided their informed consent prior to their participating.

Participants were asked to complete the four behavioural tasks first (10 to 15 mins per task), take a rest (2 to 5 minutes), and then complete the six self-report questionnaires (20 to 30 mins). All questions in the behavioural tasks and in self-report scales were compulsory. All participants were instructed that, except for the demographic questionnaires, there were no “right” or “wrong” answers to any other
questions. Instead, they should respond to each question according to their true feelings. Moreover, they were told that they could take their time to respond to each question, but that usually, their first response was the best.

All participants completed the four computer tasks in the same sequence:

- Empathic response to facial expressions with no emotional background (i.e., Task 2);
- Emotion recognition of facial expressions with no emotional background (i.e., Task 1);
- Empathic response to facial expressions with the emotional background (i.e., Task 4);
- and Emotion recognition of facial expressions with the emotional background (i.e., Task 3).

This sequence was designed for two reasons: to collect the subjective impression of empathy first and then the more objective emotion recognition, and to avoid the priming effects of the context provided in pictures with the emotional background to the NimStim stimuli with no emotional background.

For each behavioural task, participants first read the instruction, completed a practice trial (i.e., with four sample pictures), asked any questions until they understood the requirements, and then completed the formal testing. Participants were instructed to use the space bar on the keyboard to begin each task and look at a fixation cross (onscreen for 3,000 ms) in the centre of the screen until it disappeared. Then, a stimulus (onscreen for 6,000 ms) was displayed, and participants were instructed to look at it and think about what the target might be thinking or feeling. There were 24 stimuli in each task, and they were presented in a pseudo-random order. Moreover, five pseudo-random sequences were designed for the entire behavioural experiment to reduce priming effects between stimuli. Participants were randomly selected to complete one of the sequences. The questions for each behavioural task were presented one at a time, and each question remained on the screen until the participant gave a valid response.
A laptop with a 14-in. (35.56 cm) screen (Dell Latitude E6440) was used to collect all data. E-prime 2.0 (Schneider, Eschman, & Zuccolotto, 2002) was used to present stimuli and collect participants’ responses in the behavioural task. Australian participants finished the English version of the online survey on the LimeSurvey platform (https://www.limesurvey.org/). Mainland Chinese participants finished the Chinese version of the online survey on the Sojump platform (http://www.sojump.com).

**Data Analysis**

Univariate outliers (z-scores > 3.29) were identified for the non-traditional Likert-scale question in this study. The question was, how many of the out-group people were encountered per day on average (i.e., minimum was zero while no limitation for the maximum). In total, there was one outlier in the Australian female group, five outliers in the Australian male group, and two outliers in the Chinese male group. According to a suggestion by Tabachnick and Fidell (2007), these extreme cases with large scores were replaced by adding one unit larger than the next most extreme score in the distribution—vice versa for the low extremes. For all the other self-evaluations in this study, participants responded on fixed Likert scales; therefore, the outliers of these evaluations were kept as reported by the participants.

One-way between groups ANOVAs were performed to compare continuous demographic variables (i.e., age, study major type in the Art–Science categories, the out-group encounter, and the out-group communication) between the four culture–sex participant groups (viz., Australian female, Australian male, Mainland Chinese female, and Mainland Chinese male). Chi-square texts of contingencies (or Fisher’s exact tests if any cell had an expected frequency less than five) were conducted to compare categorical demographic variables, including education category (0 = *first-year*, 1 = *second-year*) and whether received empathy-related training or study (0 = *No* and 1 =...
Yes) between the four culture–sex participant groups. For self-report empathy scores (i.e., EQ and IRI scores), a set of 2 (culture) × 2 (sex) between-group ANCOVAs (Sum of Squares Type II) were conducted to examine differences between the culture–sex groups of participants. Participants’ age, education, study major types (five types in the Art–Science categories), and whether they had received empathy-related training or study were controlled in these ANCOVAs. Any significant interactions were further examined using pairwise comparisons with Bonferroni adjustments (to account for inflated Type I error), and corrected p-values for pairwise analyses were reported.

For the behavioural tasks, emotion recognition for each stimulus was checked. According to a recommendation by Tottenham et al.'s (2009), any emotions with a low accuracy of emotion recognition (i.e., < 70% for any one of the four stimuli of the emotion) among all participants were identified and excluded from further investigation. As targets’ sex was not an independent variable of interest in this study, an average of the accuracies of emotion recognition for female and male targets of the same ethnicity was calculated for each remaining emotion (i.e., for all four stimuli of the remaining emotion, the accuracy of emotion recognition ≥ 70%). Based on these averages, 2 (participant culture) × 2 (participant sex) × 2 (target culture) mixed ANCOVAs were conducted for participants’ accuracy of emotion recognition. In the ANCOVAs, participants’ age, education, study major (Art–Science types), whether received empathy-related training or study, the number of meetings with the out-group per day, and the extent of communicating with the out-group were controlled as covariates.

Before examining participant differences in empathy responses, one statistic step of missing replacements using the Expectation-Maximization (EM) method was conducted for each remaining stimulus (i.e., the accuracy of emotion recognition ≥ 70%). That is, for each of the stimuli, any empathy responses (i.e., emotional empathy,
cognitive empathy, and perspective-taking) provided by participants with incorrect emotion recognition of it was replaced with the expectation. This step was taken in order to statistically ensure all participants had correct emotion recognition for all remaining stimuli.

After the missing replacement, the target’s sex was not considered an independent variable in the following analyses. Therefore, averages of each empathic response (i.e., emotional empathy, cognitive empathy, and perspective-taking) to female and male targets of the same ethnicity depicting an emotion (e.g., happiness, sadness, and anger) were calculated. Based on these averages, 2 (participant culture) × 2 (participant sex) × 2 (target culture) mixed ANCOVs were performed for each of the empathy responses. Covariates in these ANCOVs were the same as used in the ANCOVs for accuracies of emotion recognition. For both ANCOVA sets, pairwise comparisons with Bonferroni adjustments were carried out to identify the source of any significant interactions, and corrected p-values of were reported. All analyses were processed using SPSS Version 22 (IBM Corp).

Results

Demographic Information

Demographic information for the four culture–sex groups of participants (viz., 32 Australian females, 29 Australian males, 36 Mainland Chinese females, and 32 Mainland Chinese males) is presented in Table VI. 1. Results showed that the four participant groups were not significantly different in age (p = .661), but were significantly different in education (p = .016), study major types (five Art–Science types; p < .001), whether or not received empathy-related training or study (p = .048), the number of daily encounters with the out-group (p < .001), and the frequency of communication with the out-group (p < .001). In the ANCOVs of self-report empathy,
participants’ characteristics of age, education, study major, and empathy-related training were controlled, and in the ANCOVAs of behavioural responses, all six characteristics (i.e., age, education, study major, whether received empathy-related training, the number of daily encounters with the out-group, and the frequency of communication with the out-group) were controlled.

**Self-report Questionnaires**

The means and standard deviations for the self-report scores on EQ, IRI-PT, and IRI-EC by the four culture–sex participant groups are presented in Table VI. 2, and in the same table the results of the 2 (culture) × 2 (sex) between-group ANCOVAs of the three empathy scores can also be found. Significant two-way interactions of culture and sex were found for all of the three scores; namely, EQ \( (F(1, 121) = 5.22, p = .024, \eta^2_p = .04) \), IRI-PT \( (F(1, 121) = 4.07, p = .046, \eta^2_p = .03) \), and IRI-EC \( (F(1, 121) = 7.91, p = .006, \eta^2_p = .06) \). Results of pairwise comparisons with Bonferroni adjustments revealed that Australian females reported higher than Mainland Chinese females on all of the three self-report empathy scores (i.e., \( p = .004, d = 0.54 \), for the EQ, \( p = .007, d = 0.50 \), for the IRI-PT, and \( p = .001, d = 0.63 \), for the IRI-EC); in contrast, no significant cultural difference was found between the two male groups (\( p = .816, d = 0.04 \), for the EQ, \( p = .736, d = 0.06 \), for the IRI-PT, and \( p = .924, d = 0.02 \), for the IRI-EC). In addition, sex differences for all of the three scores were found to be significant only in the Australian participants (females > males; \( p < .001, d = 0.75 \), for the EQ, \( p = .014, d = 0.45 \), for the IRI-PT, and \( p = .001, d = 0.64 \), for the IRI-EC) but not in the Mainland Chinese participants (\( p = .300, d = 0.19 \), for the EQ, \( p = .768, d = -0.05 \), for the IRI-PT, and \( p = .721, d = -0.06 \), for the IRI-EC).
The Accuracy of Emotion recognition and Group Differences

The accuracies of emotion recognition of the 24 NimStim stimuli (see Table VI. 3) and the 24 pictures with the emotional background (see Table VI. 4) are summarised for the four culture–sex participant groups and for the overall participants, separately. The information for the two sets of stimuli can also be found in the respective tables. For NimStim set, emotions with the highest to the lowest accuracies of emotion recognition based on the overall participants (the range for the four stimuli per emotion), were happiness (94.6 to 99.2%), anger (95.3 to 98.4%), sadness (72.9 to 93.8%), neutral emotion (68.2 to 94.6%), surprise (53.5 to 87.6%), and fear (41.1 to 77.5%). For pictures with the emotional background, the accuracy order was happiness (99.2 to 100.0%), anger (93.8 to 98.4%), fear (88.4 to 98.4%), neutral emotion (78.3 to 95.3%), sadness (72.1 to 89.9%), and surprise (47.3 to 93.0%). According to the above results, surprise, fear, and neutral emotion were excluded from further analyses because the accuracies of one or more stimuli depicting these emotions were found to be lower than 70%.

A set of 2 (participant culture) × 2 (participant sex) × 2 (target culture) mixed ANCOVAs for the accuracies of emotion recognition were conducted for the three remaining emotions (i.e., happiness, anger, and sadness). Results revealed that the recognition of happiness (either with or without an emotional background) was not influenced by the three independent variables (i.e., participant culture, participant sex, and target culture) investigated in the current study (all ps ≥ .274). For recognition of anger with no emotional background, a two-way interaction between participant culture and sex was found ($F(1, 119) = 8.47, p = .004, \eta_p^2 = .07$; see Figure VI. 1 a). A further analysis revealed that there was no cultural difference either between the Australian and Mainland Chinese female groups ($p = .131, d = 0.28$) or between the two male groups ($p$
= .168, d = -0.25). Nevertheless, a significant sex difference was found in the Australian participants (females > males, \( p = .013, d = 0.46 \)) but not in the Mainland Chinese participants (\( p = .116, d = -0.29 \)). For recognition of anger with the emotional background, a participant sex main effect was found (male > female, \( F(1, 119) = 5.52, p = .020, \eta_p^2 = .04 \)).

