The Use of Gesture to Communicate about Felt Experiences

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Abstract

When people describe the character of felt experiences such as a headache they can use their bodies as a resource to help them communicate. It has been proposed that when speakers use gestures, pose and facial expressions to describe an experience their listeners simulate or mimic these cues in order to help them understand the character the experience. We test this model using data from dyadic conversations in a laboratory setting. The results show that listeners do not normally match the expressive gestures that speakers use in describing their experiences and that while speakers gesture more strongly for more negative experiences their listeners do not. Rather than re-creating the speaker's experience through mimicry, listener gestures appear to be used primarily for engaging with the concrete particulars of an experience and not its 'subjective' effects.

1 Introduction

Communicating the character of a felt sensation, such as a pain, seems harder than communicating about, say, the concrete events that caused a pain (although see (Wittgenstein, 1958)). Felt experience can be difficult to articulate and there is no guarantee that it is shared from person to person. Nonetheless, we do have the capacity to empathise with each others experience although the particular mechanisms behind empathy are still disputed and unclear (Preston and de Waal, 2002).

Much of the debate about empathy concerns the in principle possibility (or impossibility) of knowing another's experience. Here we are concerned with the empirical question of how people actually go about trying to communicate their experiences in conversation. In particular, we are interested in the role of gesture, and embodiment more generally, in this process.

Gestures, posture and facial expressions are frequently used in conversation to complement and provide additional information to the accompanying speech (Kendon, 2004; McNeill, Cassell and Levy, 1998). Temporally and semantically coupled with the verbal elements raised in speech, these embodied depictions can potentially provide a more direct representation of the imagistic and embodied aspects of a speaker's message. Gestures can be particularly useful when depicting the visual or spatial domain, due to their own physicality. Gestures, posture and expressions can also provide a more direct expression of an embodied experience through direct displays or demonstrations of aspects of an experience.

In order to obtain a better understanding of how people use gestures, posture and expressions in communicating about their experiences we have collected a corpus of speech, video and body movement data. In this corpus, pairs of participants take turns to describe to each other recalled experiences that invoke significant elements of embodied experience, for example a toothache or a yawn. Here we report an initial investigation of the use of gesture in the expression of these experiences in an interaction. A basic premise of our approach is that it is the use of gesture in the live dynamics of an exchange rather than, for example, in telling a story to a camera or an experimental confederate, that is key to understand-

ing how experience is communicated in practice. It is also clear from the literature that gestures in interaction differ from those produced in monologue (Bavelas and Gerwing, 2011). More specifically, we are interested in how speakers' gestural descriptions of their experience contribute to the listeners' understanding and what *listeners* do in response to demonstrate their understanding.

A key hypothesis about how expressions and gestures contribute to communication is that listener's automatically mimic them in order to 'simulate' or 'reconstruct' the described experience and, thereby, enhance their understanding of what was said. For example, Hatfield et al. (1993) claim there is an automatic and continuous tendency to mimic one another in social interactions. Defining mimicry as a form of synchronisation of posture, facial expression, movement and instrumental behaviour of others including mimicking and synchronising vocal utterances (Hatfield, Capioppo and Rapson, 1993). Similarly, Chartrand and Bargh (1999), drawing on James principle of Ideomotor-action, propose that merely thinking about behaviour increases the tendency to engage in that behaviour. This perception-behaviour link is, they claim, a natural and non-conscious connection between the act of perceiving and the act of behaving, such that perceiving an action being done by another automatically makes one more likely to engage in the same behaviour. They suggest a two-step process for this process of direct environmental causation of social behaviour: (1) automatic perceptual categorisation and interpretation of social behaviour (environment to perception), (2) perceptual activation continuing on to activate corresponding behaviour representation (perception to behaviour). Here, they propose the sequence from perception to behaviour occurs entirely automatically, so should occur even amongst strangers and should occur even in the absence of a reason to do so, such as pursuing an affiliation goal (Chartrand and Bargh, 1999).

Two predictions follow from this model. First, that speaker descriptions of felt experiences accompanied with gestural expressions should cause the listener to produce similar behaviour or gestures. Second, that the strength and form of the listeners responses should match the strength and form of the gestures produced by the speaker. More specifically, the more unpleasant or painful (negative) the experience being described by the speaker the more mimicry produced through the empathetic responses produced by the listener in sympathy with the speaker.

