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ORIGINAL PAPER

Cross-cultural Differences in Using Nonverbal Behaviors to Identify Indirect Replies

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Abstract
The ability to decode nonverbal cues is essential for effective cross-cultural communication. Despite the significance of nonverbal communication, research in this area has primarily focused on spoken language. This is particularly problematic during indirect communication, where there is a discrepancy between the surface meaning and the true intention (e.g., "Well, there is still room for improvement in your writing skills"). Misinterpretation of nonverbal cues during indirect communication can impede the decoding of true intention and potentially create hostile situations. The present study investigated cross-cultural differences in the use of nonverbal cues in decoding indirect messages. British and Chinese raters watched silent video clips and identified the types of replies from models of their own and the other culture. Results revealed that British raters were able to recognize indirect replies from British models but not from Chinese models above chance level, whereas Chinese raters were able to recognize indirect replies from models of both cultures above chance level. Furthermore, British raters showed higher accuracy and confidence in identifying indirect replies from British models than Chinese models. In contrast, Chinese raters were equally skilled and confident in identifying indirect replies from both British and Chinese models. Additionally, British and Chinese raters employed different nonverbal cues to recognize indirect replies from models of their respective cultures. These findings underscore the importance of cross-cultural differences in identifying indirect replies through nonverbal communication and provide insights to enhance intercultural communication between British and Chinese individuals.

Keywords Cross-cultural Differences · Indirect Reply · Nonverbal Behavior · British · Chinese

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Introduction

Successful social interactions and relationship maintenance depend on effective communication (Cushman & Cahn, 1985). As a result of globalization, people are increasingly likely to interact with people from different cultures. Research on cross-cultural communication has primarily focused on spoken language, while nonverbal aspects have been largely overlooked. Decoding nonverbal messages is crucial for effective cross-cultural interaction (Dohen et al., 2010; Matsumoto, 2006). In social situations, people often use indirect communication, where the intended meaning is different from the surface meaning, to prevent disapproval or criticism and maintain social harmony (e.g., "I don't believe everyone shares the same sense of humor"; Brown & Levinson, 1987; Clark, 1996). It is crucial to comprehend cultural variances in nonverbal behaviors during indirect communication, as misinterpreting nonverbal cues can lead to misunderstanding and hostility. Thus, this study aims to explore cross-cultural differences in nonverbal cue use when decoding indirect replies among British and Chinese individuals.

Nonverbal behaviors such as hand gestures, head movements, facial expressions, and eye gaze have long been recognized as critical aspects of communication. For example, research has shown that hand gestures help listeners comprehend the context of a conversation (Hostetter, 2011), facial expressions and head movements enhance the perception of expressers' emotional status (Krumhuber et al., 2013; Livingstone & Palmer, 2016), and eye gaze indicates social closeness between individuals in a conversation (Breil & Böckler, 2021; Willis et al., 2011). In indirect communication nonverbal cues can be particularly important (Dohen et al., 2010; Kendon, 1997; McNeill, 1985, 1987, 1992). Several studies have highlighted the significant contribution of nonverbal cues in indirect communication. For example, Kelly (2001) found that children better understand their mother's indirect request (e.g., "Don't forget it's raining outside.") when accompanied by nonverbal behaviors, such as pointing to a raincoat, compared to verbal messages only. Similarly, Kirk et al. (2011) found that children with difficulties in pragmatic comprehension were more likely to comprehend hidden meanings correctly when nonverbal behaviors accompanied verbal scenarios. However, these studies have only examined the impact of hand gestures on children's interpretation of indirect messages.

Chu and colleagues (2022) recently conducted a series of experiments to explore the role of verbal and nonverbal behaviors in encoding and decoding indirect replies. Of particular relevance to the present study are Experiments 2a and 2b, which involved participants viewing silent video clips of individuals responding to moderately face-threatening (involving breaking bad news) or neutral (involving a similar situation without any bad news) questions. Participants were instructed to identify the type of reply (direct, indirect, lie or neutral) based solely on nonverbal cues (see the Materials section for details). Results showed that four nonverbal behaviors signaling uncertainty, including palm-revealing gestures, head tilt, facial shrug, and gaze aversion (see definitions in the Nonverbal Behavior Coding section), as well as reply duration, were significant predictors of indirect categorization. That is, individuals were more likely to categorize a reply as indirect if it was longer or included those four nonverbal cues. Although Chu et al. (2022) demonstrated the importance of nonverbal cues in identifying indirect replies, the study was limited to Western participants, and it remains unclear how individuals from Eastern cultures decode indirect replies from nonverbal behaviors.

Communication is deeply rooted in culture and varies in the extent to which people use nonverbal cues to convey a message (Hall, 1976). For example, in individualistic cultures, there is a greater emphasis on personal autonomy and self-expression. Consequently, individuals from such cultures may use a wide range of nonverbal behaviors to convey their emotions and thoughts. In contrast, collectivist cultures emphasize group cohesion, social harmony, and the avoidance of conflict. Therefore, nonverbal behaviors are often discouraged, as they could draw attention to an individual and disrupt group harmony (Matsumoto, 2006; van de Vijver, 2017). Matsumoto et al. (2008) examined cross-cultural differences in the nonverbal display of emotions in individualistic and collectivist cultures across more than 30 countries. Their results showed that collectivist societies generally exhibit lower levels of overall emotional expressiveness compared to individualistic ones. In another study conducted by So (2010), it was found that Americans use hand gestures more often than Chinese during face-to-face communication.

Nonverbal cues can be interpreted differently by people from different cultural backgrounds (Matsumoto & Hwang, 2016). For example, in Western cultures, eye contact often indicates self-confidence, politeness, honesty, liking, and attention (Kleinke, 1986). In contrast, Eastern cultures, such as Chinese and Japanese, usually try to avoid direct eye contact as a sign of respect, courtesy, and obedience (Akechi et al., 2013; Vargas-Urpi, 2013). Similarly, in Western cultures, pointing at someone with the index finger is generally considered acceptable and is often used to draw attention or make a specific reference to someone. However, in Chinese culture, pointing at someone with the index finger is often seen as confrontational and disrespectful, considered rude or impolite. Instead, the Chinese use an open hand to refer to someone (Kita, 2009). Raised eyebrows provide another example of clear cultural differences. In Western culture, a raised eyebrow often signifies surprise, interest, skepticism, or curiosity (Rozin & Cohen, 2003). On the other hand, in Chinese culture, a raised eyebrow can also indicate joy, excitement, and pride (Yu, 2002).

