



## Um... they were wearing...: The effect of deception on specific hand gestures

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**Purpose.** Non-verbal communication researchers have identified specific categories of hand gestures but deception researchers typically ignore these. This experiment refined and developed some of these categories and examined whether there is a difference in the frequency of *speech prompting* and *rhythmic pulsing* gestures between liars and truth tellers.

**Methods.** Twenty truth tellers and 20 liars (all undergraduate students) described a person who entered a room where they were playing a game with a confederate. Truth tellers gave a truthful description of an event they had participated in. Liars had previously taken money from a wallet in the room but had not played a game with the confederate, or seen anybody enter the room, they just pretended they did during their interview.

**Results.** Truth tellers made more *rhythmic pulsing* gestures than liars indicating this type of gesture may be connected with the prosodic flow of speech. Liars made significantly more *speech prompting* gestures than truth tellers, supporting the notion that greater cognitive load may be experienced during deceptive accounts.

**Conclusions.** This study demonstrates the benefit of examining subcategories of gestures when investigating deceptive behaviour.

This study examines whether liars and truth tellers differ in some specific types of speech-related hand gestures. Non-verbal communication researchers (Argentin, 1985; Efron, 1941; Ekman & Friesen, 1972; McNeill, 1992) have identified many subcategories of hand gestures and Bull (2009) points out that deception research would benefit from a more detailed examination of gesture in relation to speech content. Deception researchers typically ignore these subcategories. As we will argue in this article, different subcategories of hand gestures may be related to deception. The first to show this were Caso, Maricchiolo, Bonaiuto, Vrij, and Mann (2006). In the present article, we continue their innovative approach and examine two subcategories never investigated before in deception research: *speech prompting* and *rhythmic pulsing*.

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### **Deception research and hand gestures**

Vrij (2008) details the findings of a total of 35 studies that examined the use of hand gestures (which are labeled 'illustrators' in deception research) as a cue for deception. Although 13 of the studies showed a reduction in illustrators during deception and only two showed an increase, the majority (20) showed no difference at all. Furthermore, in their meta-analysis of deception research DePaulo *et al.* (2003) found that illustrators are only weakly related to deception. Thus, it seems that there is no clear difference in the amount of illustrators displayed by liars and truth tellers. However, none of the studies reported in the reviews examined differences between the specific subgroups of illustrators and so did not consider the relationship between gesture and speech content. Caso *et al.* (2006) are the only researchers to date to examine differences in the specific hand gestures used during deceptive and truthful accounts. Results showed that when taken as a whole there was no significant difference in the use of hand gestures between liars and truth tellers, though when categories of hand gestures were considered separately significant differences were found. Truth tellers made significantly more *deictic* gestures (pointing or using the hand to make reference to an object), whereas liars made significantly more *metaphoric* gestures (illustrations of an abstract concept such as a closed fist to indicate strength). However, Caso *et al.* (2006) did not consider which specific questions elicited these differences. It is possible that when responses to particular questions are considered separately, further differences in gesture categories between liars and truth tellers may emerge. Investigation into this possibility could be particularly useful in an applied forensic setting as the interviewer may be able to use specific questions to illicit these particular gestures.

The relationship between deception and hand gestures is an area where further investigation is likely to benefit both deception researchers and non-verbal communication researchers. Some useful points identified by non-verbal communication researchers could apply to deception theory. In order to gain a fuller understanding of how some specific hand gestures may provide indicators of truthfulness and deception, we first examine the ways in which gestures are thought to relate to speech.

### **Non-verbal communication research and hand gestures**

There is a large body of research showing that particular types of hand gestures are inextricably linked to discourse and play an important role in communication (Alibali, Bassok, Solomon, Syc, & Goldin-Meadow, 1999; Alibali, Kita, & Young, 2000; Beattie, 2004; Chawala & Krauss, 1994; Ekman & Friesen, 1972; Feyereisen, 1982; Frick-Horbury, 2002; Goldin-Meadow, 2006; Holler & Beattie, 2003; Kendon, 1994, 2004; Krauss, 1998; Krauss, Chen, & Chawala, 1996; McNeill, 1985, 1992, 2005; McNeill, Cassell, & McCullough, 1994; Miller & Franz, 2005). However, the precise nature of the relationship between gesture and verbal utterance is not clear and remains a matter of considerable debate.