For recognition of sadness with no emotional background, a two-way interaction of participant culture and target culture was found (\( F(1, 119) = 7.84, p = .006, \eta_p^2 = .06 \); see Figure VI.1 b). Further, it was revealed that there was no significant cultural difference between participant groups for either the Caucasian (\( p = .051, d = 0.36 \)) or Asian targets (\( p = .218, d = 0.23 \)). However, Australian participants showed a significant in-group bias (Caucasian > Asian targets, \( p = .001, d = 0.62 \)), while Mainland Chinese participants did not (\( p = .324, d = 0.18 \)). Finally, the recognition of sadness with the emotional background was found to be influenced by none of the three independent variables investigated in the current study (all \( ps \geq .068 \)).

**Empathic Response to Facial Expressions with No Emotional Background**

*Emotional empathy.* The means and standard deviations of emotional empathy (i.e., sharing the feeling of the central character) for happiness, anger, and sadness of the NimStim stimuli are presented in Table VI.5 for the four culture–sex participant groups, separately. No significant main effect or interaction was found for any of the three emotions (all \( ps \geq .066 \)).

*Cognitive empathy.* The means and standard deviations of the four participant groups’ cognitive empathy (i.e., understanding the situation of the central character) for happiness, anger, and sadness of NimStim stimuli pictures are presented in Table VI.5. For sadness, there was a main effect of participant sex (female > male, \( F(1, 119) = 6.11, p = .015, \eta_p^2 = .05 \)) and a two-way interaction between participant and target culture (\( F \)
(1, 119) = 4.09, p = .045, $\eta^2_p = .03$; see Figure VI. 2). Pairwise analyses of the two-way interaction revealed no cultural difference for either Asian ($p = .212, d = 0.23$) or Caucasian targets ($p = .572, d = -0.10$) between the Australian and Mainland Chinese participant groups. However, an out-group bias was found in the Mainland Chinese participants (Caucasian > Asian targets, $p = .022, d = 0.43$), but not in the Australian participants ($p = .258, d = 0.21$). Finally, no significant main effect or interaction was found for happiness (all $ps \geq .059$) or anger (all $ps \geq .141$).

**Empathic Response to Emotional Expressions with the Emotional Background**

*Emotional empathy.* The means and standard deviations of the four participant groups’ emotional empathy for happiness, anger, and sadness with the emotional background are presented in Table VI. 6. For happiness, results revealed a main effect of participant sex (female > male, $F (1, 119) = 4.40, p = .038, \eta^2_p = .04$) and a two-way interaction between participant and target culture ($F (1, 119) = 10.29, p = .002, \eta^2_p = .08$; Figure VI. 3 a). Pairwise analyses of the two-way interaction showed no cultural difference between two participant groups for either Caucasian ($p = .199, d = 0.24$) or Asian targets ($p = .391 d = 0.16$). However, an out-group bias was found with both the Australian participants (Asian > Caucasian targets, $p < .001, d = 0.66$) and the Mainland Chinese participants (Caucasian > Asian targets, $p = .038, d = 0.38$). Finally, no significant main or interaction effect was found for sadness (all $ps \geq .142$) or anger (all $ps \geq .502$).

*Cognitive empathy.* The means and standard deviations of the four participant groups’ cognitive empathy for happiness, anger, and sadness with the emotional background are presented in Table VI. 6. For happiness, there was a main effect of participant sex (female > male, $F (1, 119) = 14.48, p < .001, \eta^2_p = .11$) and a significant two-way interaction between participant and target culture ($F (1, 119) = 8.78, p = .004,$
Pairwise analyses of the two-way interaction revealed that there was a cultural difference for Asian targets (Australian > Mainland Chinese participants, $p = .041, d = 0.38$) but not for Caucasian targets ($p = .369, d = -0.17$). Meanwhile, an out-group bias was found in the Mainland Chinese participants (Caucasian > Asian targets, $p = .001, d = 0.60$) but not in the Australian Caucasian participants ($p = .056, d = 0.35$). In contrast, no significant main effect or interaction effect was found for sadness (all $ps \geq .139$).

For anger, a three-way interaction between participant culture, participant sex, target culture was found ($F(1, 119) = 5.41, p = .022, \eta_p^2 = .04$; Figure VI. 4), which qualified a main effect of participant sex ($F(1, 119) = 9.24, p = .003, \eta_p^2 = .07$). Pairwise analyses of the three-way interaction revealed one significant cultural difference, that is, Australian female participants had a higher rating than Mainland Chinese female participants for Caucasian targets ($p = .001, d = 0.62$); while no cultural differences were found between the two female groups for Asian targets, and no cultural differences were found between the two male groups for either Caucasian or Asian targets (all $ps \geq .199$). Meanwhile, there was one significant in-group bias in the Australian female group (Caucasian > Asian targets, $p = .025, d = 0.42$); while no significant in-group/out-group bias was found for the other three participant groups (all $ps \geq .110$). Furthermore, significant sex differences were found in the Australian participants for both Caucasian targets and Asian targets (female > male, $p < .001, d = 0.69$ and $p = .025, d = 0.41$, respectively), but not in the Mainland Chinese participants for either Caucasian or Asian targets (both $ps \geq .108$).

**Perspective-taking.** The means and standard deviations of the four participant groups’ perspective-taking (i.e., imagining oneself in the situation of the central character) for happiness, anger, and sadness with the emotional background are
presented in Table VI. For happiness, a main effect of participant sex (female > male, $F(1, 119) = 8.06, p = .005, \eta^2_p = .06$) and a two-way interaction of participant and target culture were found ($F(1, 119) = 7.99, p = .006, \eta^2_p = .06$; Figure VI. 5). Further analyses of the two-way interaction revealed no cultural difference between the two participant cultural groups for either Caucasian ($p = .136, d = 0.28$) or Asian targets ($p = .315, d = 0.19$). Nevertheless, an out-group bias was found with both the Australian participants (Asian > Caucasian targets, $p = .003, d = 0.56$) and the Mainland Chinese participants (Caucasian > Asian targets, $p = .037, d = 0.39$). Finally, no main or interaction effects were found for either anger (all $ps \geq .143$) or sadness (all $ps \geq .473$).

**Discussion**

With Australian and Mainland Chinese participants, this study examined Western–Asian cross-cultural differences in empathy using both self-report and behavioural measurements. A three-way interaction between participant culture, participant sex, and target culture was found in cognitive empathy for stimuli depicting anger with the emotional background. A further investigation of the three-way interaction revealed significant differences in all of the three variables investigated, namely, participant culture (i.e., Australian females reported more cognitive empathy than Mainland Chinese females did with Caucasian targets), participant sex (i.e., Australian females reported more cognitive empathy than did Australian males for both Caucasian and Asian targets), and target culture (i.e., Australian females reported more cognitive empathy with Caucasian than with Asian targets). These results were consistent with the current and previous findings of culture–sex interaction in self-report empathy (Melchers et al., 2015; Zhao et al., submitted). Moreover, the current results revealed a trend as previously reported by Neumann et al. (2013), namely, there were
in-group biases in empathy for negative emotions but out-group biases in empathy for positive emotions.

A three-way interaction of participant culture, participant sex, and target culture was found in the current behavioural task of cognitive empathy for anger with the emotional background. A further investigation of this interaction revealed a participant culture–sex interaction in empathy, and this phenomenon was firstly reported by Melchers et al. (2015) based on self-report empathy responses. This phenomenon suggests that Western-Asian cross-cultural differences in empathy should be separately tested for female participants and male participants because the results according to the two sex groups could be different. In the current study, it was found that the cultural difference in behavioural responses to anger expressed by Caucasian targets was only significant between female groups (i.e., the Australian females reported more cognitive empathy than did the Mainland Chinese females), but not between male groups. Moreover, for the Caucasian targets, a significant sex difference was found in the Australian participants (i.e., Australian females reported more cognitive empathy than did Australian males), but not in the Mainland Chinese participants. The above culture–sex interaction of participants’ behavioural responses to the Caucasian targets was consistent with the culture–sex interaction found on self-report empathy scores in both the current study and a previous study based on a larger sample size (Chapter V; Zhao et al., submitted). Nevertheless, in this study, for the Asian targets, no significant cultural difference was found in the cognitive empathy response in either the female or male participants; however, Australian participants still showed a significant sex difference (i.e., Australian females reported more cognitive empathy than did Australian males), while Mainland Chinese participants did not. The findings suggest that for understanding an individual’s empathy responses, people ought to take into account
both the characteristics of the person (i.e., culture and sex) and the characteristics of the targets (i.e., culture).

Currently, no clear explanation has been provided for the culture–sex interaction in empathy, even though some researchers considered that social expectation difference among the culture–sex groups could be a reason (Zhao et al., submitted). Relative to the Australian males, the Australian females may feel a greater social expectation to be warm and show concern to others (Brody, 1997; Jaggar, 1989). In contrast, influenced by the Confucian “Golden Mean” philosophy, Mainland Chinese females and males may be expected to seek a balance between “Yin” and “Yang”, “negative” and “positive”, and “femininity” and “masculinity” (Atkins et al., 2016; Chu, 2015). Nevertheless, the current study has not tested the relation between social expectation and participants’ empathy. Future research is required to test this notion. For example, future research could consider collecting participants’ subjective evaluation of social expectation for showing empathy (e.g., “How much do you think other people, in general, expect you to be an empathic person? 1 = not at all to 9 = extremely high” and “How much do you think other people, in general, expect you to externalise your empathy? 1 = not at all to 9 = extremely high”). These investigations might help to clarify the relationship between social expectation in empathy and the culture–sex interaction.

The current finding of cultural differences in cognitive empathy for anger was in line with the different social meanings of anger in the two cultures. Anger is an intense emotion which disturbs the “Golden Mean” of interpersonal relationships (de Greck et al., 2012). Generally, Asians value the “Golden Mean”, or social harmony, much more than Westerners do (de Greck et al., 2012; Drummond & Quah, 2001). Moreover, Chinese people tend to regard externalising anger as a weakness and a lack of self-
control (Kornacki, 2001). In contrast, for Westerners, expressing negative emotions, in general, can be deemed as being true to oneself and being honest with others, and therefore could boost communication (Gross & John, 2003). These cultural background differences might explain the current finding that the Australian females reported more cognitive empathy for the Caucasian anger than Mainland Chinese females did.

