Short Communication

Cultural effects on mindreading

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ABSTRACT

People from other cultural backgrounds sometimes seem inscrutable. We identified a potential cause of this phenomenon in two experiments demonstrating that adults' mental state inferences are influenced by the cultural identity of the target. We adapted White, Hill, Happé, and Frith's (2009) Strange Stories to create matched intra-cultural and cross-cultural mindreading and control conditions. Experiment 1 showed that Australian participants were faster to respond and received higher scores in the intra-cultural mindreading condition relative to the cross-cultural mindreading condition, but performance in the control conditions was equivalent. Experiment 2 replicated this pattern in independent samples of Australian and Chilean participants. These findings have important implications for cross-cultural communication and understanding.

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1. Introduction

Cross-cultural communication and understanding can be challenging. Even if linguistic barriers can be crossed and allowances made for differing behavioural norms, it is still sometimes the case that people from different cultural backgrounds seem 'inscrutable' (see e.g., Mathur, 1991 for a fictional account). This seems to be true whether we are hosting foreign visitors or visiting a foreign country ourselves. The present study suggests a possible cause of this phenomenon: We are less accurate when "mindreading" people from a different culture.

Mindreading is defined as the ability to ascribe internal mental states including desires, beliefs and feelings, to other people in order to explain and predict their behaviour (Wellman, Cross, & Watson, 2001). It appears to be a universal human ability that emerges in early childhood (Slaughter & Perez-Zapata, 2014). Mindreading involves at least two independent processes, characterised as mental-state decoding and mental-state reasoning (Sabbagh, 2004). The former, 'lower-level' process involves automatically interpreting physical cues such as a target's facial expression or eye gaze. By contrast, 'higher-level' mindreading involves making inferences about the causes of a target's behaviour in terms of complex mental states such as false beliefs (Heyes & Frith, 2014).

Mindreading is recognised as a crucial socio-cognitive process to engage efficiently in social situations (Astington, 2003), ranging from intimacy with close friends to encounters with strangers. Does the identity of the target influence our capacity to read what is in his or her mind? This is an important question that few empirical studies have addressed.

A neuroimaging study by Mitchell, Macrae, and Banaji (2006) indicated that mindreading can be influenced by target group membership. Here, participants were shown two faces, each accompanied by a paragraph describing the target's political orientation. The results indicated that participants made faster mindreading judgments for targets whose political beliefs were similar to their own, and that distinctive brain regions were activated when participants judged similar versus dissimilar targets. These data therefore suggest that, at least in circumstances when participants' have explicit prior knowledge of the target's personal beliefs, mindreading is facilitated when participants and targets are similar.

Other studies suggest that attributions of emotion are influenced by the target's cultural group membership (Leyens, Demoulin, Vaes, Gaunt, & Paladino, 2007). For instance, Paladino et al. (2002) asked adults from two European countries to make attributions about people with Spanish/Belgian names vs. North African names. Participants tended to attribute more complex, 'secondary' emotions, such as empathy and guilt, to intra-cultural targets. Such findings suggest that target culture can influence inferences about others' mental states, but this could simply reflect stereotypes about cross-cultural targets.

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One study to date does suggest that mindreading specifically is moderated by the cultural identity of the target. Adams et al. (2010) tested Japanese and Caucasian American participants on a version of the Reading-the-Mind-in-the-Eyes (RME) task, a "lower level" mindreading test in which participants make inferences about the mental states of others based on pictures of their eyes. Adams et al.'s (2010) version of the test included eye photos of both Caucasian and Asian targets. The results indicated that both participant groups gave more accurate mindreading responses for intra-cultural targets. They also reported different patterns of neural activation when participants "read" the eyes of intra- versus cross- cultural targets. These findings point to potential difficulties in processing other-race faces (Young, Hugenberg, Bernstein, & Sacco, 2012) as well as mindreading.

It appears that mindreading may be facilitated within as opposed to across cultures, but existing studies are limited because they assessed cross-cultural mindreading via blind attributions or simple mental state "decoding". The current experiments adapt a *higher*-level mindreading task to investigate how complex mental state attributions are affected by a target's cultural identity.