Given these cross-cultural differences in the production and interpretation of nonverbal behaviors, it is possible that individuals are better at recognizing and understanding nonverbal cues from members of their own cultural group compared to individuals from outside that group. This is because they have higher familiarity and exposure to nonverbal behaviors within their own culture than those from other cultures. Supporting evidence primarily comes from cross-cultural research on the facial expression of emotion. For example, Elfenbein and Ambady (2002) conducted a meta-analysis on the universality and cultural specificity of emotion recognition, analyzing a total of 97 studies with 22,148 participants from 42 different nations, 23 different ethnic groups, and a wide range of cultural backgrounds. The findings revealed that while emotions were universally recognized at better-than-chance levels, the accuracy of emotion recognition was significantly higher within the same cultural group, suggesting the presence of an in-group advantage. It's worth noting that majority groups were often less accurate at judging emotions of minority groups than the reverse, and the in-group advantage tended to diminish when cultural groups had greater exposure to one another. To date, cross-cultural research on nonverbal communication has primarily focused on nonverbal behaviors in encoding and decoding emotions. Yet, it remains unknown whether such an in-group advantage also exists in identifying indirect replies from nonverbal cues.

The Present Study

The study had three main objectives: to investigate whether British and Chinese raters could identify indirect replies from nonverbal cues at above-chance levels, to examine whether British and Chinese raters showed in-group advantage when they identified indirect replies in each other's cultures, and to explore cross-cultural differences in using nonverbal cues for indirect reply categorization. We focused on four types of nonverbal behaviors that indicate uncertainty in communication, including palm-revealing gestures, head tilt, facial shrug, and gaze aversion (Bonnefon & Villejoubert, 2006; Juanchich & Sirota, 2013; Youmans, 2001). These nonverbal behaviors were found to be associated with the identification of indirect replies by western participants (Chu et al., 2022). To address the three research goals, British and Chinese raters viewed silent video clips of four types of replies (i.e., direct, indirect, lie, and neutral) collected from British and Chinese models and were asked to categorize the replies and indicate their confidence level.

The selection of British and Chinese cultures for this study is based on a combination of theoretical considerations and societal relevance. British and Chinese cultures have distinct norms and values. For example, British culture places a strong emphasis on individualism, which encourages individuals to freely express their thoughts and emotions (Triandis et al., 1988). In contrast, Chinese culture is a typical collectivist culture deeply rooted in Confucianism, emphasizing composure, poise, and a high degree of self-control (Zhang et al., 2005). By comparing these two cultures, researchers can gain insights into how culture shapes the use of nonverbal cues to decode hidden meanings during indirect communication. With an increasing number of Chinese students, tourists, and professionals visiting the UK, it is crucial to improve the ability of both British and Chinese people to 'read' each other's nonverbal behavior. This improvement will allow for greater levels of trust to be built between UK-China communication partners and help avoid conflicts resulting from misunderstandings of nonverbal behavior.

To examine whether they could identify indirect replies purely from nonverbal cues, British and Chinese raters' accuracy in indirect categorization will be compared against chance level. In addition, the accuracy and confidence of indirect reply categorization will be compared between the British and Chinese raters. If there was an in-group advantage, the raters should be better and more confident in identifying indirect replies from models of their own culture than those of the other culture. Finally, correlational and regression analyses were conducted to determine the contributions of different nonverbal behaviors in indirect reply categorization. The results of the study will provide insights into cross-cultural differences in the use of nonverbal cues for decoding indirect replies.

Method

Participants

Eighty-two native Chinese raters aged between 18 and 31 years old (M=23.78, SD=2.33, 44 females) and 80 native British raters aged 18 and 32 years old (M=21.04, SD=2.49, 51 females) took part in this study. Sensitivity analysis using G*Power 3.1 (Faul et al., 2007) indicated that this sample size was sufficient to detect a small (f=0.2) between-subjects

main effect and a small between-within interaction effect ($f=0.12$) at 80% statistical power ($\alpha=0.05$). The Chinese raters were students at the University of Aberdeen and had never lived outside of China for more than a year. The British raters were UK students at the University of Aberdeen and the Robert Gordon University in Aberdeen. Two Chinese raters were excluded from the study for not following the instructions (i.e., pressing one key for all trials). Participants were compensated with course credits or a £6 monetary reward. This study was approved by the Psychology Ethics Committee at the University of Aberdeen.

Material

The stimuli consisted of silent video clips that were extracted from previous experiments that investigated nonverbal behaviors of native British and Chinese participants during face-to-face communication while delivering moderately bad news. In these experiments, a dyad first heard a face-threatening scenario (e.g., Simon is out of shape and unlikely to qualify for the cross-country running team.). A questioner (confederate) then asked a question based on the scenario (e.g., Are they likely to accept me onto the team?). A responder (participant) sat face-to-face to the questioner then replied to the question. Before commencing the experiment, a fake random group assignment procedure was employed to ensure that the confederate was always assigned the role of the questioner, and the real participant was always assigned the role of the responder. The confederate was used to promote participants' natural responses, as they believed they were interacting with another naive participant rather than the experimenter. No participant reported awareness of the use of a confederate after the experiment. During the experiment, the responder (participant) was asked to provide four types of replies to the questioner spontaneously. A direct reply was a straightforward response (e.g., No, I think your chances of making the team are very slim.). An indirect reply was given to avoid hurting the questioner's feelings (e.g., They are a very fit and competitive team of runners.). A lie reply was given to avoid breaking the bad news (e.g., In my opinion, you have every chance of getting on the team.). In addition, there was a neutral reply condition, in which the pair first heard a neutral scenario (e.g., You and your roommate Simon are discussing the running team at your university. Simon asks you why they seem to have improved dramatically from the previous year.). The questioner then asked a neutral question (e.g., Why do you think the running team is successful this year?) and the responder gave a fact-based neutral answer (e.g., We just have some excellent runners this year).

For the present study, a total of 640 silent video clips were used, with 320 clips created from 32 Chinese models' responses and 320 from created from 38 British models' responses. Each set included an equal number of clips ($n=80$) across the four reply categories (direct, indirect, lie, and neutral). Adobe Premiere Pro 5 was utilized to eliminate the audio from all video clips and conceal the experimenter's face in the backdrop to prevent distracting participants from concentrating on the models. The use of silent video clips was necessary because the Chinese raters were fluent in English, while the British raters had no knowledge of Chinese. Including speech in the videos would have allowed the Chinese raters to consider both verbal and nonverbal cues, whereas the British raters could only rely on nonverbal cues. The selected clips were divided equally into four testing lists, with each containing 160 clips (40 responses in each reply category), half of which were from the Chinese models and half from the British models.