We test these predictions against the behaviour of speakers and listeners in our corpus. In order to do this we first introduce a taxonomy of gesture types used to code participants responses.

1.1 A Taxonomy of Descriptive Gestures

There are many different uses of gesture and many different gesture taxonomies. For current purposes a simple taxonomy is required that allows us to discriminate basic functional differences. A review of literature categorising different types of gestures within an interaction follows, seeking to build a taxonomy of each in which a suitable context for the gestural descriptions of sensation can be placed.

Gesture, for current purposes, includes anything non-verbal[1] that is produced as part of the conversation including hand movements, postures shifts and so on. For a simple taxonomy to categorise gestures describing felt experience, we exclude gestures that form para or meta narrative elements of interaction. Para-narrative elements are where gestures are about or managing the interaction itself rather than the semantic content of what is being communicated. Meta-narrative elements are where gestures are about the speech itself, again not the semantic content or the interaction. What we are interested in are the narrative elements of an interaction, these refer to gestures that depict or are about the content of the speech. For the purposes of our study we focus on 'narrative' or 'topic' gestures (Bavelas, Chovil and Lawrie, 1992) that relate to the content of the speech. These are spontaneous gestures that occur mostly synchronously with speech, also referred to as as physiographic (Efron, 1941) or lexical movements (Krauss, Chen and Chawla, 1996).

2 Method

In order to elicit unscripted accounts of felt experiences we asked people to describe to each other

[1]Note: We use non-verbal as a gloss to mean non-speech communicative actions such as conversational facial displays, gestures and body movements.

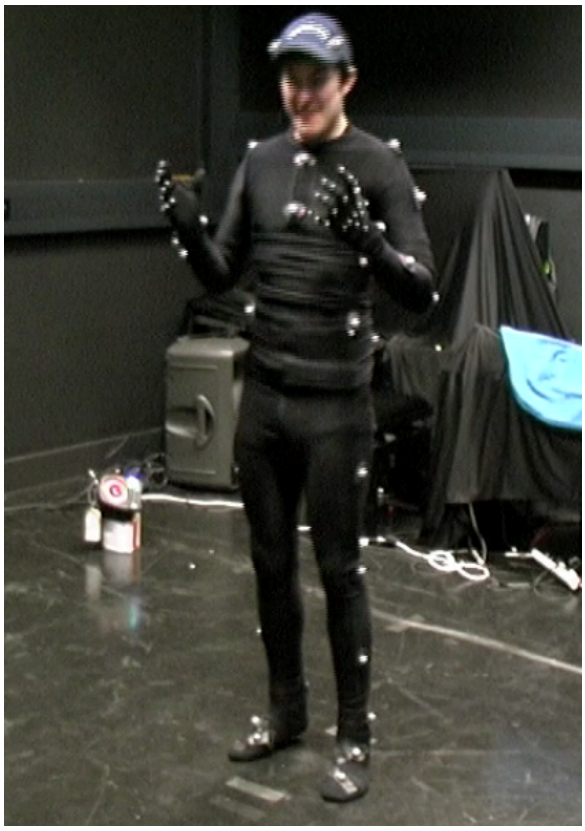

Figure 1: An Intense Throbbing Pain.

recalled experiences such as a toothache or a yawn, that have an embodied element and could provoke empathetic responses.

2.1 Participants

A total of 24 participants were recruited. Participants ages ranged from 18 to 60, consisting of 12 females and 12 males placed in 12 pairs. The aim was to elicit unrehearsed and spontaneous descriptions in an interaction. However, as the study required participants to wear motion capture suits with reflective markers, we were aware of the effect of this on the interaction, such as the assumption that participants movements (and by extension, their gestures) were being studied.

2.2 Materials

The corpus of speech, video and body movement data were captured in the Performance Laboratory at QMUL. Video footage included a full body face on view of each participant for the duration of the study. Motion capture data was also obtained for participant using a Vicon optical marker system although we do not report this data here. A set of cards were placed on a small table next to where the participants stood. Each participant was given a stack of these cards and were asked to take turns selecting one card at a time. There were 8 cards in total per participant, the experiences written on sets of cards were a headache, the taste of a nice meal, a toothache, a stomach ache, a backache, a yawn, laughing out loud and a back massage.