2. Experiment 1

2.1. Method

2.1.1. Participants

One hundred born and raised Australian first-year students (age mean = 19.64 years) at the University of Queensland took part in this study in exchange for course credit. Six non-Australians were allowed to participate for course credit but their data were discarded. As no previous studies have used our methodology, we arbitrarily pre-set the sample size at $N = 80$, and then increased the sample to $N = 100$ based on the observed effects.

2.1.2. Materials

We adapted the Strange Stories task devised by White, Hill, Happé, and Frith's (2009). This is a naturalistic mindreading measure that invites complex mental state attributions. Each of the Strange Stories describes a scenario and then poses a test question requiring a causal inference. The task includes two types of stories: Mindreading stories depict interpersonal scenarios including double bluff, white lie, persuasion and misunderstanding. Control stories depict scenarios featuring people, animals or objects that require an understanding of logical relations between statements in the story or an inference about a physical event, but no mindreading. For instance, one of the control stories describes two boys of different heights and asks why one but not the other was permitted to ride a rollercoaster. White et al. (2009) carefully designed the mindreading and control stories to equate demands associated with text comprehension, integration of information, making inferences from the text and making inferences from implicit information.

Our adaptation involved creating matched Australian and cross-cultural target conditions for the Strange Stories. We included two main changes. First, we modified the stories to identify the cultural context. The Australian stories described characters, activities and objects from around Australia and the cross-cultural stories referenced a variety of cultural contexts. Second, each story was accompanied by a picture that matched the cultural context. In the mindreading conditions, the pictures were faces of Australian or cross-cultural targets. In the control conditions, the pictures showed the person, animal or object central to the story. Table 1 provides examples of the stories. The full set of adapted Strange Stories is available from the authors.

2.1.3. Procedure

The procedure was approved by the University's ethical review board and carried out in accordance with the provisions of the World Medical Association Declaration of Helsinki.

Participants were randomly allocated to either the Australian or cross-cultural condition. In both conditions, they read eight mindreading stories and eight control stories, presented in blocks. The order of block presentation was counterbalanced across participants.

Instructions, stories and test questions were presented on a computer using EPrime software. The instructions stated that participants should read the story on screen, then press "enter" to access the test question. They were further instructed to formulate a response to the test question before pressing "enter" again to access space for typing their answer. They were presented with two practice stories prior to completing the test trials.

Following the detailed criteria provided by White et al. (2009), answers to the test questions were scored on a 0–2 scale, reflecting accuracy of the response based on the information available in the story. A maximum score of 16 was therefore possible in each of the two conditions (mindreading and control). Additionally, response times were measured as the number of milliseconds between participants' accessing the test question and subsequently accessing the response screen. We hypothesised that this temporal delay reflected the time participants spent in the reasoning process.

Two raters scored each participant's test question responses. One rater was the first author. A second independent assistant who was blinded to the experimental design and hypotheses also rated the responses. The intra-class correlation coefficient of .88 indicated very good reliability for the test question scores. In cases of disagreement, a final score was reached through discussion resulting in 65% of disagreements matching the first author's score and the remainder matching the blind coder's score.

2.1.4. Results and discussion

We first analysed participants' test question scores with a mixed-model ANOVA. Story type (mindreading, control) was the within-subjects factor and cultural target (Australian, cross-cultural) was the between-subjects factor. This analysis revealed a significant interaction, $F(1,99) = 5.01$, $p = .027$, $\eta_p^2 = .049$. Follow-up comparisons indicated that mindreading scores were significantly lower when the targets were cross-cultural ($M = 13.48$, $SE = .23$, 95% confidence interval, or CI, [13.00, 13.96]) compared to Australian ($M = 14.16$, $SE = .21$, 95% CI, [13.73, 14.58]), $F(1,99) = 4.5$, $p = .035$, $\eta_p^2 = .04$. There was no effect of cultural target on control story scores: Australian ($M = 12.98$, $SE = .21$, 95% CI, [12.55, 13.40]) versus cross-cultural ($M = 13.26$, $SE = .27$, 95% CI, [12.71, 13.80]), $F(1,99) = 0.41$, $p > .25$, $\eta_p^2 = .007$.

