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Running head: *The Saliency of Gestural Misinformation*

The saliency of gestural misinformation in the perception of a violent crime

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Abstract

Recent research has revealed that misinformation from gestures can influence eyewitness memory. However, it is still unclear whether gestural misinformation can emulate the effects of verbal misinformation on the reporting of major details in serious crimes. To investigate the salience of suggestions provided nonverbally, and how these compare to those made verbally, two experiments were conducted. In Experiment 1, participants watched footage of a crime scene and were presented with one of two types of gestures during questioning that suggested different interpretations of the crime. The results confirmed that the gestures influenced responses, with participants altering their interpretation of the crime according to the information gestured to them. Experiment 2 built on this to investigate how comparable gestural influence was to verbal influence. The results revealed that gestural misinformation caused participants to alter their interpretation of the crime and elicited the same effects as verbal misinformation. Across the two experiments, participants were unlikely to identify the misleading gestures or report feeling misled by them. These results reveal new insights into the strength of gestural misinformation and show that, despite their subtle nature in communication, gestures can exert a powerful influence in eyewitness interviews.

Keywords: misinformation; eyewitness memory; nonverbal influence; gestures;

The Saliency of Gestural Misinformation in the Perception of a Violent Crime

The accuracy of eyewitnesses' testimonies and their reliability in determining the outcome of crimes has been investigated for many years. As a result, a considerable body of evidence has revealed that eyewitness accounts are highly prone to error (see Chobak & Zaragoza, 2012; Loftus, 2005; Zaragoza, Belli, & Payment, 2007 for reviews). The reliability of eyewitness memory can be compromised largely by the introduction of post-event information which can become entangled with their original memory of an event (Loftus & Hoffman, 1989). It is now well established that, when post-event information is suggested to witnesses from an interviewer, they can incorporate this information into their original memory of the event and report false information as a result.

Much research in eyewitness testimony has focused on speech as the source of post-event information in interviews, but there is evidence to suggest that misinformation can also be provided outside of speech; for instance, through doctored photographs (Frenda, Knowles, Saletan, & Loftus, 2013; Sacchi, Agnoli, & Loftus, 2007). However, information can also be communicated independently of speech, through hand gestures (Goldin-Meadow, 1999; Goldin-Meadow, Nusbaum, Kelly, & Wagner, 2001; Kelly, Barr, Church, & Lynch, 1999). For example, when the sentence "she chased him out of the house" is spoken alone it gives only a limited amount of information, but the same sentence accompanied with a fist being waved in the air suggests that a weapon was used (McNeill, 1992). A large body of research has shown that individuals recall more information about a story when the speaker gestures (Beattie & Shovelton, 1999, 2001), even if this information conflicts with information from speech (Cassell, McNeill, & McCullough, 1999).

Researchers have built on this effect to demonstrate that additional information conveyed through gestures can also serve as a form of misinformation in police interviews. Broaders and Goldin-Meadow (2010) found that children presented with nonverbal suggestions during questioning incorporated these suggestions into their memory of a witnessed event and recalled inaccurate details as a result. While children are known to be highly prone to suggestion (Bruck & Ceci, 1999), Gurney, Pine & Wiseman (2013) confirmed a gestural misinformation effect in adults. Participants viewed a mock-up crime scene of two men fighting in an alleyway and, when asked "did you notice any jewellery?" accompanied by a hand gesture depicting a ring, many witnesses reported seeing a ring. These studies demonstrate that nonverbal communication appears to exert similar effects that verbal suggestion often has on influencing eyewitness accounts.

So far, the observation of gestural misinformation has been limited to situations when participants recall minor details (e.g. a culprit's appearance) of relatively low stake crimes (e.g. robbery). It is unclear at present whether gestural misinformation effects, like verbal misinformation effects, can extend beyond the suggestion of minor details and alter a memory representation of a perpetrator's actions in a more serious crime (such as the sighting of a weapon that was absent). This is an important observation to make; it would not only highlight practical implications for the interviewing of witnesses but would also provide new insight into the robustness of gestural misinformation in comparison to the well-established effect of verbal misinformation.