A post-study questionnaire was administered to gather further insight into the participants' use of indirect replies in daily communication and their reliance on nonverbal cues to categorize different types of replies. The questionnaire comprised five questions. The first question asked participants to rate how frequently they use indirect replies when delivering bad news on a five-point scale ranged from 1 (*daily*) to 5 (*never*). The second question asked them to rate their comfort level when someone else uses indirect replies on them on a five-point scale ranged from 1 (*very comfortable*) to 5 (*very uncomfortable*). Question 3 asked them to indicate the extent to which they relied on various nonverbal cues, such as facial expression, eye contact, and hand gestures, to categorize different types of replies in the experiment on a seven-point scale ranged from 1 (*never*) and 7 (*always*). The fourth question was open-ended and asked about any other nonverbal cues participants used during the experiment. The fifth and final question inquired whether participants attempted to read the lips of the speakers in the video clips.

Procedure

Participants were tested individually. After giving informed consent, participants were instructed that they would be presented with silent video clips that contained replies from participants in a previous study, and that they would need to categorize each reply as direct, indirect, lie or neutral, while indicating their level of confidence in each categorization. To ensure that the participants understood the different types of replies, they were given identical example scenarios and replies as those used in the original experiments. The video clips were presented using Presentation® software (Version 20.3, Neurobehavioral Systems, Inc., Berkeley, CA, www.neurobs.com) at the center of a computer screen, with a size of approximately 34 cm in width and 20 cm in height.

Each trial consisted of three phases (see Fig. 1). First, participants viewed a silent video clip of a response from a Chinese or British model. Next, they classified the response type using corresponding keys (1 = direct, 2 = indirect, 3 = lie, 4 = neutral), with no time limit. Participants could re-watch the clip as often as they wished by pressing the Space key. Finally, they indicated their confidence level on a seven-point scale ranged from 1 (*not confident at all*) to 7 (*extremely confident*). The inter-trial interval was 500 ms.

The experiment comprised two blocks of video clips, one featuring Chinese models and the other featuring British models. The order of the two blocks was counterbalanced across participants. Each block contained 80 clips, with 20 in each reply condition. The trials within each block were randomly presented. Two practice trials were given at the beginning of each block to ensure the participants were familiar with the task. After the experiment, the participants completed a questionnaire regarding their everyday use of indirect replies

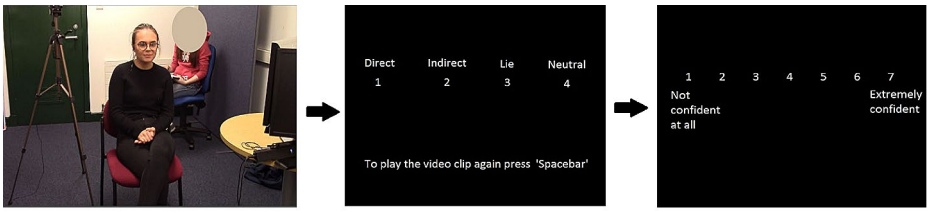

Fig. 1 An Illustration of the Three Phases in Each Trial

and the nonverbal cues they used to categorize different types of replies. Participants were debriefed at the end of the experiment. The entire study lasted approximately 50 min.

Design

A 2×2×4 mixed design was used, with rater culture (British and Chinese) being a between-subject factor, model culture (British and Chinese) and reply type (direct, indirect, lie, and neutral) being within-subject factors. The dependent variables were the categorization accuracy and the confidence level.

Nonverbal Behavior Coding

Nonverbal behavior coding was performed using the ELAN software (Wittenburg et al., 2006). The procedure of nonverbal behavior coding was identical to that used by Chu et al. (2022). Examples are illustrated in Fig. 2. The nonverbal behaviors of each model group were coded by coders from the same culture.

Palm-revealing Gesture

Palm-revealing gesture was coded when the models produced a palm up or revealed more of their palm when doing hand turns (Chu et al., 2014). Given that shoulder shrugs are sometimes generated with palm-revealing and are considered to have the same function, it was also coded as a palm-revealing gesture (Ferré, 2011; Cooperrider et al., 2018). The frequency of palm-revealing gestures was calculated by dividing the number of occurrences by the reply duration in each video clip.

Head Tilt

Head tilt was defined as a single lateral head movement. The frequency of head tilt was calculated by dividing the number of occurrences by the reply duration in each video clip.

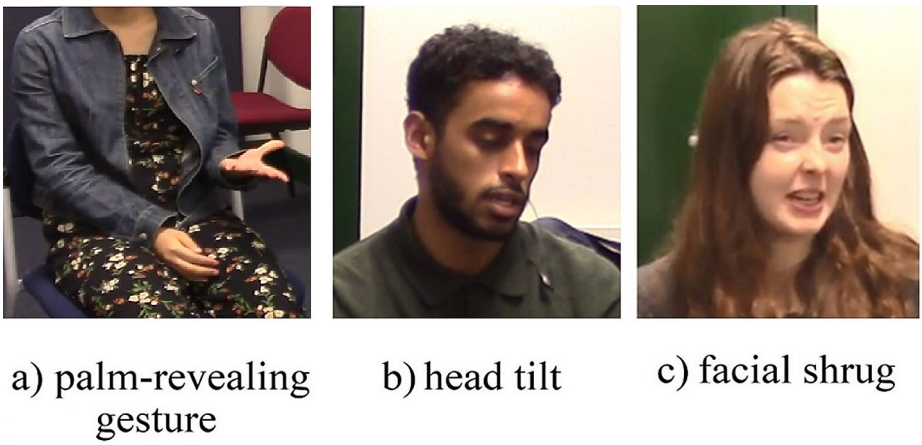

Fig. 2 Examples of (**a**) Palm-revealing Gesture, (**b**) Head Tilt, and (**c**) Facial Shrug

Facial Shrug

Facial shrug involved the movements of pulling mouth concerns back and raising cheeks and eyebrows (Chovil, 1991; Takeuchi & Nagao, 1993; Stone & Oh., 2008; Debras, 2017). A typical facial shrug often consists of the following action units described in the facial action coding system (FACS, Ekman et al., 2002), including dimpler, cheek raiser, cheek puffer, nose wrinkler, inner brow raiser or brow lowerer. The frequency of facial shrug was calculated by dividing the number of occurrences by the reply duration in each video clip.

Gaze Aversion

Gaze aversion was coded when the model did not have eye contact with the questioner. The frequency of gaze aversion was calculated by dividing the gaze aversion duration by the reply duration in each video clip.