Furthermore, the cultural difference in cognitive empathy for anger found in the current study is also consistent with previous brain imaging results (de Greck et al., 2012). De Greck et al. (2012) found that when participants were asked to empathise with in-group anger, German Caucasians had higher brain activation in ITG and middle insula (i.e., cognitive empathy-related brain regions) compared with Mainland Chinese. In contrast, Mainland Chinese had higher brain activation in DLPFC (i.e., an emotional regulation and personal distress-related brain region) than German Caucasians did. De Greck et al. (2012) reckoned that Westerners might devote more cognitive empathy to the anger, while Asians might try to inhibit negative feelings that they automatically shared from the targets. Nevertheless, de Greck et al. (2012) did not account for the possible interaction effects (i.e., participant culture, participant sex, and target culture) on participants’ empathy responses. Therefore, it is undetermined whether the cultural differences in the brain activations were only restricted between Western and Asian females.

A further investigation of the three-way interaction also revealed an in-group bias in empathy in the Australian female group. The results revealed that Australian females had more cognitive empathy for the Caucasian anger than Asian anger expressed in a similar emotional situation (i.e., female targets were in a strike and male targets were in a road rage). This in-group bias in empathy for a negative emotion was similar but not identical to a previous finding by Neumann et al. (2013). Neumann et al.,
however, reported that there were in-group biases in both emotional and cognitive empathy for negative emotions in both Caucasian and Mainland Chinese participants. The inconsistency between the findings of the current and the previous studies might be explained by the following two points. First, the current authors considered the possible culture–sex interaction effect, while Neumann et al. did not. Second, the current result was for a single type of emotion (i.e., anger), while Neumann et al.’s findings were based on a mixture of negative emotions (e.g., sadness and desperation).

Moreover, in the current study, an in-group bias in recognising sadness with no emotional background was found in the Australian participants. Sadness is an indication of weakness, submission, and seeking help (Hackenbracht & Tamir, 2010; Tiedens, 2001; Wallbott & Scherer, 1986). In the current study, cultural differences and in-group biases in empathy were investigated after the accuracy of emotion recognition for each stimulus was statistically controlled. This step, however, was not conducted in the previous studies (e.g., Cheon et al., 2011; Neumann et al., 2013). Therefore, it is possible that the in-group bias in empathy for negative emotions found in the previous studies might, in part, due to the in-group bias in recognising these emotions. Furthermore, the in-group bias in identifying of sadness might reduce the chance that an individual provides help to an out-group relative to an in-group, and this notion is consistent with the in-group bias found in altruist behaviour (Chiao & Mathur, 2010). Therefore, the current authors suggest that in a cross-cultural communication, individuals could try to verbally speak their need for help from the other groups, which might be more effective than using nonverbal expressions for seeking the help.

To date, researchers hold two main opinions about the origins of in-group bias in empathy, with some suggesting that it predominantly reflects the familiarity between participants and in-group targets (Cao et al., 2015; Désy & Théoret, 2007), while others
considering it is a result of stereotyping or prejudice against the out-group (Avenanti, Sirigu, & Aglioti, 2010). Evidence supporting both views was found; First, MNS is a key brain region of automatic behavioural imitation and empathic process, and it is more likely to be activated when observing familiar rather than unfamiliar stimuli (Calvo-Merino, Glaser, Grèzes, Passingham, & Haggard, 2005; Shamay-Tsoory et al., 2009). Moreover, Cao et al. (2015) reported that increasing out-group contact with Caucasians might help Chinese international students reduce their in-group bias in empathy for physical pain. Second, an in-group bias could also be eliminated if participants have no prejudice against the out-group (Avenanti et al., 2010). Avenanti et al. (2010) investigated empathy of Caucasian and African participants for white, black, and purple hands receiving a needle prick. They found that relative to in-group hands, both participant groups showed reduced empathy for the pain of their social out-group, but they did not reduce their empathy towards the non-existent out-group (i.e., the purple hands, which should be the least familiar hand to both participant groups) (Avenanti et al., 2010). In the current study, even though in-group biases were found in empathy for anger and in recognising sadness, out-group biases in empathy (i.e., appearing more empathic for unfamiliar targets) for happiness and sadness were also found. The current findings seem to suggest that the group bias in empathy is not, or not only, due to the familiarity with the out-group, but there are some cognitive processes involved. However, the final conclusion is open to discussion.

At the beginning of this study, the current authors proposed that there could be in-group bias in empathy for negative emotions but out-group bias in empathy for positive emotions. This prediction was made according to the theory of “reciprocal altruism” (Mathur et al., 2010), which suggests that altruism and empathy are more likely to happen between individuals who have more chance to reciprocate with each
other (e.g., in-group persons). Consistently, Neumann et al. (2013) using Caucasian and Mainland Chinese participants found in-group biases in empathy for negative emotions in both cultural groups, and an out-group bias in empathy for positive emotions in the Mainland Chinese group. Nevertheless, in the current study, out-group biases in empathy for both positive and negative emotions were found.

First, out-group biases were found in both the Australian and Mainland Chinese participants in empathy for happiness with an emotional background. Both participant groups reported more emotional empathy, cognitive empathy, or perspective-taking for the out-group happiness. Neumann et al. (2013) reported a similar finding; namely, a Mainland Chinese group displayed an out-group bias in emotional empathy for positive emotions (i.e., happiness and surprise). Results of the current and the previous study seemed to suggest that participants might be sensitive to out-group happiness. A happy face can be either a symbol of joy or a polite mask to cover negative emotions for maintaining the harmony of interpersonal relationships (Ekman, Friesen, & O'Sullivan, 1988). Meanwhile, Tan and Forgas (2010) found that individuals in a happy mood, relative to in a sad mood, were more likely to make selfish choices; for example, they keep more raffle tickets for themselves rather than divide them equally with others. Therefore, it is unclear that whether the out-group bias in empathy for happiness originates from out-group sensitive or out-group hate, and whether the out-group bias will foster or restrain cross-cultural communication. It should be noted that previous cross-cultural comparison studies have largely focused on negative emotions (e.g., Cheon et al., 2011; de Greck et al., 2012; Xu, Zuo, Wang, & Han, 2009) and few have examined positive emotions (e.g., Neumann et al., 2013). The current findings called attention to conducting research on positive emotions.
Second, an out-group bias was also observed in the Mainland Chinese participants for cognitive empathy for sadness without the emotional background. Sadness is a symbol of weakness (Hackenbracht & Tamir, 2010), and according to Chinese culture, it could be deemed as “losing face” (i.e., causing shame for self or for a group, with a Chinese origin) if an individual expresses sadness without good reason (Ho, 1976). Different from Western cultures, which provide more freedom for individuals to express their inner feelings, the Chinese culture tends to stress the importance of keeping face and requires Chinese people to mask their negative emotions (Yuki, Maddux, & Masuda, 2007). Therefore, the current Mainland Chinese participants might report lower cognitive empathy (i.e., emotional understanding) for the sadness expressed by Asian targets without an emotional background, and this has led to the out-group bias. It should be noted that when sadness was presented with the emotional background, out-group bias in empathy was not shown in the Mainland Chinese participants.

One important contribution of this study is that the current authors tested and statistically controlled the accuracy of participants’ emotion recognition for each stimulus before examining the cultural differences in empathy. As expected, the emotion recognition accuracies for some emotions were very low (e.g., fear, surprise, and neutral, especially when these emotions were presented without the emotion background). Therefore, testing cross-cultural differences in empathy for these emotional stimuli would not be meaningful. A good example is Moriguchi et al. (2005). Moriguchi et al. found that when watching a set of stimuli, Japanese recognised them as surprise but Americans recognise them as fear, and there were cultural differences in brain activations in the “fear matrix” (i.e., the latter participant group had a higher brain activation in the amygdala than the previous group).
Therefore, the current authors excluded these emotions with low emotion recognition accuracies. Furthermore, the current authors conducted missing value replacement for each of the reminding stimuli to replace all responses of empathy provided by participants who had wrong emotion recognition for the stimulus. Finally, the current cross-cultural differences in empathy were investigated after the correct emotion recognition among participants for each stimulus had been statistically ensured. These steps, however, had not been conducted by previous cross-cultural comparison studies of empathy (Atkins et al., 2016; Cheon et al., 2011; e.g., Neumann et al., 2013). Therefore, it might not rule out the possibility that the cultural differences and in-group bias in empathy found in the previous studies reflected participants’ differences in recognising these emotions. The steps of examining and controlling the accuracy of emotion recognition of stimuli before examining cultural differences in empathy were recommended for future studies.

An interesting question about the relationship among cross-cultural differences, sex-difference, culture–sex interaction, and in-group bias is whether they work in parallel or at different levels. The current authors consider that the first two factors work on a parallel level, and the culture–sex interaction is strongly correlated with the first two; however, the last factor, in-group bias, is independent of the others. First, on the individual level, individuals within one culture may receive different education and social expectations concerning the expression of empathy due to their sex role (e.g., Stauder, Cornet, & Ponds, 2011). Second, on the cultural level, each culture has its own rules and philosophy governing the expression of emotions and empathy, and the rules could be identical or different for females and males (e.g., Costa Jr., Terracciano, & McCrae, 2001; Wang, 2001). Third, on a cross-cultural level, when empathy was compared between two cultural groups that have different social rules, emotional
education, social expectations, and philosophies for emotional expression for each
culture–sex group, the culture–sex interaction would show (e.g., Melchers et al., 2015).
Finally, however, with cultural differences, sex differences, and culture–sex interaction,
individuals need not have an in-group bias. The origin of in-group bias (e.g., in-group
familiarity, out-group hate, or reciprocal altruism) is an important subject for further
research.

The current study’s contribution could be summarised as the following four
points. (1) Significant culture and sex interaction effects in empathy had been found
using both self-report questionnaires and behavioural tasks. The current authors suggest
that this interaction should be examined in further cross-cultural comparisons of
empathy. (2) Emotion recognition was checked and statistically controlled before
undertaking any comparisons in empathy between participant groups. These steps
should be conducted in future studies because the current authors found there could be
in-group bias in recognising emotions. (3) The in-group bias in empathy for anger but
out-group bias in empathy for happiness was found. The origin of the group bias (e.g.,
in-group love or out-group hate) should be carefully investigated in the further study. (4)
The current findings revealed that cultural differences in empathy for different types of
emotions (i.e., happiness, sadness, and anger) were different, and for the same emotions
within different contexts (i.e., with or without an emotional background) were also
different. Therefore, it is recommended that further research should carefully choose the
stimuli (i.e., a single emotion or a mixture of emotions, and either with or without an
emotional background) according to their research aims.