It is unclear as to how the process of gestural misinformation compares to the process of verbal misinformation. Typically, suggestions made by interviewers are processed by eyewitness intuitively; eyewitnesses have been found to be more likely to accept suggestions when the interviewer is regarded as having high authority (Skagerberg & Wright, 2009; Smith & Ellsworth, 1987). Eyewitnesses may depend on suggestions to help them recall an

event. Eyewitnesses with a weak memory of the original event are more susceptible to verbal suggestion (Pezdek & Roe, 1995) and younger children have been found to be more susceptible to verbal misinformation effects than older children (Ceci & Bruck, 1993; Roberts & Blades, 1999). However, while an increased age and stronger memory trace may buffer children against verbal misinformation effects, they do not buffer them against gestural misinformation effects (Kirk, Gurney, Edwards, & Dodimead, 2015). This suggests that eyewitnesses do not incorporate gestural misinformation through the same process; gestured information may bypass the traditional process of information uptake and, thus, be a more pervasive device to mislead eyewitnesses.

Hand gestures form an integral part of our language and communication system from an extremely young age (Goldin-Meadow, 2000, 2002; Thurnham & Pine, 2006), they occur frequently in communication among adults (Beattie & Shovelton, 2002; Rauscher, Krauss, & Chen, 1996) and are often presented without much conscious thought or effort (Krauss, 1998; McNeill, 1992). Therefore, they communicate information in a much more subtle way. Due to our habituation in receiving and conveying information through gestures, the process of gleaning information from them often occurs outside of our awareness. Kelly, et al (1999) report that individuals who heard the sentence "my brother went to the gym" with a 'shooting a basketball' gesture incorporated this 'basketball' information into the verbal message. Following an exit interview, the majority of participants who had been influenced through gestures rarely remembered seeing them, but remembered the speaker saying "my brother went to play basketball".

The subtle way in which gestures communicate information makes them important candidates of study in misinformation research, particularly given that the failure to identify the source of misinformation contributes largely to the misinformation effect (Zaragoza et al., 2007; Zaragoza & Lane, 1994). Gestures are not often fixated in conversation (Gullberg &

Holmqvist, 2006) and information can be processed from them even when they are not fixated (Gullberg & Kita, 2009).

This research together suggests that the gestural misinformation effect should be a formidable force in skewing eyewitness memory that can replicate the observed effects of verbal misinformation. Studying whether gestures can too alter the memory representation of a serious crime, and studying their ability to do so alongside the traditional verbal misinformation, would provide more insight into their suggestive power in interviews. The monitoring of gesture awareness would allow further investigation into whether the subtle nature of gestural influence makes eyewitnesses more vulnerable to source attribution errors and less likely to subject them to credibility judgements.

In light of previous research, two experiments were conducted to address two main aims: The first was to demonstrate that gestural misinformation, like verbal misinformation, is robust enough to cause an eyewitness to report false information on details of a crime with high severity. Could a gesture suggest the presence of a weapon and convince an individual they witnessed a stabbing when actually no weapon was involved at all? The second aim was to investigate how the process of gestural misinformation compares to verbal misinformation with respect to participants' awareness of its influence. Are participants less aware of when they have been influenced by gesture, and does this make them a more pervasive device for misleading eyewitnesses? These questions have both important practical and theoretical implications on eyewitness memory and the following experiments allowed these to be examined further.

Experiment 1

The first experiment was conducted with the intention of discovering whether gestures could alter an eyewitnesses' representation of a violent crime scene. If gestural misinformation is a robust form of influence that is comparable to verbal misinformation, we would expect gestures to elicit misinformation effects that would alter a witnesses' memory of a crime significantly. To examine this, participants watched a short video of a man assaulting (punching) another in an alleyway and were then questioned on this afterwards. In two experimental conditions, the type of gesture presented to participants (a correct 'punching' or misleading 'stabbing' gesture) was manipulated and their responses were compared to those in a control group. This experiment would ascertain whether these two gestures could create two different accounts of the same event, and whether the 'stabbing' gesture could cause a memory fabrication of a violent crime.