Intercoder Reliability

To establish the intercoder reliability of the nonverbal behavior coding, second trained coders, who were from the same culture as the models and were blind to the reply conditions, independently identified palm-revealing gestures, head tilts, facial shrugs and gaze aversion from all video clips. The agreements for coding of palm-revealing gestures, head tilts, and facial shrugs were calculated by dividing the number of nonverbal behaviors agreed between the two coders by the total number of nonverbal behaviors identified by the two coders. They were 92%, 90%, and 89% in Chinese models and 94%, 87% and 91% in British models, respectively. The intercoder reliability for gaze aversion was assessed by the intraclass correlation coefficients (ICC) from the two coders. Results revealed high intercoder reliabilities for both Chinese models ($ICC = 0.985$, $p < .001$) and British models ($ICC = 0.999$, $p < .001$). Any disagreements were resolved through consensus-based discussions between the two coders, and the primary coder's coding was used in the final analyses.

Data Screening

To avoid the influence of extreme outliers on the results of correlational and multiple regression analyses, any data point that deviated more than 3 standard deviations from the mean was adjusted to the value that was 3 standard deviations from the mean. This trimming procedure was employed to avoid losing data while preventing biased results from extreme values (Miyake et al., 2000). In total, this trimming procedure only affected 2% of all observations.

Results

Descriptive Statistics of the Nonverbal Behaviors from all Video Clips

Table 1 displays the descriptive statistics of the palm-revealing gesture, head tilt, facial shrug, gaze aversion and reply duration from all video clips. It presents the total count of

each type of nonverbal behavior, the percentage of video clips containing at least one such nonverbal behavior, as well as the mean, minimum and maximum frequency of each nonverbal behavior. For gaze aversion, the total duration (in seconds), the percentage of clips containing at least one gaze aversion and the mean, minimum, and maximum proportion of gaze aversion were reported. For reply duration, the mean, minimum and maximum reply duration (in seconds) was reported.

Accuracy Analysis in Indirect Replies

We first examined whether British and Chinese raters could correctly identify indirect replies from the silent video clips of British and Chinese models significantly better than chance level. Although the theoretical chance level for a 4-alternative forced-choice task is 25%, such threshold only holds for an infinite number of data samples. Corrected chance levels are more suitable for smaller sample sizes (Combrisson & Jerbi, 2015; Steffens et al., 2020). Following the approach of Combrisson and Jerbi (2015), we calculated the threshold for corrected chance level by using the MATLAB (Mathworks Inc., MA, USA) function binoinv (1- α, *N*, 1/c) * 100/*N*, where α is the significance level, *N* is the sample size, c is the number of alternative choices. For $N=80$ and $c=4$, the corrected threshold for chance was 32.5% at $\alpha=0.05$ and 36.2% at $\alpha=0.01$. As a result, British raters could identify indirect replies from British models at a level significantly better than chance, but not from Chinese models. In contrast, Chinese raters could identify indirect replies from both British and Chinese models at a level significantly better than chance. The accuracies for all four types of categorizations are presented in Table 2.

To examine whether the British and Chinese raters showed in-group advantage when they identified indirect replies, 2 (rater: British, Chinese) x 2 (model: British, Chinese) ANOVA was performed on the categorization accuracy of indirect replies. Analyses of other types of replies were reported in the supplemental materials. There was no main effect of rater culture (F (1, 158)=0.67, $p=.413$, $\eta_p^2=0.004$). There was a main effect of model culture (F (1, 158)=12.18, $p=.001$, $\eta_p^2=0.07$). There was a significant interaction between rater and model culture (F (1, 158)=13.36, $p<.001$, $\eta_p^2=0.08$; see Fig. 3 for descriptive statistics). Bonferroni corrected posthoc *t*-tests, with a corrected alpha level at $p=.013$, showed that British raters were more accurate in identifying indirect replies from British models

Table 1 Descriptive Statistics of the Nonverbal Behaviors from All Video Clips

Condition	British models					Chinese models				
	Total number	Percentage of trials	Mean rate (*SD*)	Min rate	Max rate	Total number	Percentage of trials	Rate (*SD*)	Min rate	Max rate
Palm-revealing gesture	92	18.13	2.93 (7.03)	0	28.87	53	10.94	1.37 (4.38)	0	22.27
Head tilt	55	13.75	1.98 (5.59)	0	24.02	60	15.31	1.81 (4.79)	0	19.26
Facial shrug	32	9.69	1.08 (3.54)	0	15.13	26	8.13	0.68 (2.47)	0	12.08
Gaze aversion (seconds)	646.95	88.75	0.38 (0.25)	0	0.96	951.14	86.56	0.49 (0.31)	0	1
Reply duration (seconds)	--	--	6.18 (3.63)	1.80	18.94	--	--	7.11 (3.86)	1.90	17.58

Table 2 Mean Accuracy of All four types of categorizations

Categorization type	British raters ($N=80$)		Chinese raters ($N=80$)	
	British models	Chinese models	British models	Chinese models
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Indirect	0.39** (0.13)	0.31 (0.12)	0.33* (0.12)	0.34* (0.12)
Direct	0.39** (0.15)	0.40** (0.15)	0.40** (0.15)	0.42** (0.2)
Lie	0.40** (0.19)	0.33* (0.12)	0.28 (0.17)	0.30 (0.17)
Neutral	0.19 (0.12)	0.22 (0.1)	0.22 (0.12)	0.27 (0.13)