With respect to response time, again, there was a significant interaction between story type and cultural target, $F(1,99) = 5.10$, $p = .027$, $\eta_p^2 = .05$. This indicated that participants were faster to type their mindreading responses when the targets were Australian ($M = 2504.50$, $SE = 132.44$, 95% CI, [2238.35, 2770.66]) as opposed to cross-cultural ($M = 3007.70$, $SE = 136.96$, 95% CI, [2732.46, 3282.94]), $F(1,99) = 6.98$, $p = .010$, $\eta_p^2 = .066$. By contrast, no difference in response time was revealed between Australian ($M = 3181.93$, $SE = 193.80$, 95% CI, [2792.46, 3571.40]) versus cross-cultural ($M = 3183.37$, $SE = 158.24$, 95% CI, [2865.38, 3501.37]) control stories, $F(1,99) = 0.00$, $p > .25$, $\eta_p^2 = .00$ (see Figs. 1 and 2).

These results show for the first time that cultural identity of the target influences "higher-level" mindreading. However, a potential confound in this design is that stories in the Australian conditions always described a single cultural context, whereas the cross-

Table 1
Mindreading and control story examples.

| Target Condition	Mindreading or control story	Picture	Story	Test question	Score scheme
Australian target	Mindreading Story Double Bluff		**Simon** was born and raised in **Queensland**. He is a **larrikin** and a liar. **Simon's** brother **Jim** knows this, he knows that **Simon** never tells the truth! Now yesterday **Simon** stole **Jim's cricket bat**, and **Jim** knows **Simon** has hidden it somewhere, though he can't find it. He's very cross. So he finds **Simon** and he says, "Where is my **bat**? You must have hidden it either in the cupboard or under your bed, because I've looked everywhere else. Where is it, in the cupboard or under your bed"? **Simon** tells him the **bat** is under his bed.	Why will **Jim** look in the cupboard for the **bat**?	2 points – reference to Jim knowing Simon lies 1 point – reference to facts (that's where it really is, Simon's a big liar) or Simon hiding it without reference to implications of lying 0 points – reference to general nonspecific information (because he looked everywhere else)
Chilean target	Mindreading Story Double Bluff		**Rodrigo** was born and raised in **Valparaiso, Chile**. He is a **prankster** and a liar. **Rodrigo's** brother **Matias** knows this, he knows that **Rodrigo** never tells the truth! Now yesterday **Rodrigo** stole **Matias's soccer shoes**, and **Matias** knows **Rodrigo** has hidden them somewhere, though he can't find them. He's very cross. So he finds **Rodrigo** and he says, "Where are my **soccer shoes**? You must have hidden them either in the cupboard or under your bed, because I've looked everywhere else. Where are they, in the cupboard or under your bed"? **Rodrigo** tells him the **shoes** are under his bed.	Why will **Matias** look in the cupboard for the **shoes**?	2 points – reference to Matias knowing Rodrigo lies 1 point – reference to facts (that's where it really is, Rodrigo a big liar) or Rodrigo hiding it without reference to implications of lying 0 points – reference to general nonspecific information (because he looked everywhere else)
Australian target	Control story		**Bruce** and **Jim** are best friends. They both live in **Queensland** and they are both 10 years old. **Bruce** has **brown hair, green eyes** and **is over 5 feet tall**. **Jim** looks very different to **Bruce**. He has **blonde hair and blue eyes** and he is much smaller than **Bruce**. **Bruce** and **Jim** go on an outing to **Dreamworld**. They go on lots of rides. For the last ride of the day they decide to go on the **Giant Drop**. But there is a sign which says: For safety reasons no persons **under 5 feet** are allowed on.	Why does only **Bruce** go on the **Giant Drop**?	2 points – reference to Jim being too short for the ride or Bob being tall enough (Jim's less than 5 feet) 1 point – reference to Jim being short or Bob being tall or both; no reference to height in comparison to the limit (Jim's shorter than Bob) 0 points – reference to irrelevant or incorrect factors (Jim doesn't like rollercoasters)
Chilean target	Control story		**Daniel** and **Cristian** are from **Santiago, Chile** and they are best friends. They are both 10 years old. **Daniel** has **brown hair, white complexion** and is over **135 centimetres** tall. **Cristian** looks very different to **Daniel**. He has **black hair and brown skin** and he is much smaller than **Daniel. Daniel** and **Cristian** go on an outing **to Fantasilandia**. They go on lots of rides. For the last ride of the day they decide to go on the **big rollercoaster**. But there is a sign which says: For safety reasons no persons **under 135 centimetres** are allowed on.	Why does only **Daniel** go on the **rollercoaster**?	2 points – reference to Cristian being too short for the ride or Daniel being tall enough (Cristian less than 135 centimetres) 1 point – reference to Cristian being short or Daniel being tall or both; no reference to height in comparison to the limit (Cristian's shorter than Daniel) 0 points – reference to irrelevant or incorrect factors (Cristian doesn't like rollercoasters)
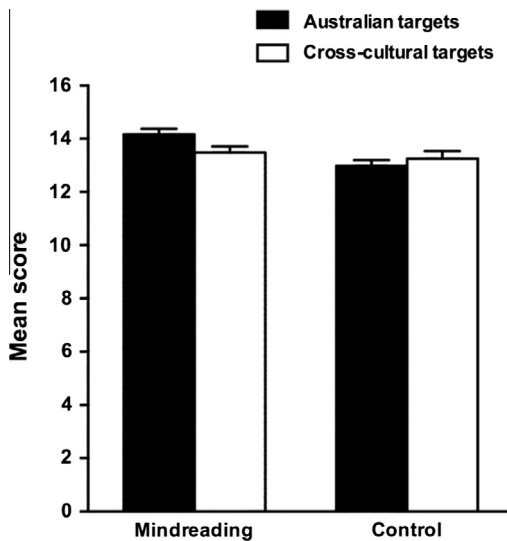
Fig. 1. Mean scores (error bars represent standard errors) for story type.
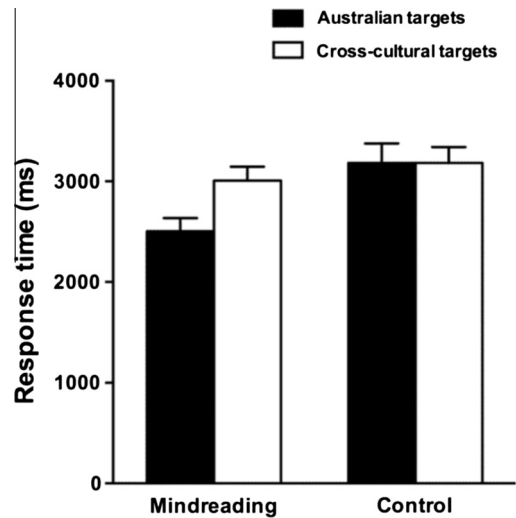