Method

Participants

The sample comprised 54 adults (35 female, 19 male) who were recruited from the University of Hertfordshire and the general public. The sample had a mean age of 36.00 ($SD = 15.43$) and included a range of ethnic origins.

Design

A between-subjects design split participants into three conditions; a factual 'punching' gesture group, a misleading 'stabbing' gesture group and a control (no gesture) group. The

main dependent variable considered how participants interpreted the action of the culprit (measured categorically by response). An additional two critical questions considered whether they believed the victim was hurt (measured categorically as ‘yes’ or ‘no’) and how much pain they thought he was in (on a 10-point rating scale; 1 = *not at all hurt*, 10 = *severely hurt*). Participants’ awareness of the interviewer’s gesture behaviour was also measured on debrief.

Materials

A stimulus video was prepared for this experiment which depicted one man (the culprit) physically assaulting another man (the victim) in an alleyway. The video was 55 seconds in length and filmed from the perspective of a third party observer using a camera-phone. During the video, the victim gave an item to the culprit (unidentifiable from the video), which resulted in the culprit beckoning the victim back and striking him, leaving him to fall to his knees. The nature of the strike appeared quite ambiguous but no weapons were present in the video. The video was of low (surveillance style) quality and the audio was deliberately ‘dampened’ to make any dialogue between the characters indistinguishable.

Procedure

Participants watched the stimulus video on a laptop screen individually, and were told to do so carefully as they would be questioned on the material afterwards. They then completed a five-minute distracter task (identifying squares in a matrix of dots) before the interview commenced. All participants were interviewed by the same person (playing the role of an investigator) and were allocated randomly to one of the three questioning conditions. The interviewer began the interview by asking a series of eight distracter questions regarding

the appearance of the two men (e.g. “how old would you say the victim was?” and “can you describe the culprit’s appearance?”).

The interviewer then explained to participants that she would like to collect some more specific details on the events of the video. To do this, she summarised part of the video and asked participants to elaborate on what they witnessed at that point in the scene. For the first question, she stated “it was clear that the two men were involved in an argument which finally resulted in the culprit [moving towards the victim]” and performed the critical gesture on the highlighted phrase. This method of gesture delivery was chosen as the results of a pilot experiment revealed that performing the gesture during a summary before the question appeared more natural than gesturing during the question. For the ‘punching’ gesture group, the interviewer clenched her fist and lunged forwards to simulate a punch. For the ‘stabbing’ gesture group, the interviewer simulated the grasp of a knife and made an underarm lunge forwards. The interviewer rehearsed her gestures thoroughly to ensure they remained consistent across conditions. No gesture was performed in the control group. Participants were asked to report on the specific actions of the culprit and provided open responses which were then written down by the interviewer. After another four distracter questions (e.g. “where did the man put the item?” and “how did he exit the scene?”), the last two critical questions asked “did the victim appear hurt?” (measured categorically, as either ‘yes’ or ‘no’) and “how much pain did he appear to be in?” rated on a 10-point rating scale (1 = *not at all hurt*, 10 = *severely hurt*). The interview closed with the participants answering a de-briefing question of “did you notice any of the interviewer’s gestures during questioning?” and, if so, stating which.

Results

The results of interest concern the responses to the questions asking what the culprit did when he approached the victim, whether the victim appeared hurt and how much pain he appeared to be in. These results are summarised in Table 1.

Insert Table 1 about here

For the first question, participants either reported that the man was stabbed (incorrectly) or that he was hit by the culprit (correctly). Responses for the latter comprised 'punched', 'pushed' and 'shoulder-barged' and were collapsed into one 'hit' response (with unanimous agreement from experimenters) to aid statistical analysis. All participants in the gesture groups gave one of these responses, though some participants in the control group claimed not to have seen what happened and thus did not provide data ($n = 5$). The frequencies of responses were submitted to a chi-square analysis and an association between condition and response confirmed that the gestures affected the responses; $X^2(2, N = 49) = 17.47, p < .001$, Cramer's $V = .597$. Examination of the standardised residuals revealed that the large number of 'stabbed' responses in the 'stabbed' condition contributed largely to this effect ($z = 2.8$).