The current study also has several limitations, which should be considered while
interpreting the current results. First, the current sample was recruited from a population
of university students, and the sample size was small. Therefore, cross-cultural
differences in empathy in the general populations of the two cultures await replication in future studies. Second, due to the fact that this study conducted a number of analyses based on the same sample, the probability of committing Type I error should be considered. Third, students’ age, year of college, and study major were collected and controlled in the current analyses; however, several other characteristics, such as students’ socioeconomic status, autism trait, and work experience which might also account for the cross-cultural differences in empathy, were not collected. These factors could be confounding factors for the current investigation. Fourth, the recruiting methods differed between Australian and Mainland Chinese groups, and it could be a confounding factor causing the cultural groups’ differences in empathy found in the current study. Finally, the effect size of the cultural differences found in the current study was not large. Therefore, the current result regarding the cultural differences should be interpreted with caution.

In addition, the current study provided three important research questions for further investigation. First, the stimuli of this study included 24 facial expression pictures and 24 expressions of emotion with the emotional background. However, comparisons were not directly made between these two sets of stimuli because these pictures were not matched in many dimensions (e.g., the target was not the same person). To test the impact of the context on cross-cultural differences in empathy, further study ought to be conducted using a better-controlled design (e.g., using the same facial expression but changing the background context). Second, even though the current study used behavioural tasks, the responses provided by the participants in the behavioural tasks might still be subjective. Further study is recommended adapting the current paradigm into brain imaging or physiological experiments to provide a more objective observation of the cross-cultural differences. Finally, all the pictures employed
in the current study were static pictures and this type of stimuli may have limited ability to capture the characteristics of some emotions. For example, Ekman and Friesen (1975–2003) considered surprise as a transient emotion. Video stimuli may be a better choice than static pictures for presenting the transient changes of the dynamic emotions, and therefore, the future researchers should consider including video stimuli to investigate empathy *per se* and the relationship between culture and empathy.  

**Conclusions**

In this study, empathy was compared between Australian Caucasian and Mainland Chinese Han university students using both behavioural tasks and self-report questionnaires. Results illustrate that empathy is a complex social activity, and it is influenced by the traits of participants (e.g., culture and sex), the traits of targets (e.g., culture, emotion, and the emotional context), and the relationships between participants and targets (i.e., in-group and out-group). The current authors’ opinion is that any conclusions stating one cultural group has stronger empathy than the other cultural group could be too facile. In addition, some suggestions were offered in the current study for future cross-cultural research, such as testing culture–sex interaction and controlling the accuracy of emotion recognition. Moreover, based on the current preliminary results, the current authors suggest that to improve cross-cultural communication, individuals could try to verbally express their emotions, feelings, and needs to each other because their facial expressions might not be understood by out-group as well as by in-group people.  

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and communication issues at work, 224-234.


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Table VI. 1

Demographic Information for Four Culture–Sex Groups

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Australian females $(n = 32)$</th>
<th>Australian males $(n = 29)$</th>
<th>Chinese females $(n = 36)$</th>
<th>Chinese males $(n = 32)$</th>
<th>$p$-value</th>
<th>$F$/Chi²</th>
<th>$\eta^2$/Cramer’s $\text{M}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (years, SD)</td>
<td>19.37 (1.39)</td>
<td>19.69 (1.67)</td>
<td>19.47 (0.97)</td>
<td>19.69 (0.69)</td>
<td>.661</td>
<td>0.53</td>
<td>.01</td>
</tr>
<tr>
<td>The first- or second-year of college ($n$ for first, first%)</td>
<td>27 (84.4%)</td>
<td>22 (75.9%)</td>
<td>19 (52.8%)</td>
<td>18 (56.3%)</td>
<td>.016</td>
<td>10.31</td>
<td>.28</td>
</tr>
<tr>
<td>Study major (Art–Science types) (categories, SD)</td>
<td>4.72 (0.73)</td>
<td>4.52 (0.95)</td>
<td>3.31 (0.79)</td>
<td>3.31 (1.00)</td>
<td>&lt; .001</td>
<td>24.83</td>
<td>.37</td>
</tr>
<tr>
<td>Empathy-training ($n$ for yes, yes%)</td>
<td>8 (25.0%)</td>
<td>5 (17.2%)</td>
<td>1 (2.8%)</td>
<td>4 (12.5%)</td>
<td>.048</td>
<td>7.64</td>
<td>.24</td>
</tr>
<tr>
<td>Foreign-communicate (frequency, SD)</td>
<td>2.81 (1.20)</td>
<td>2.59 (1.32)</td>
<td>1.17 (0.61)</td>
<td>1.25 (0.51)</td>
<td>&lt; .001</td>
<td>26.53</td>
<td>.39</td>
</tr>
<tr>
<td>Foreign-encounter (number, SD)</td>
<td>36.63 (30.19)</td>
<td>28.38 (15.59)</td>
<td>6.06 (5.29)</td>
<td>6.16 (4.53)</td>
<td>&lt; .001</td>
<td>27.04</td>
<td>.39</td>
</tr>
</tbody>
</table>

*For Empathy-training, Fisher’s exact test was used because three cells were expected to have a frequency less than five.

Note. Age ranged from 18 to 25. For the study major (Art–Science types), there were five categories: 1 = pure art, 2 = partial art, 3 = half art half science, 4 = partial science, and 5 = pure science; Empathy-training = whether participants had received or were receiving any training or study of empathy; Foreign-communicate = the frequency of communication with the out-group (e.g., studying together or doing business together) on a 5-point Likert scale (1 = very occasionally to 5 = very frequently); Foreign-encounter = the number of daily encounters with the out-group on average (i.e., no conversation was necessary), and univariate outliers of this evaluation were replaced according to Tabachnick and Fidell (2007).
Table VI. 2

*Descriptive Statistics, ANCOVA Results, and Effect Sizes on the Self-report Empathy for Four Culture–Sex Groups*

<table>
<thead>
<tr>
<th>Scale</th>
<th>Australian females</th>
<th>Australian males</th>
<th>Chinese females</th>
<th>Chinese males</th>
<th>ANCOVA†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 32)</td>
<td>(n = 29)</td>
<td>(n = 36)</td>
<td>(n = 32)</td>
<td></td>
</tr>
<tr>
<td>EQ</td>
<td>M  53.84, SD 12.87</td>
<td>M  41.69, SD 12.08</td>
<td>M  42.89, SD 13.04</td>
<td>M  40.62, SD 10.65</td>
<td>F  3.93, η² 0.03, F  12.93, η² 0.10, F  5.22, η² 0.04</td>
</tr>
<tr>
<td>IRI-PT</td>
<td>M  20.59, SD 4.82</td>
<td>M  18.00, SD 3.60</td>
<td>M  17.31, SD 4.01</td>
<td>M  17.78, SD 2.74</td>
<td>F  3.67, η² 0.03, F  2.26, η² 0.02, F  4.07, η² 0.03</td>
</tr>
<tr>
<td>IRI-EC</td>
<td>M  23.06, SD 4.83</td>
<td>M  18.93, SD 4.39</td>
<td>M  18.28, SD 4.46</td>
<td>M  18.91, SD 3.50</td>
<td>F  4.86, η² 0.04, F  4.72, η² 0.04, F  7.91, η² 0.06</td>
</tr>
</tbody>
</table>

*Note.* EQ = total score for the items of Empathy Quotient; IRI = Interpersonal Reactivity Index; IRI-PT = total score for the IRI perspective-taking items; IRI-EC = total score for the IRI empathic concern items.

†In the ANCOVAs, participants’ age, education, study major types, and whether or not had received empathy-related training or study were controlled.

*p < .05. **p < .01.
### Table VI. 3

**The Accuracies of Emotion Recognition of the 24 Pictures of NimStim Set of Facial Expressions for the Current Participants**