Note. *$p<.05$**$p<.01$

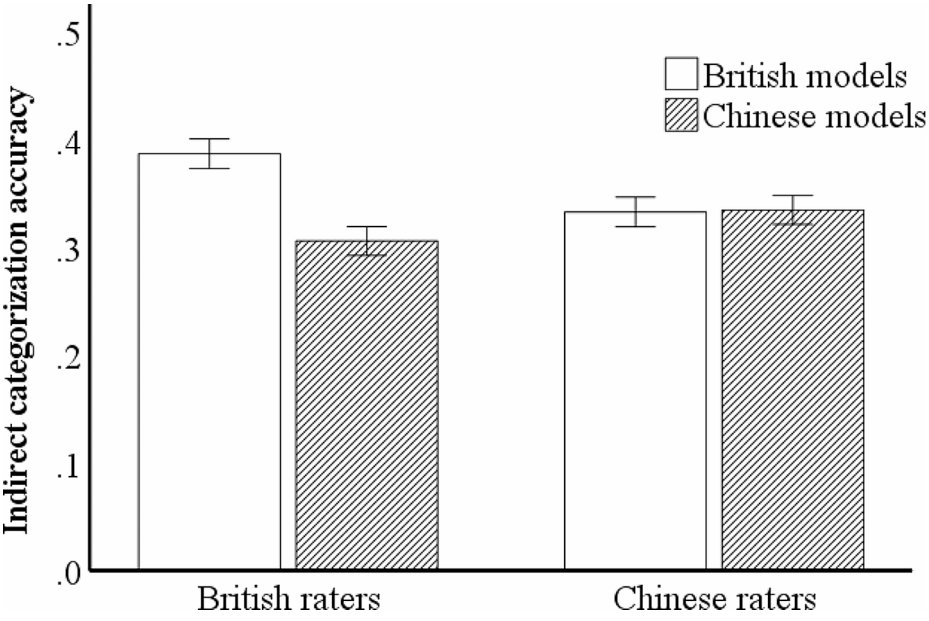

Fig. 3 Mean accuracy of indirect categorization of British and Chinese models from British and Chinese raters. Error bars represent standard errors

compared to Chinese models ($p<.001$), whereas Chinese raters performed equally well in categorizing indirect replies of British and Chinese models ($p=.891$). Additionally, British raters' accuracy in identifying indirect replies of British models was significantly higher than that of Chinese raters for both British models ($p=.006$) and Chinese models ($p=.010$).

Confidence Rating Analysis in Indirect Replies

A 2 (rater: British, Chinese) x 2 (model: British, Chinese) ANOVA was conducted on the mean confidence level of the correct categorization of indirect replies. Analyses of other types of replies were reported in the supplemental materials. There was a main effect of rater culture (F (1, 158)$=6.19$, $p=.014$, $\eta_p^2=0.04$) and a main effect of model culture (F (1, 158)$=14.41$, $p<.001$, $\eta_p^2=0.08$). There was a significant interaction between rater and model culture (F (1, 158)$=10.15$, $p=.002$, $\eta_p^2=0.06$; see Fig. 4 for descriptive statistics).

Bonferroni corrected posthoc *t*-tests, with a corrected alpha level at $p = .013$, showed that British raters had higher confidence in categorizing indirect replies of British models compared to Chinese models ($p < .001$), whereas Chinese raters had similar levels of confidence in categorizing indirect replies of both British and Chinese models ($p = .661$). Additionally, British raters' confidence level in categorizing indirect replies of British models was significantly higher than that of Chinese raters for both British models ($p = .001$) and Chinese models ($p = .001$).

Correlation Between Accuracy and Confidence Rating in Indirect Replies

To examine the relationship between participants' indirect categorization accuracy and confidence levels, Pearson correlation coefficients were computed between each participant's mean indirect categorization accuracy and confidence scores. The results showed no significant relationships between indirect categorization accuracy and confidence levels (British raters rated British models: $r\ (78) = -0.15$, $p = .191$; British raters rated Chinese models: $r\ (78) = -0.02$, $p = .832$; Chinese raters rated British models: $r\ (78) = 0.11$, $p = .341$; Chinese raters rated Chinese models: $r\ (78) = -0.15$, $p = .172$).

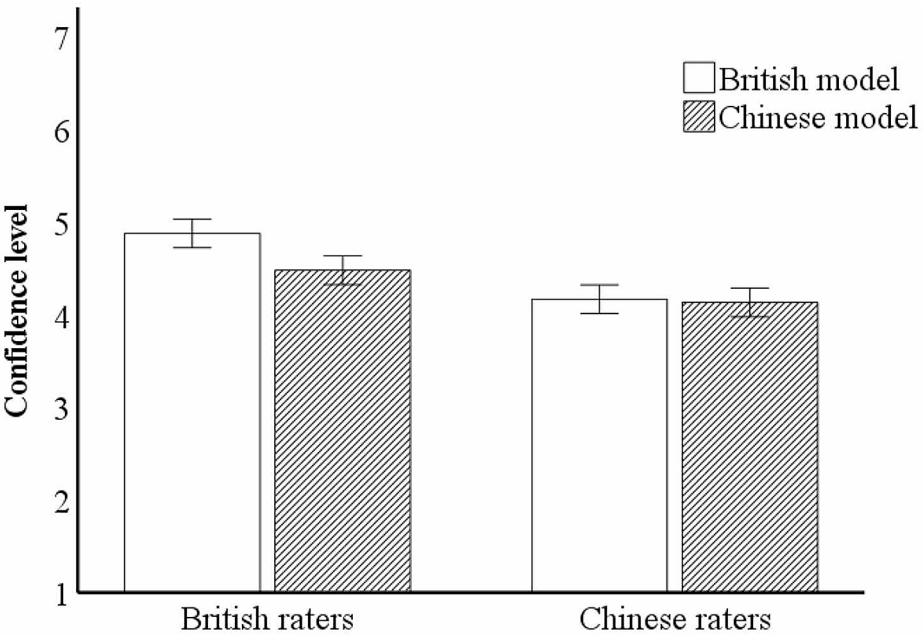

Fig. 4 Mean confidence level of correct indirect categorization of British and Chinese models from British and Chinese raters. Error bars represent standard errors

Table 3 Pearson's Correlation Coefficients between the Predictor Variables and the Proportion of Indirect Replies of British Models by British Raters

Variable	1	2	3	4	5
1. Indirect proportion	-				
2. Palm-revealing gesture	0.22***	-			
3. Head tilt	0.16**	0.14*	-		
4. Facial shrug	0.19***	0.10	0.13*	-	
5. Gaze aversion	0.27***	−0.04	0.09	0.03	-
6. Reply duration	0.62***	0.16**	0.05	0.06	0.43***

Note. $N = 320$; *$p < .05$, **$p < .01$, ***$p < .001$

Table 4 Pearson's Correlation Coefficients between the Predictor Variables and the Proportion of Indirect Replies of Chinese Models by British Raters

Variable	1	2	3	4	5
1. Indirect proportion	-				
2. Palm-revealing gesture	0.13*	-			
3. Head tilt	0.16**	0.04	-		
4. Facial shrug	0.14*	−0.02	0.19***	-	
5. Gaze aversion	0.30***	0.07	−0.03	0.02	-
6. Reply duration	0.53***	0.12*	0.05	0.08	0.30***

Note. $N = 320$; *$p < .05$, **$p < .01$, ***$p < .001$

Predicting Indirect Categorization from Nonverbal Cues

Correlations

Correlational analyses were conducted to investigate the cross-cultural difference in raters' use of nonverbal behavior cues in identifying indirect replies from British and Chinese models. The outcome variable was the proportion of indirect categorization of each video clip (the number of times a clip was categorized as an indirect reply, regardless of accuracy, divided by the total number of times this clip was categorized). The predictor variables included the frequency of each type of nonverbal behaviors and the reply duration. The duration of indirect replies was included as a predictor variable because it was generally longer than other types of replies.