For the second question, participants reported the man was either hurt or not. All gave one of these responses except four who claimed not to know ($n = 2$ in both the 'stabbing' and control groups). A 3 x 2 chi-square test revealed an association between condition and response; $X^2(2, N = 50) = 16.40, p < .001$, Cramer's $V = .573$, and the large proportion of

'no' responses from controls contributed largely to the effect ($z = 2.9$). Injury ratings of the victim were then considered in a two-way analysis of variance (ANOVA) with gesture condition ('stabbing', 'punching', control) as the first variable and responses to the first question (incorrect, correct) forming the second. All but two participants provided data ($n = 1$ in both the 'stabbing' and control groups.) A main effect for condition was found; $F(2, 42) = 3.30, p = 0.047$, with post-hoc tests using Bonferroni adjustments confirming that the 'stabbing' condition differed from both the 'punching' ($p = .002$) and control groups ($p < .001$) and the 'punching' group differed from the control group ($p = .029$). These effects were largely due to the high proportion of incorrect responses in the 'stabbing' gesture category which received higher injury ratings than the correct responses across all conditions: A main effect for response was confirmed; $F(1, 42) = 8.54, p = .006$, but with no interaction between condition and response ($F < .01$).

After the interview, participants in the experimental conditions stated which gestures they remembered the interviewer performing. Only one participant in each of the 'punching' or 'stabbing' groups remembered the gesture for their respective conditions.

Discussion

Participants recalled their experience of the crime differently according to the information gestured to them. While those presented with the factual 'punching' gesture were more likely to recall the crime accurately, those that saw a 'stabbing' gesture were more likely to recall that the victim was stabbed and, subsequently, that he was severely injured. Those who received no gesture did not recall such details. These results confirm that gestures can communicate critical information that listeners incorporate into their story (Cassell et al.,

1999; Kelly et al., 1999), and subsequently elicit misinformation effects in eyewitnesses (Broaders & Goldin-Meadow, 2010; Gurney et al., 2013; Kirk et al., 2015). However, this study adds that gestural misinformation could alter an eyewitness's account of a major crime considerably, marking it as a form of influence that may be comparable to verbal misinformation.

The misinformation presented to participants appeared to be salient enough to alter their representation of the crime. Participants who saw the 'stabbing' gesture were not only more likely to recall the man being stabbed but also that he was in more pain. Thus, these findings imply that gestures, like speech, are capable of inducing memory-based inferential errors (Hannigan & Tippens Reinitz, 2001). However, it is important to consider the process through which participants were influenced by the gestures. Given that participants' responses largely reflected the misinformation conveyed to them across the conditions, it is possible that they merely conformed to the experimenter's suggestions rather than suffered a memory impairment (McCloskey & Zaragoza, 1985). To investigate the possibility of misinformation acceptance further, an awareness of gestural misinformation should be considered.

This study examined whether gestures could influence the witnesses' memory of the culprit's actions in two distinct ways; whether they carried out physical assault or a stabbing. However, the effects of gestures may be understated, and gestures may be able to suggest more than these two actions alone. Before collapsing the data, it was found that those in the 'punching' gesture group specifically reported 'punched' (as opposed to 'shoulder barging' or 'pushed') more often ($n = 7$, 38.9%) than the 'stabbing' condition ($n = 4$, 22.2%). This observation suggests that gestures could suggest more specific types of assault. While this could be examined in further studies, the focus of this research was to examine whether

gestures could fabricate a memory of a far more severe action; a stabbing. This was confirmed by this experiment.

