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RUNNING HEAD: Co-speech gestures and pain communication

Externalizing the Private Experience of Pain: A Role for Co-speech Gestures in Pain
Communication?

SUBMISSION TO: Health Communication

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communication; patient-physician communication

Abstract

Despite the importance of effective pain communication, talking about pain represents a challenge for patients and clinicians because pain is a private and subjective experience. This article considers the limitations of current methods of obtaining information about the sensory characteristics of pain and argues that spontaneously produced ‘co-speech hand gestures’ may constitute an important source of information here. We present recent empirical evidence that reveals that co-speech gestures contain important information about the pain experience that can both add to and clarify speech. Although this is a relatively new area, these findings suggest that for effective pain communication to occur, recipients must take full advantage of the information contained in both the verbal and gestural modalities. **By highlighting the potential role for gestures in communicating pain, we hope to stimulate further research in this area, eventually leading to improvements within clinical practice. In particular,** it is expected that a more holistic approach, which considers co-speech gestures alongside speech, will lead to a greater understanding of the pain experience, and potentially to improvements in treatment and support for pain sufferers.

1. Introduction

Pain is one of the most frequently reported symptoms in medical consultations (Gureje, Von Korff, Simon, & Gater, 1998), with discussions of pain taking up a substantial portion of the consultation time, particularly during the first consultation (Henry & Eggly, 2012). Despite this, pain presents a challenge to patients and clinicians because it is a subjective experience, directly accessible only to the sufferer and often with no visible signs (such as a wound) from which to infer the sensation. Even when there is a visible cause this may not reveal anything about the sensation of pain (e.g. whether it is throbbing, stinging, persistent and so on), and amount of tissue damage does not correlate with self-reported pain intensity (Turk & Melzack, 2001). Problems also arise when trying to distinguish between similar pains (e.g. migraine and non-migraine headache); here the patient's self-report is vital for making an accurate diagnosis and providing the correct treatment (Stafstrom, Rostasy, & Minster, 2002). Thus, patients need to articulate their pain effectively to get help and support, while doctors and concerned others need to understand the sufferer's experience in order to provide this; "Our ability to help ... anybody in pain, depends upon the availability of reliable and valid information concerning the presence and specific nature of the individual's distress" (Hadjistavropoulos & Craig, 2002, p. 552).

To highlight the importance of effective pain communication, McDonald and Malony (2004) found that teaching pain communication skills to patients (including describing various aspects of the pain, such as location, sensation, intensity and changes in pain) led to decreases in post-operative pain levels. Conversely, poor pain communication and assessment has been identified by 76% of physicians as the most important barrier to effective pain management (Von Roenn, Cleeland, Gonin, Hatfield, & Pandya, 1993) and both patients and physicians report that conversations about pain are frequently difficult, frustrating, and time

consuming (Dosa & Teno, 2010; Matthias et al., 2010; Upshur, Bacigalupe, & Luckmann, 2010).

The present article provides a brief review of current methods of pain assessment, with a focus on the amount and usefulness of information that can be obtained about the characteristics of pain. As outlined above, a key difficulty in pain communication lies in translating the subjective sensory experience of pain into an external message in such a way that the addressee (e.g. a clinician) can understand the nature of the experience, leading to diagnosis and treatment. Thus, we will focus on how these sensory characteristics of pain (e.g. sensation, intensity, location) are communicated, including the limitations of current methods of obtaining this information. Although effective communication about other aspects of the pain experience, such as impact on functioning, is also important in clinical settings, particularly for chronic pain, the challenges of communicating about these may differ from those related to communicating the characteristics of pain. In particular, compared to describing what pain feels like, it may be relatively easy to explain how pain has prevented engagement in work or exercise, or how long the pain has persisted for. Thus, although these aspects of the pain experience are important, they will not be the key focus of this paper.

We will focus on those studies that are concerned with obtaining information about the sensory characteristics of pain (e.g. sensation, intensity, location), primarily in the domain of non-chronic pain, as communication of this experience, whether at initial presentation or later when reviewing the effects of treatment, tends to be focused around understanding the characteristics of the pain in order to determine the appropriate treatment (Briggs, 2010; Swann, 2010; Wood, 2008). We will not review the research on the communication of chronic pain (e.g., Baszanger, 1992; Cinciripini & Floreen, 1983; Lin, Kupper, Gammaitoni, Galer, & Jensen, 2011; Matthias, et al., 2010; Rasmussen, Sindrup, Jensen, & Bach, 2004; Steihaug, 2005; Tai-Seale, Bolin, Bao, & Street, 2011; Upshur, et al., 2010), as

communication in this domain is typically geared towards managing the impact of pain, rather than on understanding the sensory aspects of the experience. However, chronic pain studies that have considered the communication of the sensory dimensions of pain experience will be included where relevant.

Following a critical review of current methods of obtaining information about sensory aspects of pain, we will introduce the area of co-speech hand gestures, i.e. the movements of the hands and arms that spontaneously accompany speech. We will discuss key findings from recent research into the role of these co-speech gestures in pain communication, and how this modality can overcome some of the issues related to other methods of pain communication. Although this is a relatively new area of research, we will argue that co-speech gestures can play a fundamental role in pain communication, and that by attending to these gestures alongside speech clinicians and other health professionals can obtain a better understanding of the pain experience, with important implications for the treatment and support that patients receive. Finally, we will consider the limitations of research conducted to date in this area and make suggestions for future research.