<table>
<thead>
<tr>
<th>No.</th>
<th>NimStim Code</th>
<th>Sex</th>
<th>Ethnicity</th>
<th>Emotion</th>
<th>Australian females (n = 32)</th>
<th>Australian males (n = 29)</th>
<th>Chinese females (n = 36)</th>
<th>Chinese males (n = 32)</th>
<th>Overall (n = 129)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>09F_HA_O</td>
<td>Female</td>
<td>Caucasian</td>
<td>Happiness</td>
<td>100.0</td>
<td>96.6</td>
<td>100.0</td>
<td>100.0</td>
<td>99.2</td>
</tr>
<tr>
<td>2</td>
<td>20M_HA_O</td>
<td>Male</td>
<td>Caucasian</td>
<td>Happiness</td>
<td>100.0</td>
<td>96.6</td>
<td>94.4</td>
<td>96.9</td>
<td>97.7</td>
</tr>
<tr>
<td>3</td>
<td>19F_HA_O</td>
<td>Female</td>
<td>Asian</td>
<td>Happiness</td>
<td>100.0</td>
<td>100.0</td>
<td>97.2</td>
<td>96.9</td>
<td>94.6</td>
</tr>
<tr>
<td>4</td>
<td>45M_HA_O</td>
<td>Male</td>
<td>Asian</td>
<td>Happiness</td>
<td>93.8</td>
<td>93.1</td>
<td>94.4</td>
<td>96.9</td>
<td>95.3</td>
</tr>
<tr>
<td>5</td>
<td>09F_AN_O</td>
<td>Female</td>
<td>Caucasian</td>
<td>Anger</td>
<td>100.0</td>
<td>89.7</td>
<td>91.7</td>
<td>100.0</td>
<td>95.3</td>
</tr>
<tr>
<td>6</td>
<td>20M_AN_O</td>
<td>Male</td>
<td>Caucasian</td>
<td>Anger</td>
<td>93.8</td>
<td>96.6</td>
<td>97.2</td>
<td>100.0</td>
<td>96.9</td>
</tr>
<tr>
<td>7</td>
<td>19F_AN_O</td>
<td>Female</td>
<td>Asian</td>
<td>Anger</td>
<td>100.0</td>
<td>96.6</td>
<td>97.2</td>
<td>100.0</td>
<td>98.4</td>
</tr>
<tr>
<td>8</td>
<td>45M_AN_O</td>
<td>Male</td>
<td>Asian</td>
<td>Anger</td>
<td>100.0</td>
<td>89.7</td>
<td>97.2</td>
<td>96.9</td>
<td>96.1</td>
</tr>
<tr>
<td>9</td>
<td>09F_SA_C</td>
<td>Female</td>
<td>Caucasian</td>
<td>Sadness</td>
<td>100.0</td>
<td>96.6</td>
<td>86.1</td>
<td>71.9</td>
<td>84.4</td>
</tr>
<tr>
<td>10</td>
<td>20M_SA_C</td>
<td>Male</td>
<td>Caucasian</td>
<td>Sadness</td>
<td>96.9</td>
<td>96.6</td>
<td>88.9</td>
<td>84.4</td>
<td>91.5</td>
</tr>
<tr>
<td>11</td>
<td>19F_SA_C</td>
<td>Female</td>
<td>Asian</td>
<td>Sadness</td>
<td>96.9</td>
<td>96.6</td>
<td>88.9</td>
<td>93.8</td>
<td>93.8</td>
</tr>
<tr>
<td>12</td>
<td>45M_SA_C</td>
<td>Male</td>
<td>Asian</td>
<td>Sadness</td>
<td>59.4</td>
<td>51.7</td>
<td>83.3</td>
<td>93.8</td>
<td>72.9</td>
</tr>
<tr>
<td>13</td>
<td>09F_FE_O</td>
<td>Female</td>
<td>Caucasian</td>
<td>Fear</td>
<td>68.8</td>
<td>55.2</td>
<td>58.3</td>
<td>50.0</td>
<td>58.1</td>
</tr>
<tr>
<td>14</td>
<td>20M_FE_O</td>
<td>Male</td>
<td>Caucasian</td>
<td>Fear</td>
<td>56.3</td>
<td>41.4</td>
<td>19.4</td>
<td>50.0</td>
<td>41.1</td>
</tr>
<tr>
<td>15</td>
<td>19F_FE_O</td>
<td>Female</td>
<td>Asian</td>
<td>Fear</td>
<td>62.5</td>
<td>62.1</td>
<td>63.9</td>
<td>75.0</td>
<td>65.9</td>
</tr>
<tr>
<td>16</td>
<td>45M_FE_O</td>
<td>Male</td>
<td>Asian</td>
<td>Fear</td>
<td>84.4</td>
<td>65.5</td>
<td>86.1</td>
<td>71.9</td>
<td>77.5</td>
</tr>
<tr>
<td>17</td>
<td>09F_SP_O</td>
<td>Female</td>
<td>Caucasian</td>
<td>Surprise</td>
<td>75.0</td>
<td>82.8</td>
<td>91.7</td>
<td>87.5</td>
<td>84.5</td>
</tr>
<tr>
<td>18</td>
<td>20M_SP_O</td>
<td>Male</td>
<td>Caucasian</td>
<td>Surprise</td>
<td>84.4</td>
<td>62.1</td>
<td>36.1</td>
<td>34.4</td>
<td>53.5</td>
</tr>
<tr>
<td>19</td>
<td>19F_SP_O</td>
<td>Female</td>
<td>Asian</td>
<td>Surprise</td>
<td>65.6</td>
<td>75.9</td>
<td>72.2</td>
<td>90.6</td>
<td>76.0</td>
</tr>
<tr>
<td>20</td>
<td>45M_SP_O</td>
<td>Male</td>
<td>Asian</td>
<td>Surprise</td>
<td>90.6</td>
<td>93.1</td>
<td>69.4</td>
<td>100.0</td>
<td>87.6</td>
</tr>
<tr>
<td>21</td>
<td>09F_NE_C</td>
<td>Female</td>
<td>Caucasian</td>
<td>Neutral</td>
<td>93.8</td>
<td>96.6</td>
<td>88.9</td>
<td>100.0</td>
<td>94.6</td>
</tr>
<tr>
<td>22</td>
<td>20M_NE_C</td>
<td>Male</td>
<td>Caucasian</td>
<td>Neutral</td>
<td>81.3</td>
<td>75.9</td>
<td>72.2</td>
<td>84.4</td>
<td>78.3</td>
</tr>
<tr>
<td>23</td>
<td>19F_NE_C</td>
<td>Female</td>
<td>Asian</td>
<td>Neutral</td>
<td>90.6</td>
<td>89.7</td>
<td>94.4</td>
<td>93.8</td>
<td>92.2</td>
</tr>
<tr>
<td>24</td>
<td>45M_NE_C</td>
<td>Male</td>
<td>Asian</td>
<td>Neutral</td>
<td>71.9</td>
<td>65.5</td>
<td>61.1</td>
<td>75.0</td>
<td>68.2</td>
</tr>
</tbody>
</table>

*Note. NimStim = The NimStim set of facial expressions (Tottenham et al., 2009).*
Table VI. 4

The Accuracies of Emotion Recognition of the 24 Pictures with the Emotional Background for the Current Participants

<table>
<thead>
<tr>
<th>No.</th>
<th>Source</th>
<th>Sex</th>
<th>Ethnicity</th>
<th>Description of the background</th>
<th>Emotion</th>
<th>Australian females (n = 32)</th>
<th>Australian males (n = 29)</th>
<th>Chinese females (n = 36)</th>
<th>Chinese males (n = 32)</th>
<th>Overall (n = 129)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Neumann et al. 2013</td>
<td>Female</td>
<td>Caucasian</td>
<td>a bride in a wedding</td>
<td>Happiness</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>2</td>
<td>Neumann et al. 2013</td>
<td>Male</td>
<td>Caucasian</td>
<td>running a marathon</td>
<td>Happiness</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>3</td>
<td>Internet</td>
<td>Female</td>
<td>Asian</td>
<td>a bride in a wedding</td>
<td>Happiness</td>
<td>96.9</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>99.2</td>
</tr>
<tr>
<td>4</td>
<td>Internet</td>
<td>Male</td>
<td>Asian</td>
<td>running a marathon</td>
<td>Happiness</td>
<td>100.0</td>
<td>96.6</td>
<td>100.0</td>
<td>100.0</td>
<td>99.2</td>
</tr>
<tr>
<td>5</td>
<td>Internet</td>
<td>Female</td>
<td>Caucasian</td>
<td>protesting in a strike</td>
<td>Anger</td>
<td>100.0</td>
<td>96.6</td>
<td>97.2</td>
<td>100.0</td>
<td>98.4</td>
</tr>
<tr>
<td>6</td>
<td>Internet</td>
<td>Male</td>
<td>Caucasian</td>
<td>a driver shouting to others</td>
<td>Anger</td>
<td>96.9</td>
<td>100.0</td>
<td>86.1</td>
<td>100.0</td>
<td>95.3</td>
</tr>
<tr>
<td>7</td>
<td>Internet</td>
<td>Female</td>
<td>Asian</td>
<td>protesting in a strike</td>
<td>Anger</td>
<td>90.6</td>
<td>93.1</td>
<td>97.2</td>
<td>100.0</td>
<td>95.3</td>
</tr>
<tr>
<td>8</td>
<td>Internet</td>
<td>Male</td>
<td>Asian</td>
<td>a driver shouting to others</td>
<td>Anger</td>
<td>93.8</td>
<td>96.6</td>
<td>88.9</td>
<td>96.9</td>
<td>93.8</td>
</tr>
<tr>
<td>9</td>
<td>Internet</td>
<td>Female</td>
<td>Caucasian</td>
<td>a victim of bushfire hugging her children</td>
<td>Sadness</td>
<td>87.5</td>
<td>86.2</td>
<td>91.7</td>
<td>93.8</td>
<td>89.9</td>
</tr>
<tr>
<td>10</td>
<td>IAPS4598</td>
<td>Male</td>
<td>Caucasian</td>
<td>a crying soldier hugging a lady</td>
<td>Sadness</td>
<td>65.6</td>
<td>65.5</td>
<td>80.6</td>
<td>75.0</td>
<td>72.1</td>
</tr>
<tr>
<td>11</td>
<td>Internet</td>
<td>Female</td>
<td>Asian</td>
<td>a victim of earthquake hugging her child</td>
<td>Sadness</td>
<td>96.9</td>
<td>96.6</td>
<td>97.2</td>
<td>100.0</td>
<td>97.7</td>
</tr>
<tr>
<td>12</td>
<td>Internet</td>
<td>Male</td>
<td>Asian</td>
<td>a crying soldier hugging a lady</td>
<td>Sadness</td>
<td>90.6</td>
<td>93.1</td>
<td>86.1</td>
<td>87.5</td>
<td>89.1</td>
</tr>
<tr>
<td>13</td>
<td>IAPS6313</td>
<td>Female</td>
<td>Caucasian</td>
<td>a hostage threatened by a knife-armed robber</td>
<td>Fear</td>
<td>96.9</td>
<td>100.0</td>
<td>100.0</td>
<td>96.9</td>
<td>98.4</td>
</tr>
<tr>
<td>14</td>
<td>Internet</td>
<td>Male</td>
<td>Caucasian</td>
<td>a hostage threatened by a knife-armed robber</td>
<td>Fear</td>
<td>96.9</td>
<td>96.6</td>
<td>94.4</td>
<td>96.9</td>
<td>96.1</td>
</tr>
<tr>
<td>15</td>
<td>Internet</td>
<td>Female</td>
<td>Asian</td>
<td>a hostage threatened by a knife-armed robber</td>
<td>Fear</td>
<td>100.0</td>
<td>96.6</td>
<td>94.4</td>
<td>100.0</td>
<td>97.7</td>
</tr>
<tr>
<td>16</td>
<td>Internet</td>
<td>Male</td>
<td>Asian</td>
<td>a hostage threatened by a knife-armed robber</td>
<td>Fear</td>
<td>90.6</td>
<td>89.7</td>
<td>86.1</td>
<td>87.5</td>
<td>88.4</td>
</tr>
<tr>
<td>17</td>
<td>Internet</td>
<td>Female</td>
<td>Caucasian</td>
<td>holding gift boxes</td>
<td>Surprise</td>
<td>93.8</td>
<td>100.0</td>
<td>88.9</td>
<td>90.6</td>
<td>93.0</td>
</tr>
<tr>
<td>18</td>
<td>Internet</td>
<td>Male</td>
<td>Caucasian</td>
<td>reading news on a laptop</td>
<td>Surprise</td>
<td>68.8</td>
<td>75.9</td>
<td>27.8</td>
<td>40.6</td>
<td>51.9</td>
</tr>
<tr>
<td>19</td>
<td>Internet</td>
<td>Female</td>
<td>Asian</td>
<td>opening a gift box</td>
<td>Surprise</td>
<td>90.6</td>
<td>82.8</td>
<td>52.8</td>
<td>56.3</td>
<td>69.8</td>
</tr>
<tr>
<td>20</td>
<td>Internet</td>
<td>Male</td>
<td>Asian</td>
<td>reading news on a laptop</td>
<td>Surprise</td>
<td>56.3</td>
<td>62.1</td>
<td>36.1</td>
<td>37.5</td>
<td>47.3</td>
</tr>
<tr>
<td>21</td>
<td>IAPS2377</td>
<td>Female</td>
<td>Caucasian</td>
<td>reading a book in a courtyard</td>
<td>Neutral</td>
<td>93.8</td>
<td>96.6</td>
<td>91.7</td>
<td>100.0</td>
<td>95.3</td>
</tr>
<tr>
<td>22</td>
<td>IAPS2102</td>
<td>Male</td>
<td>Caucasian</td>
<td>reading a newspaper on a wooden bench</td>
<td>Neutral</td>
<td>90.6</td>
<td>79.3</td>
<td>97.2</td>
<td>96.9</td>
<td>91.5</td>
</tr>
<tr>
<td>23</td>
<td>Internet</td>
<td>Female</td>
<td>Asian</td>
<td>reading a book in front of a bookshelf</td>
<td>Neutral</td>
<td>93.8</td>
<td>75.9</td>
<td>91.7</td>
<td>96.9</td>
<td>89.9</td>
</tr>
<tr>
<td>24</td>
<td>Internet</td>
<td>Male</td>
<td>Asian</td>
<td>reading a newspaper on a sofa</td>
<td>Neutral</td>
<td>71.9</td>
<td>75.9</td>
<td>77.8</td>
<td>87.5</td>
<td>78.3</td>
</tr>
</tbody>
</table>