Gestures almost always occur with speech or the rehearsal of speech (Ekman & Freisen, 1972; McNeill, 1985). According to Ekman and Friesen (1972), gestures are used to embellish verbal statements, though they may be used to substitute a word or even to contradict what is being verbalized. Research into non-verbal behaviour has traditionally centred on the communicative function of gestures. This approach is largely derived from Darwin's (1872) view that all expressions and behaviours were functional at some time in our evolutionary history. However, more recently some researchers have questioned the supposition that communication is the primary function of gestures

(Rimé & Schiaratura, 1991) and there is some considerable debate among researchers concerning their precise role (Chawla & Krauss, 1994).

Rimé and Schiaratura (1991) claim that gestures are not usually noticed during an interaction. They also argue that when a person is not visible, the verbal content is still understood, and people are generally unable to understand speech content from gestures. They state that gestures are a by-product of speech and that any benefits to communication are secondary.

Contrary to this view, McNeill (1985) claims that the connections between speech and gesture are so closely interlinked they cannot be regarded as separate things. They are actually the same psychological structure, so gestures are coordinated both semantically and pragmatically along side the corresponding speech utterance.

However, Alibali *et al.* (1999) found that when describing algebraic word problems gesture did, at times, convey different information to speech. This lack of co-expressiveness suggests that speech and gesture may not be linked in the way proposed by McNeill (1985). Nevertheless, Alibali *et al.* (1999) claim that gesture can provide insight into mental representations and this is consistent with the notion that gestures are in some way closely related to and important in communication.

Kendon (1994) also argues against Rimé and Schiaratura's (1991) view, stating that gestures can assist the semantic and pragmatic understanding of speech, and therefore have a role in communication. In support of Kendon (1994), Chawla and Krauss (1994) and McNeill (1992) demonstrate that gestures can convey important information to the listener. Furthermore, the use of gestures can also aid the speaker during communication. When speaking is difficult gestures occur more frequently (Feyereisen, 1983; Goldin-Meadow, 2006) and this is consistent with Rauscher, Krauss, and Chen (1996) who conclude that the use of gestures could help the speaker to access the mental lexicon. Continuing along these lines, Krauss (1998) claims that gestures affect the ease with which words are retrieved from lexical memory (Lexical Retrieval Hypothesis). However, Alibali *et al.* (2000) found that rather than simply *aiding* lexical retrieval, gestures have a greater role in that they help the speaker to group spatial information into units and so are involved in the *conceptual planning* of the utterance (Information Packaging Hypothesis).

The position of non-verbal communication researchers is still open to debate and the precise purpose of hand gestures and their relationship to verbal utterances remains elusive. Emerging from this research, however, is the general consensus that gestures are in some way important to the speaker, the recipient, or both, either as a means of communication or to assist in the planning of speech and/or the retrieval of verbal information from lexical memory. As lying can be more cognitively demanding than truth telling (Vrij, 2008; Vrij, Granhag, Mann, & Leal, 2011; Vrij, Granhag, & Porter, 2010; Vrij *et al.*, 2008) and gestures occur more frequently when speaking is difficult (Goldin-Meadow, 2006; McNeill, 1992) cues to deception may 'leak' through the various uses of these specific movements as liars may use some gestures more frequently than truth tellers. Conversely, as liars typically try harder to control their behaviour (Buller & Burgoon, 1996; Vrij, 2008), there may be some gestures that are used less frequently by liars than truth tellers.

The present experiment examines the gesture content of short descriptions of a person who entered a room and aims to identify indicators of 'truth telling' and 'deception' that are readily recognized in an applied setting. This type of short, focused description is not expected to elicit the same categories of gesture identified by Caso *et al.* (2006) (e.g., *deictic* and *metaphoric* gestures) However, theoretically, different

types of gestures, not examined by Caso *et al.* (2006), could be linked with deception in such a context: *speech prompting* gestures and *rhythmic pulsing* gestures.