Experiment 2

The second experiment sought to investigate whether speech and gesture elicit similar misinformation effects, and how participants' awareness of each compares. Addressees are not often aware of communicative gestures, yet still glean information from them (Gullberg & Kita, 2009; Krauss, Chen, & Gottesman, 2000) without being able to identify them as a source of information (Kelly et al., 1999). This may make the process of gestural misinformation more subtle than that of verbal misinformation and suggest that gestures are more likely to mislead eyewitnesses outside of their awareness. Misinformation effects depend largely on source attribution (Zaragoza & Lane, 1994) and credibility (Skagerberg & Wright, 2009; Vornik, Sharman, & Garry, 2003). If participants are not aware of suggestions made nonverbally, these suggestions may not be subject to the same credibility judgements as those made through speech. As a result, witnesses may be more inclined to accept suggestions from gestures and have less awareness of having done so.

Experiment 2 used a similar design to Experiment 1 whereby participants watched the same stimulus video and were provided misinformation on its contents in an interview afterwards. In this experiment, three pieces of misinformation were presented to participants either verbally, through wording of the question, or nonverbally, through gesture. A control group was also used for comparison. The same 'stabbing' misinformation was included in this experiment, but the interviewer introduced new misinformation; that the victim had an injured shoulder, and that the culprit ran from the scene. (Both were incorrect as the victim had a stomach injury and the culprit walked slowly from the scene.) In order to test

awareness of influence, participants in both experimental groups were asked during debrief whether they could identify being given misleading information throughout the interview.

Method

Participants

A new sample of sixty young adults (age $M = 24.60$, $SD = 11.00$), 17 male and 43 female took part in this experiment. The sample mainly comprised students from the University of Hertfordshire and included a range of ethnic origins.

Design

A between subjects design varied how misinformation was presented to participants; either verbally, through wording of the question, or nonverbally, through gesture. A third, control group (with no misinformation) was also used. Accuracy was measured in the three questions categorically; as either correct or incorrect (congruent with misinformation). Participants in the experimental group were asked if they felt being misled during the experiment and responses were measured categorically (either as 'yes' or 'no').

Procedure

Participants were allocated randomly to either the 'verbal', 'nonverbal' or control group. After watching the stimulus video and completing a distracter task (as used in Experiment 1), participants were asked to write a statement summarising the events of the

video. This served as a manipulation check to identify any preconceived errors and ensure any incorrect answers were given as a consequence of the misleading gesture. As in Experiment 1, the interviewer began posing the same distracter questions regarding the appearance of the culprit and victim. The interviewer then summarised the critical aspect of the video: In the verbal condition, the interviewer said “the culprit stabbed the victim”. In the nonverbal condition, the interviewer said “the culprit [approached the victim]” and performed the critical ‘stabbing’ gesture during the highlighted phrase. The control group also used this statement but with no misleading gesture. As in Experiment 1, participants gave free responses to the question which were written by the interviewer and coded as containing the misinformation or not. The interviewer then gave a second critical statement: For the verbal group, the interviewer said “the victim appeared to have a hurt shoulder”. For the nonverbal group, the interviewer said “the victim [appeared hurt]” and grasped her shoulder on the highlighted phrase, and this statement (without the gesture) was also used in the control group. For the third critical question, the interviewer said “the man ran from the scene” (in the verbal condition), or “the culprit [exited the scene]” with a forearm-swinging ‘running’ gesture (for the nonverbal group), or no gesture (for the control group). After each summary, participants were asked to state what they witnessed at that part of the video and their responses were again coded categorically as either containing the misinformation or not.

To measure awareness of misinformation, an open debrief question was posed to participants in both experimental conditions, asking "did you feel misled at any point during the interview?" Participants replied simply with ‘yes’ or ‘no’.

Results

Before any statistical analyses were conducted, participants' statements were read to verify that no incorrect information congruent with the misinformation presented in the interview appeared. Of all participants, only four (7%) stated specifically that the victim was 'punched' (all in the 'nonverbal' condition) and their responses in the interview remained consistent with this information. No other critical detail was reported in the statements. After examining the responses to the interview, all incorrect responses across all conditions were found to be congruent with the misinformation presented in the experimental conditions for the respective question and no other incorrect responses were given. Therefore, participants' responses were categorised as either correct or incorrect (gave misinformation). Two participants in the verbal condition claimed to have not seen what happened (and thus did not provide an answer) for the second critical question and, similarly, two control participants did not provide answers for the final critical question. The results are summarised in Table 2.