Fig. 2. Mean response times (error bars depict standard errors) for story type.

cultural conditions described a variety of cultural contexts. Thus, it is possible that this variability increased the processing demands associated with task completion, and led to the slower response times and lower accuracy seen in the cross-cultural condition. To address this issue, we conducted a second experiment in which the Australian and the cross-cultural conditions each described only a single cultural context.

In addition, although Experiment 1 suggests that cross-cultural mindreading may be more challenging than intra-cultural mindreading, in order to draw such a general conclusion, it is important to rule out the possibility that Australians are unique in this regard. Therefore in Experiment 2 we also expanded the study design to include participants from two different cultures, namely Australia and Chile. We contrasted these two groups because they are unmistakably different cultures with distinct languages and artifacts, and members that have culturally-typical facial features. Furthermore, we had access to access to native Australian and Chilean participant samples that were well matched on age, gender and educational level. Thus in Experiment 2 we compared mindreading speed and accuracy when participants made judgements about targets from their own, and from the opposite cultural group.

2.2. Experiment 2

2.2.1. Participants

Based on the results of our first study, we set the sample size at $N = 100$. However, we ended up testing a higher number of undergraduates in both samples because more individuals signed up to the research study webpages than anticipated.

A final sample of 120 native Australian first-year students (age mean = 21.01) from the University of Queensland and 108 native Chilean undergraduate students (age means = 20.73) from the University of Tarapacá participated in this study in exchange for course credit. Eight non-Australians in the former sample and 6 non-Chileans in the latter were tested and given course credit but their data were discarded. We also discarded 6 additional Australian and 5 additional Chilean participants because their response times were greater than 3 standard deviations from their respective sample means.

Participants in each country were randomly assigned to either the intra-cultural or cross-cultural condition.

2.2.2. Materials

The task was equivalent to that used in Experiment 1 except that the cross-cultural stories were replaced with a set of Chilean stories that were matched to the Australian stories. Then, the Australian and Chilean Strange Stories were translated into Spanish by the first author. The translation was reviewed and approved by a second Spanish native speaker.