### **Speech prompting**

Liars can experience greater cognitive load than truth tellers (Vrij, 2008; Vrij *et al.*, 2008, 2010, 2011) so may find it difficult to 'think of the right words'. This may result in gestures that occur when the person is trying to think of what to say next: We call such gestures *speech prompting* gestures. To our knowledge, *speech prompting* gestures are an entirely new category as they do not fit the definition of any other gesture defined by Efron (1941), McNeill (1992), and Rimé and Schiaratura (1991). *Speech prompting* gestures may accompany utterances such as 'umm . . .' or 'and then . . .' or occur during a pause in the dialogue. They may be small repetitive movements, such as tapping, flapping, or small circular movements, or possibly large movements such as rehearsing the shape of an item of clothing before describing it verbally. They are not temporally aligned with the semantic or prosodic aspects of meaningful speech. Instead, they are made prior to that meaningful speech. We expect liars to make more *speech prompting* movements than truth tellers (Hypothesis 1).

### **Rhythmic pulsing**

The classification of rhythmic type gestures has attracted a vast number of differing descriptions by researchers, all giving a slightly different emphasis to the nature and purpose of this gesture. Efron (1941) describes these speech-marking hand movements as baton-like gestures, which he says belong to the ideation process and 'time out' the activity of the referent. Rimé and Schiaratura (1991) have grouped together a series of gestures classified by other researchers as representing some variant form of Efron's (1941) original, namely, (1) punctuating movements and minor qualifiers (Freedman, 1972); (2) beats (McNeill, 1992); and (3) batons (Ekman & Friesen, 1972). According to Rimé and Schiaratura (1991), these gestures stress some elements of the discourse, introduce new elements, or chunk sentences. However, not all gestures accompanying meaningful speech seem to be connected to the semantics of speech. Thus, in the interests of deception research, a new category, *rhythmic pulsing* has been created. This new category comprises all gestures that appear rhythmic in nature, in that they flow, yet do not seem to link to the speech content as in the emphasizing rhythmic gestures as defined by Efron (1941), Ekman and Friesen (1972), McNeill (1985), and Freedman (1972). They are almost continuous flowing movements that could be described as fidgeting or fiddling with ones own hands. These movements are generally small, continuously flowing movements made loosely 'in time' with the pitch and tone of speech, thus they are connected to the prosodic flow of speech.

The use of gesture is linked to the flow of speech (Rauscher *et al.*, 1996). However, both the media and police manuals actively encourage the expectation that liars exhibit more nervous behaviour, such as fidgeting, than truth tellers (Vrij, 2008). Liars, being aware of this supposition, are more likely to attempt to control their behaviour compared to truth tellers (Buller & Burgoon, 1996). Furthermore, liars typically try harder than truth tellers to make a convincing impression (DePaulo *et al.*, 2003). Thus, we expect liars to attempt to suppress these gestures as they are afraid they will be seen as signs of nervousness. Therefore, we expect truth tellers to make more *rhythmic pulsing* gestures than liars (Hypothesis 2).

## Method

### Participants

Participants consisted of 40 undergraduate students (22 males and 18 females) their average age was  $M = 23.05$  ( $SD = 7.17$ ), ranged 18–42 years. No participants experienced problems such as tics, speech difficulties, and motor difficulties.

### Measures

#### Speech prompting

To reiterate, *speech prompting* gestures may occur in the absence of speech or may accompany utterances such as ‘and then . . .’, ‘umm . . .’, and ‘err . . .’. The movements may be small and repetitive, such as tapping, flapping, or small circular movements, or larger movements, such as rehearsing the description of a hair style before describing it verbally. When coding this gesture, firstly the recorded material was viewed to identify gestures occurring in the absence of meaningful speech. Careful attention was paid to the subsequent verbal content and only those movements that were clearly related to that speech were counted. If the movement was circular then one complete circle was counted as one movement. If the movement was a tapping, flapping, or stroking motion then one forwards or backwards movement was counted as one movement.

#### Rhythmic pulsing

To reiterate, although *rhythmic pulsing* gestures occur with meaningful speech they do not directly reference or emphasize any word or syllable in the speech content. They are small fidgeting or fiddling movements that almost continuously flow in time with the prosodic aspects of the speech. When coding this gesture, the recorded material was often slowed down and each separate cycle of movement was counted. If the movement was circular then one complete circle was counted as one movement. If the movement was a stroking motion then one forwards or backwards movement was counted as one movement.

### Procedure

The experiment took place at the Students’ Union in the University of Portsmouth and participants were told the experiment was on the subject of ‘telling a convincing story’. They were guaranteed payment of £5 with the possibility of increasing this amount to £15. Participants signed an informed consent form and were then randomly allocated to the ‘truth telling’ or ‘deception’ condition.