Insert Table 2 about here

Participants' responses to the interviewer were first considered for each question individually. Across all questions, more inaccurate responses were given in the misinformation conditions (verbal, nonverbal) in comparison to the control group. For the initial 'stabbing' question, a 3 x 2 association between condition (verbal, nonverbal, control) and response (correct, incorrect) was found to be significant; $\chi^2(2, N = 60) = 6.19, p = .045$, Cramer's $V = .321$. A borderline significant association was found for the 'shoulder' question, $\chi^2(2, N = 58) = 5.95, p = .051$, Cramer's $V = .320$, albeit with low statistical reliability, and a

significant association was present for the 'running' question; $X^2(2, N = 58) = 6.47, p = .039$, Cramer's $V = .334$.

To ensure a robust analysis, responses given by participants across the three questions were combined to form a composite score of critical questions answered incorrectly (measured out of 3). Those provided with misinformation nonverbally gave more incorrect answers ($M = 1.25, SD = .72$) than those presented with misinformation verbally ($M = .75, SD = .79$), followed by controls ($M = .25, SD = .44$). A one-way analysis of variance (ANOVA) revealed a significant difference between all groups $F(2, 59) = 11.29, p < .001, \eta^2 = .284$. Post hoc tests using Bonferroni adjustments confirmed that the verbal group differed from controls ($p < .001$), confirming the well-established verbal misinformation effect, as did the nonverbal group ($p < .001$), supporting the gestural misinformation effect. Nonverbal misinformation exerted more influence than verbal, though a comparison between the two was shy of significance ($p = .063$). Figure 1 summarises this data.

Insert Figure 1 about here

Finally, participants in the two misinformation groups were asked whether they felt misled at any point during the interview. Most participants ($n = 14, 70\%$) provided with verbal misinformation did not report feeling misled by the interviewer and, as expected, all but one ($n = 19, 95\%$) participants provided with nonverbal misinformation did not report feeling misled. While low in statistical reliability (due to the large number of participants that did not report feeling misled), an association between condition and reported influence was found; $X^2(2, N = 40) = 4.32, p = .037$, Cramer's $V = .329$. Therefore, despite verbal and

nonverbal misinformation prompting similar responses, participants were less likely to have felt being misled by nonverbal influence than verbal influence.

Discussion

These results confirm the well-established verbal misinformation effect (Chobak & Zaragoza, 2012; Loftus, 2005; Loftus & Hoffman, 1989; Zaragoza et al., 2007) and provide further evidence for gestural misinformation (Broaders & Goldin-Meadow, 2010; Gurney et al., 2013; Kirk et al., 2015). Additionally, this study located the effects of gestural misinformation in relation to those made verbally and highlighted differences between the two. Both forms of influence were found to be robust with gestural misinformation appearing as likely to exert an influence as verbal misinformation.

The results of this experiment also provide some insight into participants' awareness of misinformation. Those who received the misinformation nonverbally were considerably less likely to report feeling misled than those who received the same misinformation verbally. This low gesture awareness is in line with the observations of other research in gesture attention during conversation (Gullberg & Holmqvist, 1999, 2006). Thus, nonverbal suggestions not only exerted misinformation effects comparable to verbal suggestions, but did so without arousing as much suspicion from participants. An explanation for this is that misinformation is mediated by eyewitnesses' attribution of credibility to the source of influence (Skagerberg & Wright, 2009; Smith & Ellsworth, 1987). However, gestures are not often attended by listeners (Gullberg & Holmqvist, 1999, 2006) and yet still convey critical information (Gullberg & Kita, 2009) without being identified as the source (Kelly et al., 1999). Therefore, gestures may not be subject to the same credibility judgements as speech.

Because of this, subtle suggestions made through gesture were as successful (and sometimes more so) than suggestions made through speech. These findings are discussed in more detail below.