Note. IAPS = International Affective Picture System (Lang et al., 1999).
Table VI. 5

Means and Standard Deviations of Empathy Responses by Four Participant Groups for NimStim Happiness, Anger, and Sadness

<table>
<thead>
<tr>
<th>No.</th>
<th>Ethnicity</th>
<th>Emotion</th>
<th></th>
<th>Emotional empathy</th>
<th></th>
<th>Cognitive empathy</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Australian females</td>
<td></td>
<td>Australian males</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Caucasian</td>
<td>Happiness</td>
<td>6.62</td>
<td>2.21</td>
<td>7.01</td>
<td>1.83</td>
<td>6.74</td>
</tr>
<tr>
<td>2</td>
<td>Asian</td>
<td>Happiness</td>
<td>7.15</td>
<td>2.01</td>
<td>6.92</td>
<td>1.82</td>
<td>6.74</td>
</tr>
<tr>
<td>3</td>
<td>Caucasian</td>
<td>Anger</td>
<td>6.03</td>
<td>2.61</td>
<td>6.06</td>
<td>2.33</td>
<td>6.70</td>
</tr>
<tr>
<td>4</td>
<td>Asian</td>
<td>Anger</td>
<td>5.92</td>
<td>2.58</td>
<td>6.31</td>
<td>2.50</td>
<td>6.93</td>
</tr>
<tr>
<td>5</td>
<td>Caucasian</td>
<td>Sadness</td>
<td>5.50</td>
<td>2.43</td>
<td>6.21</td>
<td>1.92</td>
<td>6.77</td>
</tr>
<tr>
<td>6</td>
<td>Asian</td>
<td>Sadness</td>
<td>5.82</td>
<td>2.33</td>
<td>6.20</td>
<td>1.83</td>
<td>6.31</td>
</tr>
</tbody>
</table>

Note.
Table VI. 6

**Means and Standard Deviations of Empathy Responses by Four Participant Groups for Pictures with the Emotional Background**

<table>
<thead>
<tr>
<th>No.</th>
<th>Ethnicity</th>
<th>Emotion</th>
<th>Stimulus</th>
<th>Emotional empathy</th>
<th>Cognitive empathy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Australian females</td>
<td>Australian males</td>
</tr>
<tr>
<td>1</td>
<td>Caucasian</td>
<td>Happiness</td>
<td></td>
<td>7.20 2.14</td>
<td>6.81 1.86</td>
</tr>
<tr>
<td>2</td>
<td>Asian</td>
<td>Happiness</td>
<td></td>
<td>7.74 1.87</td>
<td>6.93 1.87</td>
</tr>
<tr>
<td>3</td>
<td>Caucasian</td>
<td>Anger</td>
<td></td>
<td>7.04 2.37</td>
<td>6.82 1.89</td>
</tr>
<tr>
<td>4</td>
<td>Asian</td>
<td>Anger</td>
<td></td>
<td>6.93 2.12</td>
<td>6.83 1.90</td>
</tr>
<tr>
<td>5</td>
<td>Caucasian</td>
<td>Sadness</td>
<td></td>
<td>7.43 1.85</td>
<td>6.86 1.88</td>
</tr>
<tr>
<td>6</td>
<td>Asian</td>
<td>Sadness</td>
<td></td>
<td>7.75 2.06</td>
<td>7.22 1.86</td>
</tr>
</tbody>
</table>

*Note.*
Table VI. 7

**Means and Standard Deviations of Perspective-taking Responses by Four Participant Groups for Pictures with the Emotional Background**

<table>
<thead>
<tr>
<th>No.</th>
<th>Ethnicity</th>
<th>Emotion</th>
<th>Perspective-taking</th>
<th>Australian females</th>
<th>Australian males</th>
<th>Chinese females</th>
<th>Chinese males</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Caucasian</td>
<td>Happiness</td>
<td></td>
<td>6.92 (n = 32)</td>
<td>6.24 (n = 29)</td>
<td>7.18 (n = 36)</td>
<td>6.59 (n = 32)</td>
</tr>
<tr>
<td>2</td>
<td>Asian</td>
<td>Happiness</td>
<td></td>
<td>7.66 (n = 32)</td>
<td>6.35 (n = 29)</td>
<td>7.04 (n = 36)</td>
<td>6.41 (n = 32)</td>
</tr>
<tr>
<td>3</td>
<td>Caucasian</td>
<td>Anger</td>
<td></td>
<td>6.74 (n = 32)</td>
<td>5.87 (n = 29)</td>
<td>6.26 (n = 36)</td>
<td>6.34 (n = 32)</td>
</tr>
<tr>
<td>4</td>
<td>Asian</td>
<td>Anger</td>
<td></td>
<td>6.39 (n = 32)</td>
<td>5.74 (n = 29)</td>
<td>6.28 (n = 36)</td>
<td>6.19 (n = 32)</td>
</tr>
<tr>
<td>5</td>
<td>Caucasian</td>
<td>Sadness</td>
<td></td>
<td>6.23 (n = 32)</td>
<td>6.20 (n = 29)</td>
<td>6.62 (n = 36)</td>
<td>6.49 (n = 32)</td>
</tr>
<tr>
<td>6</td>
<td>Asian</td>
<td>Sadness</td>
<td></td>
<td>6.17 (n = 32)</td>
<td>5.89 (n = 29)</td>
<td>6.79 (n = 36)</td>
<td>6.73 (n = 32)</td>
</tr>
</tbody>
</table>

*Note.*
Figure VI. I Two-way interactions on the mean accuracies of emotion recognition of NimStim anger and sadness.

(a) an interaction of participant culture and participant sex in the accuracy of emotion recognition of anger, and (b) an interaction of participant culture and target culture in the accuracy of emotion recognition of sadness. Participants were 61 Australian Caucasians (29 males) and 68 Mainland Chinese (32 males). Participants’ age, education (first- or second-year of college), study major (Art–Science types), whether or not received any empathy-related training or study, the frequency of communication with the out-group, and the number of daily encounters with the out-group were controlled. Error bar = 95% confidence interval.
Figure VI. 2 A two-way interaction of participant culture and target culture on cognitive empathy for NimStim sadness.

Participants were 61 Australian Caucasians (29 males) and 68 Mainland Chinese (32 males). Participants’ age, education (first- or second-year of college), study major (Art–Science types), whether or not received any empathy-related training or study, the frequency of communication with the out-group, and the number of daily encounters with the out-group were controlled.

Error bar = 95% confidence interval.
Figure VI. 3 Two-way interactions on emotional and cognitive empathy for happiness with the emotional background.

(a) an interaction of participant culture and target culture in emotional empathy for happiness, and (b) an interaction of participant culture and target culture in cognitive empathy for happiness. Participants were 61 Australian Caucasians (29 males) and 68 Mainland Chinese (32 males). Participants’ age, education (first- or second-year of college), study major (Art–Science types), whether or not received any empathy-related training or study, the frequency of communication with the out-group, and the number of daily encounters with the out-group were controlled. Error bar = 95% confidence interval.
Figure VI. 4 A three-way interaction of participant culture, participant sex, and target culture on cognitive empathy for anger with the emotional background.

Participants were 61 Australian Caucasians (29 males) and 68 Mainland Chinese (32 males). Participants’ age, education (first- or second-year of college), study major (Art–Science types), whether or not received any empathy-related training or study, the frequency of communication with the out-group, and the number of daily encounters with the out-group were controlled.

Error bar = 95% confidence interval.
**Figure VI. 5** A two-way interaction of participant culture and target culture on perspective-taking happiness with the emotional background.

Participants were 61 Australian Caucasians (29 males) and 68 Mainland Chinese (32 males). Participants’ age, education (first- or second-year of college), study major (Art–Science types), whether or not received any empathy-related training or study, the frequency of communication with the out-group, and the number of daily encounters with the out-group were controlled.

Error bar = 95% confidence interval.
CHAPTER VII.

General Discussion

The current authors investigated Western–Asian cross-cultural differences in empathy (which is defined as understanding and sharing the emotions of others; Cohen & Strayer, 1996). Evidence of Western–Asian cross-cultural differences in psychometric characteristics (Chapter IV), self-report (Chapters V and VI), and behavioural responses of empathy (Chapter VI) was observed through three independent investigations. As far as the authors know, this is the first study that included all of these three aspects of empathy while investigating the impact of culture on empathy. Furthermore, cultural differences (Chapters IV to VI), sex differences (Chapters IV to VI), culture–sex interactions (Chapters IV to VI), and in-group/out-group biases in empathy (Chapter VI) were investigated in this thesis. Two-way or three-way interactions were found in participant self-report of and behavioural responses of empathy, and these interaction effects have seldom been investigated by previous researchers (one exception is Melchers, Li, Chen, Zhang, & Montag, 2015). Finally, a simplified Chinese-translated version of the EQ was validated in Mainland China in this thesis. This validation has bridged a gap in this research area by providing an important experimental material for future investigations of empathy in the Mainland Chinese population and future investigations of cultural differences in empathy with this population and people from other cultural backgrounds.