The truth tellers ( $N = 20$ ) played a game of Connect 4 with confederate 1 whom they believed was another participant. Connect 4 is a two-player game, each player alternately drops counters into a grid to achieve a row of four counters whilst preventing their opponent from achieving a row of four. Confederate 1 was played by the same person for all 20 truth tellers. During the game, the pair was interrupted by confederate 2 who apologized for interrupting, wiped some equations from a whiteboard, made a comment from a list of scripted comments, and left the room. One minute later, confederate 1’s mobile phone rang and she left the room to answer it leaving the participant alone. She returned to the room and the game resumed. After another minute, they were interrupted by confederate 3 who came to search for their missing wallet and also made scripted comments. The wallet had previously been placed in one of several locations and was found by either the participant or confederate 1. Confederate 3 left the room

and returned 1 min later with the experimenter claiming that £10 was missing from the wallet. The participant was then told they would be interviewed about the missing money. Confederates 2 and 3 were varied occasionally. This event is a modification of the event used by Vrij, Akehurst, Soukara, and Bull (2002).

The liars ( $N = 20$ ) were taken to the same room. Instead of taking part in this event, they were asked to take the £10 from the wallet, keep it somewhere on their person, and to deny taking it during their interview. They were given a written account of the truth-telling scenario. This included details of the interruptions but not descriptions of those interrupting. They were given five minutes to familiarize themselves with their alibi.

Immediately prior to being interviewed, liars and truth tellers were told that they would receive £15 if they managed to convince the interviewer they did not take the money. If they were not able to convince the interviewer they would have to write a statement detailing what had happened.

All participants were interviewed by the same uniformed male police officer who was blind to the condition (truth telling or lying). The interview began with the interviewer saying '£10 has gone missing from a wallet in the room next door and I have to find out whether or not it was you who took it'. The interviewer then asked several standardized questions including 'You just mentioned that someone came into the room who rubbed information off the board. Can you describe that person in detail?' All interviews were recorded on VHS tapes.

After the interview, participants were taken to another room. The experimenter told all participants that they had convinced the police officer they were telling the truth and they were paid £15. The experimenter then debriefed the participants and answered any questions.

### **Ethical considerations**

All participants were told prior to the interview that they would be treated as suspects during their interview. As part of the informed consent process, they were also aware they could withdraw from the study at any time without penalty.

### **Coding of dependent variables**

The purpose of this study was to compare the frequency with which particular gestures occur during truthful and deceitful descriptions given whilst replying to the standardized question 'You just mentioned that someone came into the room who rubbed information off the board. Can you describe that person in detail?' As the events of interest are inextricably linked to the semantic and prosodic elements of speech, consideration of the verbal stream was essential when coding the gestures. We coded the frequency of occurrence of *speech prompting* and *rhythmic pulsing* gestures (so-called momentary event coding). It is feasible that each hand could be moved independently, therefore each hand was coded separately and the frequencies summed. Thus, any parallel gestures were counted once for each hand. The scheme is mutually exclusive.

The experiment provided a total of 13 min and 47 s of videotape, which was edited into 40 clips ( $M = 33.67$  s, range 9–56 s) representing 20 truthful and 20 deceptive descriptions. The experimenter was blind to the experimental condition. Each clip was viewed using ELAN software as it was possible to transcribe the speech and note the movements together along a timeline and it allowed viewing of the material at varying

speeds. Initially, each clip was watched through with the aim of the experimenter familiarizing herself with the verbal and gesture content. The clips were then watched again and *speech prompting* and *rhythmic pulsing* gestures were systematically noted according to the coding specifications detailed in the *Measures* section.

### Observer reliability

An independent observer coded 25% of the sample comprising ten descriptions (five truthful and five deceitful). This observer was also blind to the experimental condition. The frequency scores were highly correlated: speech prompting:  $r = .97$ ; *rhythmic pulsing*:  $r = .98$ .

### Data analysis

For each question, the frequency of occurrence of each gesture was adjusted for the length of description to provide a frequency per minute.