2.3 Procedure

The participants were given written instructions outlining the study procedure. They were asked to recall specific instances of the experiences stated on the cards and talk about them to each other. When it was their turn each participant was to explain the details of a previous experience they have had of the sensation written on the card to their partner for no longer than a 2 minutes. An emphasis was placed on describing how this experience felt or the particular sensation they felt at the time of the experience. On each description the listening participant was encouraged to talk and ask questions at any time, the process was described in the instructions as an exchange. In attempt to allow participants to practise and settle into the irregular nature of having a conversation in the conditions of the lab, the first two experiences that came up in the set of cards in each session were practise experiences that were not analysed, these were a headache and the taste of a nice meal. Aside from the two practise experiences at the beginning of the stack, the cards were shuffled into random order for both participants in each session.

2.4 Coding

For the coding process, the video and audio descriptions of each experience was separated into separate items. As we are interested in topic gesture, these were coded for each item. The participants were labelled cardholder (CH) and non-cardholder (NCH) for each item. On the first pass, any occurrences of physiographic gesture were coded without specifying their nature. On the second pass, topic gestures were separated into three types: Iconic, Metaphoric and Abstract Descriptive, the annotator following the definitions indicated in the taxonomy below. It is important to mention that all topic gestures were

coded irrespective if it was the cardholder or non-cardholder that performed it, so both speaker and listener were coded for their gesture and the same definitions were used for each. On each pass, only one camera view was coded at a time, so for example, while coding the cardholders gestures the non-cardholder was not in view.

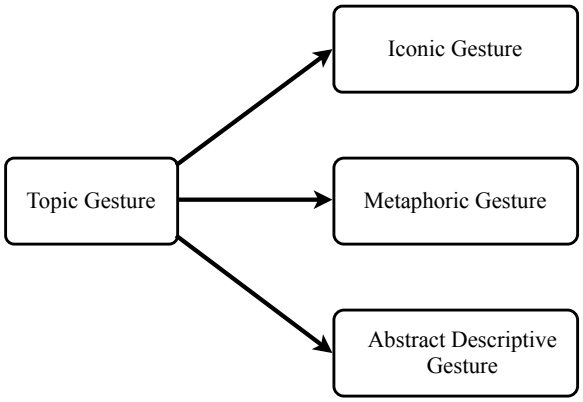

Figure 2: Gesture Taxonomy.

In order to differentiate between narrative gesture types in this study we adopt McNeill's subdivision of spontaneous gesture into Iconic and Metaphoric subcategories (McNeill, Cassell and Levy, 1998) and supplement it with the 'Abstract Descriptive' topic gestures described by (Rowbotham et al., 2011).

Iconic gestures include a depiction that is intrinsic to the content that is being conveyed, for example a gesture describing a ball will depict a characteristic intrinsic to a ball, such as making a fist to represent roundness by making the hand round. Iconic gestures are always a concrete entity or action rather than abstract or analogous. Perhaps more relevant to us is iconic gestures that act out being in pain or the cause of the pain. For example, when describing an experience of stubbing a toe, the speaker may hop around on one foot depicting the outward behaviour caused by stubbing their toe. This mimicry of their behaviour is intrinsic to the original action and so therefore we class as a iconic gesture. They encode a speakers viewpoint on a communicated depiction. Ekman and Friesen (1969) include deictics, spatial, kinetographs, pictographs and rhythmic elements in this category. Beattie (2002) suggests that the content of these gestures to describe action, shape, size, direction, speed, and relative-positions.