General Discussion

The two experiments together provide further support that gestures can act as a source of misinformation in eyewitness testimony (Broaders & Goldin-Meadow, 2010; Gurney et al., 2013; Kirk et al., 2015) but add that suggestions made through gesture can be salient as those made through speech. In Experiment 1, a single 'stabbing' gesture caused participants to believe that a man was stabbed (and, subsequently, that he was seriously injured) when no such incident occurred. This was in contrast to those who saw a correct 'punching' gesture who were more likely to recall the event correctly. Experiment 2 measured this gestural misinformation against the same suggestions made verbally and found gestures to exert the same influence, sometimes to an even greater degree. Critically, this study revealed that gestural misinformation influences eyewitnesses in a more subtle way than speech. We introduced measures of misinformation awareness to ensure that participants' responses were not given as a result of demand characteristics and that an actual memory effect had occurred. To confirm this, most participants were unable to identify misleading gestures on recall (Experiment 1) and were less likely to report feeling misled when misinformation was presented through them (Experiment 2). These results together suggest that gestural influence can be as powerful as verbal influence but is more likely to occur outside of an eyewitness's awareness.

While research has found that suggestions from gesture can become incorporated into speech (Cassell et al., 1999; Kelly et al., 1999) we confirm that gestural misinformation, like

verbal misinformation, is robust enough to influence the reporting of major details in violent crimes. While this research has obvious practical implications, it is important to consider the theoretical contribution of this research and the extent to which gestural misinformation is comparable to verbal misinformation.

As a witnesses' original memory weakens, they become more prone to novel post-event information to 'fill in the gaps' of memory (Chobak & Zaragoza, 2012; McCloskey & Zaragoza, 1985). Such dependence on extraneous details upon recall can cause witnesses to fabricate false memories as a result, even those which are impossible (Braun-LaTour, LaTour, Pickrell, & Loftus, 2004). However, the acceptance of post-event information during questioning appears limited to situations where this information seems plausible (Loftus & Pickrell, 1995) and the source of misinformation is credible (Skagerberg & Wright, 2009; Smith & Ellsworth, 1987; Underwood & Pezdek, 1998). This theory accounts largely for misinformation effects observed verbally, but can we conclude that gestural misinformation occurs through the same process? It could be argued that if gestures carry substantive semantic information they would merely provide an indirect route to the standard effect of misinformation. Misinformation effects prevail when witnesses cannot identify the interviewer's suggestion as being a source of influence and, when warned about the effects of misinformation, these effects reduce substantially (see Blank & Launay, 2014). However, while verbal suggestions can be processed intuitively, spontaneous co-speech gestures are most often not fixated (Gullberg & Holmqvist, 1999, 2006) and cannot often be identified as a source of information retrospectively (Kelly et al., 1999). Therefore, witnesses may be less aware of when misinformation has been communicated to them through gesture and subsequently more prone to believe their original memory to be the source. This serves as an explanation for why participants rarely identified the gestures but were still misled by them. Furthermore, this suggests that, while the semantic detail offered by gestures is the same as

that offered through speech, their subtle manner of communicating make them a formidable force in misinformation.

An automatic incorporation of gestured information into speech would ensure gestural misinformation occurs as a more subtle form of influence. Gestures are thought to be tightly integrated with speech (Bernardis & Gentilucci, 2006; Kendon, 2004; McNeill, 1992) to give the listener an 'overall representation' of the speaker's message (Goldin-Meadow, 1998; McNeill, Cassell, & McCullough, 1994). Evidence from Ozyurek, Willems, Kita & Hagoort (2007) states that speech-gesture mismatches are not resolved by listeners locally but, instead, are processed globally. Therefore, listeners experience a simultaneous incorporation of gesture and speech during comprehension. Due to this incorporation of information, listeners cannot identify gestures as a source of information retrospectively and instead conclude that this information was provided entirely through speech (Kelly et al., 1999). As source misattribution is an important factor in misinformation (Zaragoza & Lane, 1994), the failure to identify gestures as the source may make eyewitness more prone to misinformation, and attributing source credibility to them would also not be possible. Therefore, even if the status of the interviewer is an important factor in mediating misinformation effects (Skagerberg & Wright, 2009; Smith & Ellsworth, 1987), this may become redundant if witnesses cannot identify any offering of post-event information. The suggestive effects on the witness may then be more easily passed off as their own memories if they have no recollection of how this information was first suggested to them.