2.2.3. Procedure

The procedure was approved by both universities' ethical review boards.

The procedure was identical to Experiment 1. Inter-rater reliability for the test question scores was very good with intra-class correlation coefficients of .83 for the Australian participants and .84 for the Chilean participants. In cases where the raters disagreed, a final score was determined through discussion resulting in 70% of the final scores matching the first author's original determination and the remainder matching that of the blind coder.

2.2.4. Results and discussion

With respect to score results, a mixed-model ANOVA with story type (mindreading, control) as a within-subjects factor and cultural target (Australian, Chilean) and participant culture (Australia, Chile) as between-subjects factors revealed a significant three-way inter-
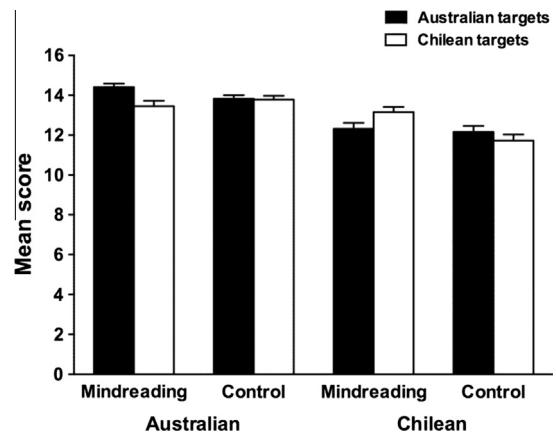

Fig. 3. Mean scores (bars represent standard errors) for story type according to country of participants (Experiments 2 and 3, respectively).

action, $F(2, 224) = 13.67$, $p < .001$, $\eta_p^2 = .058$. Follow-up analyses by participant culture revealed that, amongst Australian participants, mindreading scores were significantly higher in the Australian condition ($M = 14.41$, $SE = .18$, 95% CI, [14.04, 14.79]) relative to the Chilean condition ($M = 13.45$, $SE = .27$, 95% CI, [12.91, 13.98]), $F(1, 119) = 8.78$, $p < .004$, $\eta_p^2 = .06$. By contrast for Chilean participants, mindreading scores were significantly higher in the Chilean ($M = 13.16$, $SE = .25$, 95% CI, [12.66, 13.66]) relative to Australian condition ($M = 12.32$, $SE = .29$, 95% CI, [11.73, 12.90]), $F(1, 107) = 4.57$, $p = .035$ $\eta_p^2 = .041$. There was no effect of cultural target on control story scores, for either group of participants. For the Australian participants, Australian control story scores ($M = 13.83$, $SE = .17$, 95% CI, [13.48, 14.16]) were almost identical to Chilean control story scores ($M = 13.78$, $SE = .19$, 95% CI, [13.39, 14.17]), $F(1, 119) = 0.36$, $p > .25$, $\eta_p^2 = .00$. Similarly, amongst Chilean participants control story scores did not differ by cultural target: Chilean control stories ($M = 11.72$, $SE = .31$, 95% CI, [11.09, 12.34]) versus Australian control stories ($M = 12.16$, $SE = .30$, 95% CI, [11.57, 12.76]), $F(1, 107) = 1.07$, $p > .25$, $\eta_p^2 = .10$. Thus the pattern of findings for test response scores confirm an advantage for intra-cultural as opposed to cross-cultural mindreading, for both Australian and Chilean participants.

Considering response times, a 2 (story type) × 2 (cultural targets) × 2 (cultural background) mixed-model ANOVA showed a significant three-way interaction, $F(2, 224) = 6.38$, $p < .012$, $\eta_p^2 = .028$. Amongst Australian participants, mindreading responses were slower in the Chilean condition ($M = 2553.02$, $SE = 105.62$, 95% CI, [2341.66, 2764.38]) compared to the Australian condition ($M = 2285.17$, $SE = 81.68$, 95% CI, [2121.73, 2448.62]), $F(1, 119) = 4.02$, $p = .047$, $\eta_p^2 = .033$. However, different from the Australian participants, the interaction between cultural target and story type was not significant for the Chilean participants, $F(1, 107) = 2.65$, $p = .107$, $\eta_p^2 = .024$. No effects of cultural target on response time were found in the Australian ($M = 2753.32$, $SE = 143.20$, 95% CI, [2466.76, 3039.87]) or Chilean ($M = 2650.88$, $SE = 100.42$, 95% CI, [2449.94, 2851.83]) control conditions, $F(1, 119) = 0.34$, $p > .25$, $\eta_p^2 = .003$ (see Fig. 3).