For British raters, the proportion of indirect reply categorization of both British and Chinese models was positively correlated to the frequencies of all four types of nonverbal behaviors and reply duration. For Chinese raters, the proportion of indirect reply categorization for British models was positively correlated with the frequency of facial shrug, the proportion of gaze aversion and reply duration, while the proportion of indirect reply categorization of the Chinese models was positively correlated to the frequencies of palm-revealing gesture, head tilt, gaze aversion and reply duration. Tables 3, 4, 5 and 6 present the Pearson correlation coefficients among the outcome variable and the predictor variables.

Multiple Regression Analyses

Two multiple regression analyses were conducted, one with British raters and the other with Chinese raters, to investigate the independent contributions of each predictor in indirect reply categorization and to determine whether participants relied on different nonverbal cues when categorizing models from different cultures. The outcome variable was the pro-

Table 5 Pearson's Correlation Coefficients between the Predictor Variables and the Proportion of Indirect Replies of British Models by Chinese Raters

Variable	1	2	3	4	5
1. Indirect proportion	-				
2. Palm-revealing gesture	0.07	-			
3. Head tilt	0.05	0.14*	-		
4. Facial shrug	0.20***	0.10	0.13*	-	
5. Gaze aversion	0.30***	−0.04	0.09	0.03	-
6. Reply duration	0.43***	0.16**	0.05	0.06	0.43***

Note. $N=320$; *$p<.05$, **$p<.01$, ***$p<.001$

Table 6 Pearson's Correlation Coefficients between the Predictor Variables and the Proportion of Indirect Replies of Chinese Models by Chinese Raters

Variable	1	2	3	4	5
1. Indirect reply proportion	-				
2. Palm-revealing gesture	0.16**	-			
3. Head tilt	0.13*	0.04	-		
4. Facial shrug	0.04	−0.02	0.19***	-	
5. Gaze aversion	0.14*	0.07	−0.03	0.02	-
6. Reply duration	0.36***	0.12*	0.05	0.08	0.30***

Note. $N=320$; *$p<.05$, **$p<.01$, ***$p<.001$

portion of indirect categorization for each video clip. The predictor variables included the frequency of each type of nonverbal behavior, reply duration, and their interactions with model culture. Model culture was coded as a dummy variable with −1 for British models and 1 for Chinese models. All predictor variables were mean-centered. Both multiple regression analyses satisfied the assumptions proposed by Field (2009). The sample sizes were considered adequate for the inclusion of ten predictor variables (Green, 1991). The normality, linearity, and homoscedasticity assumptions were met by visually inspecting residual scatterplots between errors of predictor variables and the outcome variables. The Durbin-Watson test indicated that the independence of errors assumption was met, as no values fell outside the range of 1–3. The predictor variables did not exhibit multicollinearity problems, as the VIF (Variance Inflation Factor) values ranged from 1.07 to 1.27, which were not substantially larger than 1. All Cook's distance values were below 1, indicating that the regression models were not influenced by any single case.

Using the forced entry method, both multiple regression models on the proportion of indirect replies categorization were significant (British raters: $R^2=42.80\%$, $F\,(10, 629)=38.60$, $p<.001$; Chinese raters rating British models: $R^2=23.30\%$, $F\,(10, 629)=15.65$, $p<.001$).

For British raters, the frequencies of palm-revealing gesture, head tilt, facial shrug, and reply duration were significant predictors of the proportion of indirect categorization for both British and Chinese models. Additionally, there was a significant interaction between model culture and reply duration, indicating that reply duration was a stronger predictor when British raters categorized indirect replies from British models than from Chinese models.

For Chinese raters, the proportion of gaze aversion and reply duration were significant predictors of the proportion of indirect categorization for both British and Chinese models. Additionally, there was a significant interaction between model culture and facial shrug,

Table 7 Summary of Multiple Regression Analyses of Indirect Reply Categorization from British Raters (N=640)

Predictor	β	t	se	95% CI
Palm-revealing gesture	0.10	2.86**	0.001	[0.03, 0.17]
Head tilt	0.11	3.47***	0.001	[0.05, 0.18]
Facial shrug	0.11	3.34***	0.002	[0.05, 0.18]
Gaze aversion	0.06	1.71	0.021	[-0.01, 0.13]
Reply duration	0.54	15.24***	<0.001	[0.47, 0.61]
Model culture x palm-revealing gesture	<0.01	0.01	0.001	[-0.07, 0.07]
Model culture x head tilt	0.01	0.39	0.001	[-0.05, 0.08]
Model culture x facial shrug	-0.02	-0.52	0.002	[-0.09, 0.05]
Model culture x gaze aversion	0.06	1.80	0.021	[-0.01, 0.13]
Model culture x reply duration	-0.15	-4.26***	<0.001	[-0.22, -0.08]

Note. *p<.05, **p<.01, ***p<.001

Table 8 Summary of Multiple Regression Analyses of Indirect Reply Categorization from Chinese Raters (N=640)

Predictor	β	t	se	95% CI
Palm-revealing gesture	0.08	1.92	0.001	[0, 0.16]
Head tilt	0.06	1.54	0.001	[-0.02, 0.13]
Facial shrug	0.07	1.83	0.002	[-0.01, 0.15]
Gaze aversion	0.09	2.33*	0.020	[0.02, 0.17]
Reply duration	0.36	8.96***	<0.001	[0.28, 0.44]
Model culture x palm-revealing gesture	0.08	1.91	0.001	[0, 0.16]
Model culture x head tilt	0.06	1.59	0.001	[-0.01, 0.13]
Model culture x facial shrug	-0.08	-2.09*	0.002	[-0.16, -0.01]
Model culture x gaze aversion	-0.06	-1.47	0.020	[-0.14, 0.02]
Model culture x reply duration	-0.06	-1.38	<0.001	[-0.13, 0.02]

Note. *p<.05, **p<.01, ***p<.001

indicating that facial shrug was used as a cue for indirect replies when Chinese raters categorized indirect replies from British models but not from Chinese models.

Tables 7 and 8 present the individual contribution of each predictor variable on the proportion of indirect reply categorization.