## Results

Two independent *t*-tests were carried out. For both tests, Levene's test for equality of variance was significant and the readings of 'equal variances not assumed' are reported. As the sample size is small ( $N = 40$ ), *post hoc* statistical power analyses were also carried out with a view to interpreting results using effect size as well as statistical significance (Howell, 2002). Statistical power measures the likelihood that one would detect a meaningful difference. It is generally accepted that statistical power should be .80 to avoid a Type II error (failure to spot an actual difference). In order to detect a moderate effect this would require  $N = 64$  (Cohen, 1992). In support of Hypothesis 1, liars ( $M = 4.32$ ,  $SD = 6.77$ ) used significantly more *speech prompting* gestures than truth tellers ( $M = 0.97$ ,  $SD = 2.31$ ),  $t(23) = 2.09$ ,  $p < .05$  (one-tailed),  $d = .66$ . In alignment with Hypothesis 2, truth tellers ( $M = 9.99$ ,  $SD = 13.34$ ) made more *rhythmic pulsing* gestures than liars ( $M = 5.24$ ,  $SD = 7.4$ ). The difference was not statistically significant,  $t(30) = 1.39$ ,  $p = .087$  (one-tailed),  $d = .44$ . However, since statistical power was low (.39), there is a risk of a Type II error. In such cases, examining effect sizes becomes relevant. The effect size was moderate ( $d = .44$ ), which means that the difference between liars and truth tellers was meaningful (Cohen, 1977).

## Discussion

This study compared the effects of deception and truth telling on *speech prompting* and *rhythmic pulsing* hand gestures. As expected, liars made significantly more *speech prompting* gestures than truth tellers and truth tellers made more *rhythmic pulsing* gestures than liars. Although the latter difference was not statistically significant, the moderate effect size showed it was meaningful. However, the clips were very short descriptions and so did not encourage the flow of speech to any great extent. We expect results for this gesture to be stronger in longer descriptions.

The increased frequency of *speech prompting* gestures in liars supports the notion that liars can experience greater cognitive load than truth tellers (Vrij, 2008; Vrij et al., 2008; Vrij et al., 2010; Vrij et al., 2011) and that more gestures are made when speech becomes difficult (Feyereisen, 1983; Goldin-Meadow, 2006; McNeill, 1992).

These gestures seemed to be used in order to help the speaker 'find the right words' so supporting the proposition that the use of gesture can aid lexical retrieval. Furthermore, this result also supports Alibali *et al.*'s (2000) suggestion that gestures are possibly involved in the planning of speech. Many of these movements in some way 'rehearsed' an illustration of the speech before it was spoken. For example, one participant 'outlined' the shape of an item of clothing before mentioning 'a hoodie'.

The more frequent use of *rhythmic pulsing* gestures by truth tellers supports Rauscher *et al.*'s (1996) view that gestures are linked to the flow of speech. These results also support the notion that compared to liars, truth tellers are less likely to attempt to control their behaviour (Buller & Burgoon, 1996). These small movements occurred with the prosodic aspects of speech when the flow of speech was not inhibited by having to think hard and attempts to control behaviour.

As liars tended to make more of one type of gesture (*speech prompting*) whereas truth tellers tended to make more of another type of gesture (*rhythmic pulsing*), taken together these results go some way to explain the rather tenuous link between deception and illustrators found by DePaulo *et al.* (2003) and Vrij (2008).

There are a number of limitations to be considered. We acknowledge that the sample size was small. This led to a lack of statistical power and although results are encouraging a larger sample may have yielded more conclusive results for *rhythmic pulsing* gestures. In addition, we acknowledge that there are limitations to the extent these findings can be generalized as the sample consisted of undergraduate students. None of our participants experienced speech or motor control deficits and such deficits could lead to more, or less, frequent use of particular gestures.

In conclusion, more *speech prompting* gestures were made by liars supporting the view that gestures aid access to the mental lexicon and are used in the planning of speech. More *rhythmic pulsing* gestures were made by truth tellers supporting the view that these gestures are connected to the prosodic flow of speech and that, for these gestures, truth tellers make less attempt to control their behaviour compared to liars. Overall, when investigating deceptive behaviour, this study demonstrates the benefit of examining subcategories of gestures rather than considering them as a single category of 'illustrators'. This could be particularly useful in an applied setting where easily identifiable non-verbal cues to deception could provide a practical tool for police officers during the interviewing of suspects.

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