Metaphoric gestures: are usually pictorial but unlike iconic gestures, metaphorics depict abstract ideas rather than a concrete object or event. The topic of the metaphor being the abstraction, the vehicle or gestural image being the offered virtual object spatially localised, and the common ground of meaning is where the topic and vehicle are linked in properties, such as physical containers. For example, in a description of a backache an interlocutor describes the most extreme sensation of that particular pain by saying 'and that was the crest of it', while reaching high and pointing to the top point in the gesture space, spatially highest gesture metaphorically signifying the most intense pain. We exclude what Gullberg (2009) calls conventionalised gesture, otherwise known as emblems and symbolic gesture (Ekman and Friesen, 1969; Krauss, Chen and Chawla, 1996). These have a known meaning across a culture and are independent of speech, although can accompany it. Here we exclude as they lack the spontaneous descriptive characteristic that focuses on the quality of the experience.

Absract Descriptives Rowbotham, Holler and Lloyd (2011) make an additional subtype of topic gesture they term abstract descriptive, these gestures describe inner experiences and are categorised by featuring 'imaginist and semantically related to speech but containing information which could not be visually accessed (subjective experience of pain), therefore not iconic according to McNeill". (Rowbotham et al., 2011; Hyden and Peolsson, 2002) These gestures describe the felt sensation without acting it out, and express more than just the location of the sensation. They specifically refer to the inner sensation of the experience, put plainly, what the sensation feels like. For example, when describing the sensation of stubbing ones toe we might depict the pain with a gesture that uses our hands to represent the rhythmic quality of a throbbing pain by mimicking it in the rhythm of our hand movement, or perhaps the intensity intrinsic to the pain would be depicted by the tenseness of our fingers. This type of gesture does not represent an analogy of the felt experience so cannot be a metaphoric gesture but on the other hand cannot be symbolised concretely, as the felt experience is only accessible to the experiencer. This indicates that they lie somewhere on the borders of iconic gesture and metaphoric gesture.

3 Results

We report data for 9 pairs of participants and for four target items: Toothache, Backache, Yawn and Laugh. Excluded were a stomach ache and a back massage, these were excluded because for these particular items, one pair of participants proceeded to talk about another persons experience of the sensation on their card, for example describing their fathers backache or a dogs yawn, this resulted in although unrehearsed and spontaneous description, not a personal account. Also excluded were two sessions where the participants didn't follow the instructions, where both participants talked about one experience that came up on one participants card at the same time, comparing experiences rather than describing their own individual experiences, these were very different interactions to the other sessions.

The overall distribution of different gesture types is reported in Table 1.

Gesture Type	Mean	Std. Deviation	Median	Sum
Abstract Descriptive	1.56	2.090	1.00	184
Iconic	3.58	4.463	2.50	423
Metaphoric	.07	.252	.00	8

Table 1: Overall Occurances of Different Gesture Types

Because Metaphoric gestures were low frequency in these data (0.07 per item, less that 1.3%) they are excluded from the statistical analysis.

The initial inspection of the data for the dependent variables, number of occurrences and duration of gestures, showed a strong positive skew towards zero so a Tweedie distribution was used for the Generalised Estimating Equations analyses reported below.

Item	Mean	Std. Deviation	Median	Sum
Backache	2.88	3.844	2.00	184
Laugh	1.89	2.356	1.00	106
Toothache	3.52	5.106	1.50	197
Yawn	2.00	2.300	1.00	120

Table 2: Average Gesture Use for Each Target Item (Excluding Metaphorics)

The four target items are not directly comparable but were ranked according to Experience Type to reflect the intuitive degree of (un)pleasantness involved. For analysis we ranked them in the variable Experience Type as follows: 1 Laugh, 2 Yawn, 3 Backache, 4 Toothache to provide a ranking from positive to negative experience.

Dependent Variable: Occurrences

Source	Type III Wald Chi-Square	df	Sig.
(Intercept)	33.655	1	.000
Role	49.821	1	.000
Gesture Type	19.700	1	.000
Experience Type	11.499	3	.009
Role * Gesture Type	5.135	1	.023
Role * Experience Type	1.332	3	.722
Gesture Type * Experience Type	2.635	3	.451
Role * Gesture Type * Experience Type	4.042	3	.257

Table 3: Results of GEE Analysis for Frequency of Gestures

Dependent Variable: Average Duration

Source	Type III Wald Chi-Square	df	Sig.
(Intercept)	20.766	1	.000
Role	51.953	1	.000
Gesture Type	1.924	1	.165
Experience Type	5.178	3	.159
Role * Gesture Type	4.485	1	.034
Role * Experience Type	2.961	3	.398
Gesture Type * Experience Type	5.994	3	.112
Role * Gesture Type * Experience Type	3.560	3	.313

Table 4: Results of GEE Analysis for Average Duration of Gestures

In order to check if the order of presentation has an effect on the frequency of gesturing item number was correlated with total number of gestures produced this was not significant (Kendalls Tau-b = 0.03, p (two-tailed) = 0.49.