Questionnaire Data

Fifty-eight British raters and fifty-six Chinese raters completed the post-study questionnaire. Results from between-subject t-tests on the answers to the first two questions showed no

differences between British and Chinese raters in how frequently they used indirect replies to convey bad news in everyday communication or their level of comfort when others used indirect replies. Furthermore, Bonferroni corrected *t*-tests on the answers to question 3, with a corrected alpha level at $p = .008$, revealed that British raters relied more on facial expressions and eye contact than Chinese raters when categorizing different types of replies. However, both groups relied similarly on hand gestures, self-touches, body postures, and head gestures to categorize different types of replies. Table 9 shows the results of the *t*-tests on questions 1 to 3. Answers to question 4 showed that both British and Chinese raters also used silent pauses and reply duration to categorize different types of replies. Finally, answers to question 5 indicated that both British (79.25%) and Chinese raters (73.21%) attempted to read lips to aid their categorization.

Discussion

The present study aimed to investigate cross-cultural differences in the use of nonverbal behaviors in identifying indirect replies. British and Chinese raters viewed silent video clips of British and Chinese models giving direct, indirect, lie and neutral replies, and were then asked to categorize the type of reply conveyed in each clip. The results revealed that British raters could only identify indirect replies from models of their own culture at above-chance levels, while Chinese raters could identify indirect replies from models of both cultures at above-chance levels. Furthermore, British raters identified indirect replies more accurately and confidently from British models than from Chinese models. Conversely, Chinese raters identified indirect replies equally accurately and confidently from British and Chinese models. Finally, cultural differences were observed in the use of nonverbal cues by both British and Chinese raters. The following sections provide a comprehensive analysis and discussion of the observed cultural differences in decoding indirectness.

Table 9 Differences Between the British and Chinese Raters on Each Question

Questions	British models		Chinese models					
	M	*SD*	*M*	*SD*	*df*	*t*	*p*	Cohen's *d*
1. Frequency of Indirect reply use (1 = never; 5 = every day)	3.27	0.89	3.32	0.88	112	0.28	0.784	0.05
2. Comfortableness with indirect reply (1 = very uncomfortable; 5 = very comfortable)	3.02	1.10	3.14	1.00	112	0.20	0.525	0.12
3.1 Rely on facial expressions (1 = never, 7 = always)	6.45	0.86	5.07	1.25	112	6.87	< 0.001	1.29
3.2 Rely on eye contact (1 = never, 7 = always)	5.83	1.37	4.82	1.53	112	3.71	< 0.001	0.70
3.3 Rely on hand gestures (1 = never, 7 = always)	5.03	1.47	5.13	1.57	112	0.32	0.752	0.06
3.4 Rely on self-touches (1 = never, 7 = always)	3.48	1.81	3.41	1.87	112	0.21	0.835	0.04
3.5 Rely on body postures (1 = never, 7 = always)	4.10	1.68	4.11	1.91	112	0.01	0.991	0.002
3.6 Rely on head movements (1 = never, 7 = always)	4.48	2.07	3.59	1.81	112	2.45	0.016	0.46

Accuracy and Confidence in Identifying Indirect Replies

Our results showed that British raters were better at identifying indirect replies from models of their own culture than from Chinese models. This finding was not surprising as the British raters in the present study were primarily undergraduate students who did not have much exposure to Chinese culture. This result shows an in-group advantage of the British raters in identifying indirect replies from nonverbal cues. It is consistent with previous research showing that people are better at judging emotional expressions from their own cultural group than from other cultural groups (Elfenbein, 2013). In contrast, Chinese raters were equally good and confident in identifying indirect replies from British and Chinese models. This might be due to the increasing global influence of Western culture (Odinye & Odinye, 2013). English has become more international and modern than other languages (Pan & Block, 2011). Young Chinese have frequent exposure to nonverbal behaviors from English movies, TV series and other media resources (Dong et al., 1998; Huang & Yeh, 2019; Willnat et al., 1997). Additionally, the Chinese raters in this study were Chinese international students, who may have had more exposure to Western culture and a higher level of English proficiency compared to the majority of individuals from China. As a result, they might have already been familiar with Western nonverbal cues and able to use them to identify indirect replies from British models. Future research could consider incorporating a separate group of Chinese speakers with less exposure to Western culture and a lower level of English proficiency.

Furthermore, British raters were more accurate and confident than Chinese raters when categorizing indirect replies from models of their own cultures. This indicates that British people are better at using nonverbal cues from their own culture to identify indirect replies than Chinese people. One possible explanation for this is that British people might use indirect replies more frequently and feel more comfortable about indirect replies than Chinese people in everyday communication. However, this explanation is not supported by our questionnaire data, which showed no differences in the frequency and comfortableness of indirect replies between the British and Chinese raters. Another possibility is that people from individualistic cultures, such as Britain, may be more used to expressing their thoughts and feelings through external nonverbal behaviors. In contrast, those from collectivistic cultures, such as China, are taught to suppress nonverbal behaviors that can reveal personal feelings (Nisbett & Masuda, 2003). This explanation is consistent with the questionnaire data, which showed that British raters relied more on facial expressions and eye contact to categorize different types than Chinese raters, although the use of the other nonverbal cues did not differ between British and Chinese raters.

Our results indicated no significant relationships between categorization accuracy and confidence level in either British or Chinese raters, regardless of the model culture. This lack of correlation could be attributed to the raters' inexperience in categorizing reply types from silent video clips without speech. In such an unfamiliar task, confidence levels may be interpreted differently by different raters. Furthermore, previous research has suggested that accuracy correlates more strongly with less granular confidence scales, such as a binary low/high confidence scale, than with more granular scales involving continuous responses. Scales with continuous responses can be subject to varying interpretations by different participants, potentially leading to more divergent biases. (Jin et al., 2022).

Cultural Differences in Using Nonverbal cues to Identify Indirect Replies

The results indicated that British and Chinese raters relied on different nonverbal cues to identify indirect replies, except for reply duration which was used as a signal of indirectness by both British and Chinese raters in both British and Chinese models. Since beating around the bush is a major strategy to convey messages during indirect replies, longer reply duration was a reliable cue for indirect replies. This idea is supported by the finding from Chu et al. (2022) that indirect replies had the longest duration compared to direct, lie and neutral replies. This result also replicated Chu et al. (2022)'s result that reply duration was a significant predictor of indirect reply categorization when westerners rated western models. Hence, reply duration may serve as a cue that indicates indirect communication in both British and Chinese cultures.