Despite the subtle manner in which gestures convey meaning, they also provide visual information that cannot be communicated easily through speech (Goldin-Meadow, 1999; Graham & Argyle, 1975). This could be an important factor in eyewitness memory, as false memory creation is facilitated by imagery ability (Drivdahl & Zaragoza, 2001; Zaragoza et al., 2007). In Experiment 2, the 'shoulder' misinformation elicited twice as many responses

when provided visually through gesture than when given through speech. In some cases, witnesses may be more susceptible to misinformation provided visually rather than verbally. In light of these points, there are many ways in which gestures vary from speech as conveyers of information. These differences suggest that, rather than mirroring the standard errors of verbal misinformation, gestural misinformation can influence eyewitnesses through a far more implicit process.

While an attempt was made to ensure the interview was as realistic as possible, it was not possible to simulate a real eyewitness experience without compromising ethics. Like other misinformation research, participants in this study may have been more willing to testify to observing critical (stabbing) information knowing that there would be no consequence for them doing so. Positive responses may be reduced if witnesses are aware that post-event information that will have an impact on the prosecution has been offered to them. However, if witnesses are unable to identify gestural misinformation as a source, it is an open question as to whether this would be observed in real life.

The effects of gestural misinformation are worthy of further investigation and future research could consider the circumstances under which individuals are most prone to them. While the methodology of Experiment 2 remained similar to that of Experiment 1, there were subtle differences between the two; including a lower mean age of participants in Experiment 2, the introduction of a written statement, and additional critical questions. While the misinformation effects remained robust across the two experiments, there were slight variations in the results. For instance, in Experiment 2, fewer participants gave a 'don't know' response in the control condition (Experiment 1: 15%; Experiment 2: 0%), and more participants subscribed to the 'stabbing' misinformation (Experiment 1: 50%; Experiment 2: 61%). It is unclear at present whether these methodological changes accounted for these variations, but a precise manipulation of participant age and interview style could be a

consideration for future research. It would also be necessary to ascertain whether gestural misinformation effects generalise to other crimes and gestures, and whether memory traces of gestural and verbal misinformation decay at a similar rate.

The practical implications of this study are considerable. Testifying that a man conducted a stabbing (and subsequently that he was carrying a weapon) would have serious ramifications for prosecution. Many eyewitness interviews are logged only through audio recordings. However, the absence of video surveillance, and poor retrospective recall of gestures, would mean that any gestural misinformation effects would occur 'off the radar'. Therefore, these results add to the growing literature stating that police interviews should be video recorded rather than audio recorded. Given the findings of this research, we consider gestural misinformation to be a very powerful form of misinformation that should be a point of consideration in eyewitness memory research and police interviews.

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Table 1: Summary of responses to the interviewer's questions by condition

Condition	<i>n</i>	What did the culprit do?		Did the victim appear hurt? "yes"	How hurt was the victim?	
		Correct "hit"	Incorrect "stabbed"		<i>M</i>	<i>SD</i>
Control (no gesture)	18	12 (66.7%)	1 (5.6%)	6 (33.3%)	3.82	1.41
Punching gesture	18	17 (94.4%)	1 (5.6%)	15 (83.3%)	5.41	2.27
Stabbing gesture	18	7 (38.9%)	11 (61.1%)	16 (88.9%)	7.61	2.06

Table 2: Summary of responses to the interviewer's questions by condition

Condition	<i>n</i>	Question type		
		<i>“stabbed”</i>	<i>“hurt shoulder”</i>	<i>“ran from scene”</i>
Control (no gesture)	20	3 (15%)	1 (5%)	1 (5%)
Verbal misinformation	20	5 (25%)	3 (15%)	7 (35%)
Nonverbal misinformation	20	10 (50%)	7 (35%)	8 (40%)

Figure 1: Total number of misinformed statements by condition. Error bars show 95% confidence intervals.