Two main Generalised Estimating Equation (GEE) analyses were carried out on a) the frequency of occurrence of gestures and b) the duration of gestures under the conditions defined by the three experimental factors: Role of the participant (Cardholder vs. Non-Cardholder), Gesture Type (Iconic vs Abstract Descriptive) and Experience Type (from 1 positive to 4 negative). All two-way and three-way interactions were included. Participant ID was included as a subject factor. Pair identity, Role, Order and Item specified as within-subjects variables.

As Table 3 shows, there were main effects of Role, Gesture Type and Experience Type and a Role X Gesture Type Interaction on the likelihood that a gesture would be produced (occurrences). The

largest effect is Role, with Card Holders producing approximately three times as many gestures as Non-Card Holders. The effect of Experience Type (i.e. target item) is illustrated in Table 2. Descriptions of Toothaches prompted the most gestures and Laughs the least.

The interaction between Experience Type and Role is illustrated in Table 5. The people describing an experience rely more on Abstract Descriptive than Iconic Gestures. The people listening to them, by contrast, show the reverse pattern, replying more on Iconic gestures than on Abstract Descriptives.

The second GEE analysis, reported in Table 4, shows the results for average gesture production time. This replicates the main effect of role with Cardholders producing longer, i.e. more sustained, gestures than Non Cardholders. The overall average duration of gestures for two different categories of gesture are not reliably different, nor are the four different Experience Types. However, the interaction between role and Experience Type is Replicated with Card Holders taking longer over Abstract Descriptives than Iconics and Non Cardholders showing the reverse pattern.

In order to test whether patterns of use of Iconic and Abstract Descriptive Gestures vary systematically with the different levels of the Experience Type variable i.e. from positive (1) to negative (4) four additional Univariate General Linear Model analyses were carried out on the frequency of gestures. It is important to note that the model fit is not as good for the current data and the statistical power is lower than the GEE analysis. However, this does provide a way to compare the trends for the different roles and different gesture types across the four levels of Experience Type.

For Cardholders, Iconic gestures show a reliable linear pattern of increase across from positive to negative experience ($F(3,55) = 3.47$, $p = 0.01$). However, Abstract Descriptive gestures do not show the same pattern ($F(3,55) = 1.01$, $p = 0.11$). For Non Cardholders neither Iconic gestures ($F(3,55) = 0.73$, $p = 0.28$) nor Abstract Descriptive Gestures ($F(3,55) = 0.06$, $p = 0.73$) show a reliable pattern of increase from positive to negative Experience types.

4 Discussion

Overall, there is little evidence of direct mimicry in this corpus, people listening to the description of an experience rarely produce gestures or expressions that match, in any simple way, those produced by the speaker. Patterns of listener gesture are systematically different from those of the people they are listening to.

The results show that speakers (Cardholder) perform more gestures, with a longer duration than listeners (Non Cardholder) for each item. This is expected, as the task structure ensures that the description of the Cardholders experience should take precedence, resulting in the speaker performing a more in depth gesticulation about the felt experience on the card to communicate the experience to the Non Cardholder.

The manipulation of (un)pleasantness of experience affects speakers and listeners differently. More Iconic gestures were performed than Abstract Descriptive gestures for both the Cardholder and the Non Cardholder. For example, when describing a toothache, the speaker might add iconic gestures describing the location of the pain by pointing to it, or perhaps detailing that they had to eat on the other side of their mouth, accompanied gesturally by performing a chewing motion and pointing to that side simultaneously.