Each study of this thesis brings a deeper understanding of cross-cultural differences in empathy into this research area than the previous study conducted in this thesis and the previous studies reviewed in the literature (Chapter II). In the first study (Chapter IV), the current results of self-report empathy based on the Mainland Chinese participants were compared with previous publications based on Western populations,
and it was found that the sex differences and the mean values of the self-report empathy scores were both smaller in the current Mainland Chinese participants than previously reported for Westerners. This observation illustrates that future researchers can conduct a meta-analysis to calculate the effect size of cultural differences in self-report empathy based on these publications. Moreover, findings of the first study implied that there could be cultural differences or culture–sex interactions in self-report empathy between Mainland Chinese and Westerners. In the second and third studies (Chapters V and VI), the expected culture–sex interaction in self-report empathy was confirmed, and cultural differences in overall empathy (i.e., the EQ score), emotional empathy (i.e., the IRI-EC score), and cognitive empathy (i.e., the IRI-PT score) were found to be significant between Australian and Mainland Chinese female groups but not between the two male groups. Therefore, the current studies addressed a limitation in the literature reviewed (Chapter II); namely, a culture–sex interaction effect should be taken into account when interpreting cultural differences in empathy. Finally, in the third study (Chapter VI), a three-way interaction in behavioural responses of empathy was found with the Australian and Mainland Chinese participants. These results suggest that empathy is a complex interpersonal reactivity influenced not only by the characteristics of participants (e.g., culture, sex, self-construal, and personal distress), but also the characteristics of targets (e.g., culture, emotions, and the background context), and the relationship between participants and the targets (i.e., in-group and out-group).

One of the most important findings in the current thesis is the interaction effects observed in empathy. First, two-way interactions of participant culture and sex were found in self-report overall, emotional, and cognitive empathy in the Australian and Mainland Chinese participants (Chapters V and VI). Cultural differences in empathy were observed between the female groups (i.e., Australian females reported higher
scores than Mainland Chinese females did) but not between the male groups. Further analyses also revealed that the typical sex differences in self-report empathy (i.e., the scores are usually higher for females than for males) reported in the literature (Baron-Cohen & Wheelwright, 2004) were observed in the Australian participants but not in the Mainland Chinese participants. Similarly, Melchers et al. (2015) observed the culture–sex interaction in self-report empathy in Mainland Chinese and German participants, and they also found that sex differences were smaller in the Asian participants than in the Western participants. Moreover, results of a preliminary literature review conducted in Chapter IV (Zhao et al., 2017) indicate that the culture–sex interaction may also exist between other Western and Asian groups (e.g., British people and Koreans). Nevertheless, to date, apart from the current study and that by Melchers et al., few researchers have investigated culture–sex interactions in empathy. As a result, the conclusions of cross-cultural differences in empathy in the literature reviewed in Chapter II are tentative. It is suggested that future researchers should examine potential culture–sex interactions and take the participant’s sex into consideration when interpreting the results.

Furthermore, the current authors endeavoured to account for the cultural differences in self-report empathy found between Australian and Mainland Chinese females. The mediating effects of self-construal and personal distress on cultural differences in empathy were found to be significant. Self-construal is the concept of self as being independent or interdependent on others (Singelis, 1994), and personal distress is self-oriented negative feelings invoked by noticing the suffering of others (Batson, Fultz, & Schoenrade, 1987; Davis, 1980). The current results suggested that relative to the Mainland Chinese females, the Australian females had a clearer boundary between self and others and less personal distress during empathy. Moreover, regression paths of
the mediating models suggested that independent self-construal was a positive predictor of cognitive and overall empathy, while personal distress was a negative predictor of the two components of empathy, and what is more, independent self-construal was a negative predictor of personal distress. These mediating analysis results suggest that having a clearer boundary between self and others (i.e., high independent self-construal) can help the individual inhibit personal distress during empathy, and both of the two factors (high independent self-construal and less personal distress) may, in part, account for individuals such as Australian females having higher self-report cognitive and overall empathy than others such as Mainland Chinese females. These findings were consistent with previous theoretical hypotheses of the relationships between self-construal, personal distress, and empathy (e.g., Neumann, Chan, Wang, & Boyle, 2016; Xu, Zuo, Wang, & Han, 2009). To the best of the author’s knowledge, the current study might bridge a gap by providing the first piece of empirical evidence supporting the mediating effects between these factors. Nevertheless, the current results suggested that the cultural differences in emotional empathy could not be explained by the two factors (viz., independent self-construal and empathy-related personal distress), leaving an important research subject for further investigation. Based on the preliminary results, an empirical suggestion for individuals such as Mainland Chinese females is that keeping some self and other distance during empathy may ameliorate the experience so they are not emotionally overwhelmed.

Using computerised behavioural tasks, a three-way interaction was found between participant culture, participant sex, and the target culture in cognitive empathy for anger depicted within an emotional context. A further investigation of this interaction revealed a culture–sex interaction for the Caucasian targets, and this interaction effect was the same as the one observed for the self-report empathy. That is,
the cultural difference was found between two female groups (i.e., Australian females reported more cognitive empathy than Mainland Chinese females did) for the Caucasian anger; however, such cultural difference was not found for the two male groups; moreover, the sex difference (i.e., females reported more empathy than males did) was found to be significant in the Australian participants, but not in the Mainland Chinese participants for the stimuli. In contrast, for stimuli of Asian anger, no cultural difference was observed either between the two female participant groups or between the two male groups. Nevertheless, for the Asian anger, the significant sex difference (i.e., females reported more empathy than males did) was still observed in the Australian participants, but not in the Mainland Chinese participants. Furthermore, an in-group bias, which could be tested using the computerised tasks but not by self-report empathy questionnaires, was found in the Australian female group, but not the other three culture–sex groups.

The current finding that Australian females reported more cognitive empathy for the targets depicting anger than Mainland Chinese females might have some cultural reasons. Researchers are concerned that due to being influenced by Confucius’ “Golden Mean” philosophy, Chinese people tend to value social harmony much more than Westerners do (de Greck et al., 2012; Drummond & Quah, 2001). Expressing anger may threaten the harmony of social relationships (de Greck et al., 2012). Therefore, Chinese people may not only suppress their anger but also not express empathy for anger, or “see no evil, hear no evil, speak no evil” as described in Confucian philosophy (Smith, 1993). In contrast, Western cultures seem not to discourage individuals from expressing negative emotions as much as Asian cultures do (Kitching, 2009). De Greck et al. (2012) found that when empathising in-group anger, Mainland Chinese participants had higher activation in a region of the brain related to emotional regulation
and personal distress, the DLPFC, than German Caucasians. In contrast, German Caucasians had higher activation in two cognitive empathy-related brain areas, the ITG and middle insula, than the Mainland Chinese participants. De Greck et al.’s results suggested that Mainland Chinese might try to suppress the aversive feelings while watching the targets’ anger, while the Westerners could try to understand the targets’ anger (de Greck et al., 2012). In some respects, the brain imaging findings by de Greck et al. (2012) and the current behavioural findings are consistent. However, the possible interaction effects of participant culture, participant sex, and target culture in empathy were examined in the present study, whereas it was not investigated in the study by de Greck et al. (2012). The brain mechanism underlying the three-way interaction observed in the current thesis is worthy of investigation.

Another important finding of the current studies is that both in-group and out-group biases in empathy were observed. First, in-group biases were found in the Australian participants for emotion recognition of sadness without an emotional context and in the Australian female group for cognitive empathy for anger depicted within an emotional context. In contrast, out-group biases were found in both Australian and Mainland Chinese participants for both emotional and cognitive empathy for happiness within an emotional context. A similar result of ‘in-group bias in empathy for negative emotions and out-group bias in empathy for positive emotions has also been reported by Neumann, Boyle, and Chan (2013) in Australian and Mainland Chinese participants.

Researchers have several opinions about the origins of in-group biases in empathy, including “in-group love” (Mathur, Harada, Lipke, & Chiao, 2010), “in-group familiarity” (Cao, Contreras-Huerta, McFadyen, & Cunnington, 2015; Désy & Théoret, 2007), “out-group hate” (Avenanti, Sirigu, & Aglioti, 2010), and “reciprocal altruism” (Mathur et al., 2010). The theory of “reciprocal altruism” suggests that individuals are
more willing to help those who are more likely to return the favour (Mathur et al., 2010). It should be recognised that in-group individuals seem to have more chance of fulfilling the reciprocal altruism than out-group individuals do. As a result, individuals may exhibit an in-group bias in sharing their resources (e.g., emotions or finances), and they might avoid sharing their resources with the out-group in order to reduce non-reciprocal investment (Mathur et al., 2010). This conclusion is consistent with the finding of in-group bias in altruism (Chiao & Mathur, 2010).

The theory of “reciprocal altruism” is very appealing and it may explain the current findings of in-group bias in negative emotions, such as sadness and anger, and out-group bias in positive emotions, such as happiness. First of all, meanings attributed to each type of emotion should be carefully studied. Sadness is an indication of weakness, submission, and seeking help (Hackenbracht & Tamir, 2010; Tiedens, 2001; Wallbott & Scherer, 1986). Anger is a means of showing authority, asserting and sustaining power, protecting benefits, and making demands (Domagalski, 2006; Emmerson, 2011). Therefore, the two negative emotions of sadness and anger seek resources. In contrast, happiness is a symbol of joy (Ekman, Friesen, & O'Sullivan, 1988), but researchers have pointed out that a happy mood may drive people to be more selfish than a sad mood (Tan & Forgas, 2010). Therefore, in-group bias in negative emotions (i.e., the tendency to ignore an out-group request for assistance) but out-group bias in happiness (i.e., the tendency to be sensitive to a happy but probably selfish out-group) are consistent with the conclusions reached according to the theory of “reciprocal altruism” (Mathur et al., 2010). It should be noted that previous cross-cultural comparison studies of empathy have largely focused on negative emotions (e.g., Cheon et al., 2011; de Greck et al., 2012; Xu et al., 2009), with few studies examining positive emotions (e.g., Neumann et al., 2013). The current findings stress the
importance of conducting investigations into positive emotions. Further, the current finding suggests individuals in cross-cultural circumstances communicate their emotions with the out-group verbally, as their facial expressions of emotions might be misunderstood and result in an inappropriate empathic response by the out-group.

The current studies addressed several limitations in this research area as introduced in Chapter II. First, most of the previous researchers did not control the accuracy of emotion recognition, an important step in the empathic process (Gery, Miljkovitch, Berthoz, & Soussignan, 2009), while the present study did. The current results suggested that the accuracies of emotion recognition of happiness, anger, and sadness were relatively high, but for surprise, fear, and neutral, the accuracies were very low. These findings are consistent with previous research (Tottenham et al., 2009). Moreover, the current results indicate that participant sex, participant culture, and target culture may have an influence on emotion recognition (see Chapter VI). Therefore, in order to obtain a better understanding of cultural differences in empathy per se, future researchers ought to check and control the accuracy of emotion recognition.