British raters used palm-revealing gesture, head tilt, and facial shrug as nonverbal cues to identify indirect replies. This is consistent with the findings in Chu et al. (2022) that nonverbal behaviors that signify uncertainty, including palm-revealing gestures, head tilt, and facial shrug, were used to identify indirect replies when western raters judged silent video clips of western models. The present study extended this finding by showing that British raters also rely on these nonverbal cues to identify indirect replies in Chinese models. However, gaze aversion in Chu et al. (2022) was a significant cue for indirect categorization, whereas in the current study gaze aversion was not a significant predictor of indirect categorization. This discrepancy may be because Chu et al. (2022) included more indirect clips ($n=179$ in Experiment 2a and $n=320$ in Experiment 2b) than the current study ($n=80$). As gaze aversion was the weakest predictor of indirect categorization in Chu et al. (2022), the current study may lack the statistical power to establish a significant relationship between gaze aversion and indirect categorization. Furthermore, the results revealed that British raters relied more strongly on reply duration to categorize indirect replies from British models than from Chinese models. This difference may be attributed to the fact that in British models, the duration of the indirect replies was the longest among the four types of replies (Indirect: $M=6.18$, Direct: $M=3.54$; Lie: $M=2.78$; Neutral: $M=5.35$). In contrast, in Chinese models, the duration of the indirect replies was only longer than direct and lie replies but shorter than neutral replies (Indirect: $M=7.11$, Direct: $M=3.31$; Lie: $M=3.81$; Neutral: $M=7.23$). Consequently, reply duration was a more salient cue for identifying indirect replies in British models than in Chinese models.

Chinese raters relied on gaze aversion and reply duration to categorize indirect replies from both Chinese and British models. In Chinese culture, avoiding direct eye contact can help preserve social harmony, especially in potentially sensitive or confrontational conversations. It can be a way to show deference and avoid embarrassing or challenging others (Chang, 2001; Wei & Li, 2013). Thus, gaze aversion served as a nonverbal cue of indirect reply for Chinese raters. Furthermore, the significant interaction between model culture and facial shrug indicated that Chinese raters used facial shrug as a cue for indirect replies of British models but not for indirect replies of Chinese models. One might wonder whether this difference is linked to the difference in the production of facial shrug by British and Chinese models. For example, if facial shrugs were used more frequently by the British models than by the Chinese models, then Chinese raters simply relied on the more frequent nonverbal cues produced by the British model group to categorize indirect replies. Instead, it might be associated with the collectivist nature of Chinese culture, where individuals tend

to maintain harmonious social interactions and are less likely to overtly express their inner states (Lim, 2016; Tsai et al., 2007). Chinese culture encourages reserved and less overt facial expressions compared to North American cultures (Gao, 1998). Emotions like joy, anger, and sadness are often contained to avoid imposing feelings on others and to maintain harmony (Bond, 1993; Bond & Hwang, 1986). This could explain why Chinese raters did not rely on subtle facial cues, such as facial shrug, to identify indirect replies in Chinese models. In contrast, Western cultures, often characterized as individualistic, are more likely to openly express their feelings. Therefore, Chinese raters relied on British models' facial shrug to identify indirect replies. Additionally, palm-revealing gestures and head tilts were not considered reliable nonverbal cues for indirect replies by Chinese raters. This may be because, in Chinese culture, maintaining composure and poise in public and interpersonal interactions is seen as a sign of maturity and social grace, and overly expressive body language may be considered impolite or disruptive (Zhang et al., 2005).

Limitations and Future Research

It is important to consider some limitations of the present study. First, the use of video clips instead of face-to-face interaction is a potential limitation as it may not fully capture the richness and complexity of real-world social interaction. Although stimuli such as video clips were more socially relevant and perceived as more comprehensible than static images, vital aspects of social interaction may be lacking in video stimuli (Risko et al., 2012; Tsunemoto et al., 2022). Previous research has shown that live hand movements elicit stronger neural responses than recorded hand movements (Järveläinen et al., 2001), indicating that video stimuli may reduce the perception of real-world social interaction and weaken the associations between nonverbal behaviors and indirectness identification in the current study. To address this limitation, future research could employ virtual reality technology, which offers both experimental control and ecological validity, to further investigate the role of nonverbal cues in indirect communication.

The second limitation of the present study is that the raters only viewed silent video clips without speech. However, in real-life communication, both verbal and nonverbal cues are important in decoding indirect meanings, and people may not exclusively rely on nonverbal cues. In future studies, it would be beneficial to investigate the cross-cultural differences in the use of both verbal and nonverbal cues by testing two cultural groups who know each other's language.

The third limitation worth noting in the present study is that the models in the video recordings were communicating with people from their own culture, which may have affected their use of nonverbal cues. As people tend to adjust their communication style according to the social context, they may use different nonverbal cues or vary the intensity of their behaviors when communicating with individuals from different cultures (Anawati & Craig, 2006; Pekerti & Thomas, 2003; Tian & McCafferty, 2021). To address this issue, future studies could investigate whether raters are more successful in identifying indirect replies when they perceive nonverbal behaviors produced by a foreign speaker towards listeners from the raters' culture rather than the speaker's culture.

Conclusion

Understanding cultural differences in nonverbal behaviors is particularly important during cross-cultural indirect communication. This is because the true intention behind the words goes beyond the surface meaning and misinterpretation of nonverbal cues could lead to misunderstandings and hostile interactions. The current study revealed that British and Chinese raters could identify indirect replies at above-chance levels based solely on nonverbal cues. Furthermore, British raters demonstrated an in-group advantage, performing better in identifying indirect replies from British models compared to Chinese models. In contrast, Chinese raters showed no in-group advantage, performing equally well in identifying indirect replies from both cultural groups. Finally, our research also highlights cultural differences in the use of nonverbal cues to identify indirect replies, except for reply duration being a cue for identifying indirect replies in both cultures. These findings have important implications for raising public awareness of cross-cultural differences in nonverbal behavior and improving British and Chinese people's ability to "read" each other's nonverbal behavior during indirect communication.

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Author Contributions Hio Tong Pang wrote the manuscript. Mingyuan Chu supervised the findings of this work. Xiaolin Zhou and Mingyuan Chu designed and directed the project All authors discussed the results and contributed to the final manuscript.

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Data Availability The stimulus materials will be available on request. Video recording data will be available once related manuscripts based on the same data set have been published.

Code Availability Not applicable.

Declarations

Ethics Approval The study has received ethical approval from the Psychology Ethics Committee at the University of Aberdeen (PEC/3837/2018/1Update: 1021).

Consent to Participate Written informed consent was obtained from all participants before the experiment.

Consent for Publication Written informed consent was obtained from all participants before the experiment.

Competing Interests The authors declare no competing interests.

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