When comparing the ratio of Iconic to Abstract Descriptive gestures, the Cardholder produced a higher ratio of Abstract Descriptive gestures than the Non Cardholder. We speculate that the higher amount of Iconic gesture suggests that both participants focus more on the concrete context of the situation surrounding the experience than the felt experience itself. Interestingly, the Non Cardholder's focus' even less on the sensation of the felt experience than the contextual aspects of the experience so would be more likely to mimic the contextual descriptions back to the Cardholder. We might speculate that the Non Cardholder actually avoids engaging with the description of the felt experience as the abstract descriptive gestures are not seen to mimic the Cardholders.

Returning to Chartrand and Barghs' (1999) work, their findings suggest that the mimicry of postures and gestures are a continual source of informa-

Note: CH = Cardholder, NCH = Non-Cardholder.

Role	Gesture Type	Mean	Std. Error	95% Wald Confidence Interval	
				Lower	Upper
CH	Abstract Descriptive	3.212131	.4086602	2.411172	4.013090
	Iconic	2.888671	.1616220	2.571898	3.205444
NCH	Abstract Descriptive	.629115	.1798742	.276568	.981662
	Iconic	1.145358	.2085097	.736687	1.554030

Table 5: Illustrating the Interaction Between Gesture Type and Role

tion throughout a social interaction, communicating messages indicating understanding and attention. The consensus appears to be coordination behaviour is related to empathy, rapport and liking, although some see mimicry as the cause and effect of empathic understanding. Chartrand and Bargh argue that individuals use behaviour mimicry as a communicative tool on a completely non-conscious level and that this mimicry usually leads to emotional convergence (Chartrand and Bargh, 1999). However, non-concious mimicry is not suggested in our results, as listeners did not tend to mimic the abstract descriptive gestures, if the mimicry was truly non-concsious in the way the perception-action link and our first hypothesis suggest, the listener would tend to mimic all gesture types as performed by the speaker, and this was not the case in this situation.

For the experiences with higher ranked experiences of (un)pleasantness, the amount and duration of gestures both increase for the Cardholder than the lower ranked experiences. However, the Non Cardholder was not affected, or showed no difference in terms of gestures, by the difference in rank. These results are consistent with a situation in which the person describing an experience will add iconic information to convey more negative experiences but do not add information about the felt experience. Listeners, by contrast, do not appear respond differently, in terms of gesture, to different degrees of (un)pleasantness. These results are also contrary to our second and third hypothesis, that the listener would produce more mimicry either for the more intense experiences, or for the more unpleasant or negative experiences, however as the listeners' responses were not affected in terms of rank at all, this is not consistent with either hypothesis. Also, this provides further evidence inconsistent with the perception-behaviour link, as again nonconscious mimicry would be affected by an increased frequency of gestures, as is the case with speakers' gestures in the higher ranked experiences, however listeners' gestures are not affected.

Why do listeners appear to avoiding mimicking the abstract descriptive gestures produced by the speaker? One alternative explanation is that this might be an issue of politeness, perhaps an acknowledgement of such inner experience is seen to be intrusive by the listener. This would result in the listener avoiding mimicking this description. A second alternative is that the interlocutors may find it easier to demonstrate the cause of the sensation or act out the outcome for the listener to understand the experience to infer or simulate how it felt, rather than describe the sensations itself.

An important limitation of the current study is that it looks at a limited number of gesture categories and doesn't examine their specific content or the structure of the interactional sequences in which they occur. Further work will examine the interactional context more closely and the other ways a listener can acknowledge or engage with speaker's descriptions of felt experience. For example, Bavelas et al. (1986) classify empathetic listener responses as motor mimicry. Here motor mimicry is not a straight mirroring or general imitation in the sense we have used the term mimicry in this paper, but is defined as the mimicry of an expressive behaviour, or the performance of the expected expressive behaviour of an occurrence in the perspective of another. Motor mimicry is found within a micro-social interaction where there is a high level of reciprocity and mutual influence between speaker and listener. Conceptualised as primitive empathy, motor mimicry is described as an automatic reflex of conditioned cues

based on ones own prior experience. Bavelas and her colleagues suggest that motor mimicry serves as an expression of the perceived emotion, an interpersonal act to put across, in their words, I feel as you do (Bavelas et al., 1986). This is a response that acknowledges and engages with the felt experience, while not necessarily mimicking the Abstract Descriptive gesture that accompany the description as shown by this study, indicating a possible avenue for further work.

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