3. General discussion

These two experiments are the first to demonstrate cultural effects on "higher-level" mindreading. The results showed that, when considering other people from the same cultural background, mindreading is more accurate and generally faster, compared to when considering people from another culture.

Specifically, in both experiments, participants' mindreading scores were lower when reasoning about cross-cultural relative to intra-cultural targets. This effect was evident amongst Australian participants whether they were reasoning about targets from a variety of different cultures (Experiment 1) or about targets from a single non-Australian culture (Experiment 2). Experiment 2 also demonstrated that this pattern was not unique to Australians, with Chilean participants receiving higher mindreading scores when reasoning about Chilean as opposed to Australian targets. It might be argued that the current results reflect a general difficulty understanding the stories about foreign situations, and not mind-reading of foreigners *per se*. For instance, the use of foreign names and foreign scenarios could potentially have influenced task performance, independent of any more specific influence on mind-reading. Importantly, this explanation seems unlikely given that the control stories also included foreign names and scenarios, yet no effect of culture was observed in either experiment when participants answered questions about the control stories. Thus, participants did not find it generally more difficult to draw inferences about stories depicting cross-cultural actors, objects and places. Rather, it was specifically when asked to engage in mindreading that participants' performance was influenced by the cultural context.

The response time results indicated that in addition to being lower in accuracy, Australian participants were also slower to formulate mindreading responses about cross-cultural targets. For Chilean participants the overall pattern of responding was similar, but did not attain significance. However, the critical point here is that even though Australian participants took greater time to reason about the mental states of the cross-cultural targets, accuracy was reduced. This implies that the increased difficulty associated with understanding cross-cultural mental states cannot be compensated for simply by allocating greater time (and therefore presumably more effort) to the task.

Our findings therefore align with Adams et al.'s (2010) research on lower-level mindreading. As noted, this study showed that simple mental state attributions based on "eye-reading" are more accurate for intra-cultural relative to cross-cultural targets. This study also showed that the former was accompanied by stronger activation of areas within the "social brain" (Adams et al., 2010). Future work is now needed to establish whether a similar pattern of neural activation emerges when participants are engaged in *higher*-level mindreading.

What explains this cultural effect on mindreading? One possibility, suggested by Adams et al.'s (2010) work, is that accurate mindreading is facilitated when the target is similar to oneself. However, other research suggests that similarity can actually lead to less accurate mindreading. For instance, Todd, Hanko, Galinsky, and Mussweiler (2011) found that German participants were less accurate in predicting the false beliefs of German, compared to Turkish targets. It was argued that this may reflect an egocentric bias, and specifically a tendency to attribute one's own (true) beliefs about the scenarios to similar others. Identifying a similar effect, but invoking a different causal mechanism, Savitsky, Keysar, Epley, Carter, and Swanson (2011) argued that perspective-taking may be more relaxed – and therefore less accurate – when interacting with a friend relative to a stranger.

However, in both of these latter studies, participants were provided with privileged information that may have encouraged egocentrism or a more relaxed perspective-taking style when reasoning about similar targets. This differs from real-world cross-cultural mindreading, which is often likely to involve complex and ambiguous cues, like those described in the Strange Stories. With this in mind, the current findings are most consistent with Apperly's (2010) suggestion that people from the same cultural background share a common understanding of what is relevant in a given situation, which in turn creates a natural interpersonal alignment that facilitates accurate mindreading.

From a practical perspective, our findings indicate relatively small effects. However, it may be that these decrements in mindreading accuracy, coupled with slower responding, add up over the course of extended interactions with cross-cultural partners to produce a mutual sense that the other is inscrutable. Further work that assesses mindreading with more naturalistic, dynamic tasks will be valuable for assessing the impact of these effects.

Author contributions

V. Slaughter conceived and designed the experiments, D. Pérez-Zapata collected and analysed the data and all three authors wrote the manuscript.

Declaration of conflicting interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Acknowledgements

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