Second, researchers found that individual social experience in contact with the out-group might influence their in-group bias in empathy (Cao et al., 2015). A fact illustrated by the current results is that Australian participants had more social experience in contact with the out-group than Mainland Chinese participants did. This could be a confounding factor in investigating in-group bias in empathy between these two cultural groups. Therefore, in the current study, this confounding factor was statistically controlled before conducting cross-cultural comparisons of behavioural responses of empathy, and as far as the current authors know, this is the first time it has been attempted to control in this research area.
Third, the current authors administered emotional stimuli both with and without an emotional background. Preliminary results illustrated that Western–Asian cross-cultural differences in empathy for the two types of stimuli were not identical. Moreover, considering researchers have suggested that background information may have more influence on Asian participants than Caucasian participants during empathy (e.g., Ko, Lee, Yoon, Kwon, & Mather, 2011), the impact of background information in cross-cultural differences in empathy is worthy of careful study.

Finally, the findings of this thesis also confirmed the validity of the simplified Chinese version of the EQ to measure self-report overall empathy in the Mainland Chinese population (Chapter IV). Demonstrating the validity of the EQ in this population is essential for both the current and future research of the relevant topic. Moreover, it should be noted that currently, most of the other self-report empathy questionnaires are used for measuring different components of empathy separately (e.g., the IRI; Davis, 1980) or an aspect of empathy specifically (e.g., the Questionnaire Measure of Emotional Empathy; Mehrabian & Epstein, 1972). In contrast, EQ is one of the few instruments that measure overall empathy as such (Neumann, Chan, Boyle, Wang, & Westbury, 2015). Therefore, the EQ validated in this thesis is an important tool for measuring empathy as a single component in future research with Mainland Chinese.

**Contributions**

In all, the current results illustrate that there are Western–Asian cultural differences in psychometric characteristics, self-report empathy, and behavioural responses of empathy, as predicted at the beginning of the thesis. Moreover, it was found that the traits of participants (e.g., culture and sex), the traits of targets (e.g., culture, emotional type, and emotional context), and the relationship between the
participants and the targets (i.e., in-group or out-group), all have an impact on the empathy responses. The current thesis is one of few studies that investigated cultural differences in empathy through such a systematic process. The important contributions of the current thesis are summarised in the following:

1. A simplified Chinese version of EQ was validated in this thesis. EQ is a self-report measurement testing empathy as a single component (i.e., overall empathy), while most of the other scales (e.g., the IRI) were not. Therefore, the new validated EQ is a valuable tool for measuring overall empathy in further research with Mainland Chinese participants;

2. The interaction between participant culture and sex on empathy was consistently found in both self-report and behavioural responses of empathy in the present thesis. This interaction has seldom been investigated before, and the current results suggest that the interaction is essential for understanding Western–Asian cross-cultural differences in empathy;

3. The current preliminary findings illustrated that Australian females had higher independent self-construal and lower personal distress than Mainland Chinese females; and moreover, these characteristics could be used to explain, in part, the cross-cultural differences in empathy found between them (i.e., Australian females reported higher empathy scores than Mainland Chinese females did);

4. Both cultural differences and in-group biases in empathy have been examined in this study. These two aspects are complementary for understanding the cultural impact on empathy, but few reviewed studies in the literature have reported both.

5. Emotion recognition has been checked and statistically controlled for each stimulus before comparing empathy between participant groups. This step is important for controlling the confounding factor of emotion recognition in
testing cross-cultural differences in empathy; however, it has not been conducted in previous studies.

(6) For individuals such as Mainland Chinese females, it is recommended that they keep some self and other differentiation during empathy. The distance may help them to have a better control of personal distress and be more other-oriented during empathy-eliciting scenarios.

(7) For cross-cultural communicators, it is suggested that people should try to share their emotions and ask for help from out-groups in a forthright way (e.g., using the verbal expression), as their non-verbal expressions of emotions may not be fairly understood by the out-group.

Limitations

The current thesis has several limitations, and these limitations need to be considered when interpreting the current results.

(1) The participant sample size for the third study is small, and the sample sizes for each participant group in all of the three studies are unequal. Even though the current authors conducted the ANCOVAs using Sum of Squares Type II in the second and third study to handle the issue of unequal participant numbers, the issue of sample size might still limit the statistical power of the current study.

(2) The effect sizes of cultural differences in empathy found in the current study were relatively small. There is a need to replicate this study with a larger sample size before making the final conclusion.

(3) All of the three studies were based on participants’ subjective self-ratings. Participants’ subjective ratings might be influenced by the social expectation of showing empathy, and therefore the social expectation could be a confounding factor. However, this factor was not investigated or controlled in the current
study.

(4) The current self-report and behavioural studies were both based on convenience samples recruited from university students. Therefore, the current results could not represent the cross-cultural differences in empathy between the general populations of Australia and Mainland China.

(5) A large portion of the current participants was recruited online. Online recruitment might introduce a bias in the sample in that the sample would be restricted to individuals with access to the Internet (Jami, Mansouri, Thoma, & Han, 2018). This issue further highlighted that the current results might not represent the cross-cultural differences in empathy between the general populations of Australia and Mainland China.

(6) The procedures of participant recruitment were different between the Mainland Chinese and Australian participant groups. Most important, the portion of online participants was larger for the Mainland Chinese group than the Australian group. Relative to a traditional recruitment of participants from a university population that tends to be more homogenous, recruiting online could result in a sample with more variability in demographic characteristics (e.g., age, geographic location, socioeconomic status, and work experience). Thus, the variability in demographic characteristics might be inconsistent between the current Mainland Chinese and the Australian sample, and this could be a confounding factor in the current investigation. In addition, the Mainland Chinese participants were paid by cash or equivalent gift, while the Australian participants were paid by course credit, gift card, or occasionally by cash. The different types of participant gift might attract different populations, and in turn, the motivation of the participants to join the current study could be different between these two cultural groups.
The differences in participant recruitment between the two cultural groups could be the biggest confounding factors in this study.

**Further Directions**

The current thesis remains several questions unanswered. These questions are important for understanding the cultural impact on empathy and should be addressed by future research.

(1) There is a debate about whether the concept of empathy measured by the EQ or IRI is more suited to a Western than an Asian culture. This debate requires attention because the cross-cultural differences observed could be an artefact of an inappropriate measurement tool. Therefore, identifying scales that can be applied with equal confidence across Western and Asian cultures is an important task for future studies.

(2) It was found that the best-fit model of the EQ for Mainland Chinese was a one-factor model which differs from the best-fit model for Western populations. Thus, Western–Asian cross-cultural differences in self-report empathy found in the current study might, in part, reflect psychometric differences between these two cultures. Further studies may consider investigating this issue in greater depth.

(3) For behavioural tasks, the influence of target sex has not been examined. This is because the current participant number could not provide sufficient statistical power to also include target sex as an independent variable. However, it is possible that participants might modulate their empathy responses according to whether the target was female or male. This topic should be studied in further research.

(4) The current study did not directly compare empathy responses to two types of stimuli that depicted the same emotion but within two different emotional
contexts (i.e., a plain backdrop versus an emotional context). This is because, in this study, the main character in these two pictures was not the same person. To understand the impact of the context on empathy, future studies might consider using the same character expressing the same emotion but in two different contexts. It is possible that there will be an interaction in empathy between participant culture and the stimulus background, as researchers have pointed out that contextual information has a stronger influence on Asians than Caucasians (e.g., Ko et al., 2011).

(5) All stimuli used in the third study were static pictures. Static pictures, however, might not capture a genuine expression of emotions, and in fact, by its very nature, it is a dynamic behaviour. This might explain why the accuracy of emotion recognition for some emotions, such as fear and surprise, was low in the current study and in previous studies using the static stimuli (e.g., Tottenham et al., 2009). Relative to a real-life interaction, the static stimuli might increase the difficulty of empathy with the targets; in turn, it might have a bigger impact on interpreting the emotions of the out-group than in-group targets, causing the in-group bias in empathy for negative emotions. Further study can consider using video clips to investigate cross-cultural differences in empathy, as video can capture dynamic emotions much better than static pictures.

(6) As the current findings were largely based on subjective self-ratings, it is recommended that future researchers adapt the current paradigm into brain imaging or physiological experiments, to investigate cross-cultural differences in empathy on a more objective basis.

(7) There may be other factors to explain the Western–Asian cross-cultural differences in empathy found in the current thesis. For example, the current
Mainland Chinese participants were born between 1991 and 1997 within China’s one-child policy period (from 1979 to 2015; Qin, Zhuang, & Yang, 2017). Empathy in this population may be relatively low, compared with the non-single child who has the opportunity to show and experience empathy within siblings. For another example, participants might respond to empathy questions according to social expectations, and the social expectations for showing empathy could be different between Western and Asian populations (Dehning et al., 2013; Ickes, Gesn, & Graham, 2000). The impact of the one-child policy and the social expectations on empathy per se and on cross-cultural differences in empathy should be investigated.

Conclusion

Empathy, sharing and understanding others’ emotions, has been investigated in the current study with both Australian and Mainland Chinese participants. The current results support many of the hypotheses made at the beginning of the thesis, including cultural differences in psychometric characteristics of self-report empathy (Chapter IV), significant culture–sex interactions in self-report empathy (Chapters V and VI), and significant interaction between participant cultural, participant sex, and target culture in behavioural responses of empathy (Chapter VI). Moreover, the current results highlight the fact that empathy is a complex interpersonal activity, which is impacted by the traits of participants (e.g., culture and sex), the traits of targets (e.g., culture, emotional type, and emotional context), and the relationship between these two subjects (i.e., in-group or out-group). Finally, it was discussed that there could be a broad aspect of culture (e.g., self-construal type, social expectation, one-child policy, and emotional expression) that attribute to the cultural differences in empathy. In all, the current results acknowledge
the cultural differences in empathy, but do not conclude that one culture has higher empathy than the other.

“Empathy is love in action” (Shek & Li, 2015, p. 321). At the end of this thesis, some methodological suggestions for further study, and a few recommendations for individuals to improve empathy in cross-cultural communication and in general situations are provided. In the 1950s, when John H. Griffin dyed his skin black, he felt greater caring and understanding from the African people than from his own Caucasian people; Yet, after the dye washed out, the source of empathy was inverted (Griffin, 2004). As the observations recorded in his memoir *Black Like Me* (Griffin, 2004), group biases in empathy were also observed in the current thesis. Nevertheless, the current authors hope that through scientific research and individual efforts, cross-cultural understanding and communication will be increased, and one day, perhaps in the ‘age of empathy’, the love and warmth of empathy will be shared by people from all cultural backgrounds.
References