It is important to note from the outset that the co-speech gestures we will be discussing in this article are crucially different from the behaviors traditionally referred to as ‘nonverbal communication’ (e.g. facial expression, eye gaze, posture; see Section 4 for more detail on this issue). Nonverbal communication of patients and healthcare practitioners has been studied extensively in clinical contexts, both in medical consultations (e.g., about pain) and in psychiatric therapy sessions, with these behaviors serving as important signals of distress, emotion, attention and empathy, which have been linked to outcomes such as increased patient satisfaction (e.g., Finset & Piccolo, 2011; Henry, Fuhrel-Forbis, Rogers, & Eggly, 2012; Lepper, Martin, & DiMatteo, 1995; Ong, de Haes, Hoos, & Lammes, 1995; Robinson, 2006; Roter, Frankel, Hall, & Sluyter, 2006; Shaw et al., 2011; Sheeler, 2013; Stewart &

Roter, 1989). In considering the role of co-speech gestures in pain communication, however, the present article takes a new approach, considering how this crucially different and comparatively under-studied aspect of visual, bodily communication can contribute to pain communication by conveying semantic, propositional information about pain.

2. Verbal self-report of pain experience

Speech is often considered to be the primary means of expressing pain, particularly in the absence of physical indicators (Craig, 1992; Tian, Panesar, Bhatt, & Carson-Stevens, 2011), and patients and physicians spend up to 23% of the consultation time talking about pain (Henry & Eggly, 2012). Further, verbal self-report is seen as the most accurate and reliable means of assessing pain experience (Craig, 2009; National Cancer Institute, 2011). However, despite the obvious importance of speech, there are problems with this mode of communication, both for the pain sufferer, in terms of finding the right words to describe their pain, and for the listener, in terms of correctly inferring the nature of the pain from the words used.

It has long been recognized by pain sufferers and scholars alike that as a subjective, internal sensation, pain is extremely difficult to translate into language; “English, which can express the thoughts of Hamlet and the tragedy of Lear, has no words for the shiver and the headache...let a sufferer try to describe a pain in his head to a doctor and language at once runs dry” (Woolf, 1993, p. 200). Thus, patients often struggle to find the right words to describe their pain, in some cases leading to them becoming frustrated and ceasing to describe their pain to others, perpetuating a cycle of withdrawal and ineffective communication (Ehlich, 1985; Scarry, 1985); “unable to express pain, we come to believe there is nothing to say...silenced we become isolated in pain and the isolation increases the pain” (Frank, 1991, p. 30). If patients are unable (or become unwilling) to communicate their

pain then clinicians will not have sufficient information to provide appropriate treatment and support.

Although there are some 'pain-words' (e.g. 'throbbing', 'stinging', 'stabbing') available, pain, like other subjective, phenomenal experiences such as taste and smell, has been suggested to be ineffable, i.e. difficult or impossible to put into words in a way that truly represents the experience (Majid, in press). In the same way that it would seem impossible to explain to congenitally blind individuals what red means because they cannot experience this for themselves (Levinson & Majid, in press), it can be argued that it is not possible to truly express the subjective experience of pain. Although words to describe pain can be learned through their application to experiences of injury (IASP Task Force on Taxonomy, 1986), the true establishment of names can only occur through the process of ostensive definition, that is, by pointing at and naming things in the shared public world (for a philosophical discussion of this problem see Wittgenstein, 1953). However, for sensations such as pain, there is no referential content for ostensive definition; we cannot show our pain to others and say, "this is a stinging pain", meaning that it is not possible to unequivocally identify and name pain within a public language (Levinson & Majid, in press). Thus, even when the same description is used by different speakers or by the same speaker at different times, we do not know whether it carries the same intended meaning. For example, Salovey and colleagues (1992) found that when asked to indicate which types of pain were best described by a series of adjectives, participants provided an average of ten different types for each adjective. This suggests that verbal pain language is ambiguous and people struggle to map lexical pain terms onto specific pain experiences, highlighting the potential for misunderstanding of others' pain descriptions. Cross-linguistic research into the communication of sensory experiences such as taste, smell and touch has revealed that where languages have limited vocabulary for such experiences, language users recruit other modes of communication (Majid

& Levinson, 2011). In the following sections we will discuss the various ways in which researchers and medical professionals have attempted to overcome some of the problems associated with the verbal communication of pain.

3. Alternative methods of obtaining information about pain

3.1. Self-report pain assessment tools

Pain assessment tools such as numerical and verbal rating scales are simple to administer and attempt to make the pain experience ‘measurable’ by categorizing and quantifying aspects of the experience. These tools have been used in research settings to measure changes in intra-individual pain across time (Defrin, Grunhaus, Zamir, & Zeilig, 2007; McCaffrey & Freeman, 2003), and distinguish between different types of pain (Crawford, 2009; Dubuisson & Melzack, 1976). However, it is not clear that these tools necessarily provide more detailed or useful information than would be obtained from verbal self-report. For certain tools, such as numerical rating scales, pain sufferers are simply asked to assign a numerical value to an aspect of their pain (e.g. “on a scale of 1 to 10, how intense is the pain?”). While this might be useful in terms of having a record of pain scores over time, it does not necessarily add much to the verbal pain description. Other tools, such as the McGill Pain Questionnaire (MPQ; Melzack, 1975), are more comprehensive and contain a range of descriptors from which sufferers can select those that apply to their pain. While this is useful when patients struggle to verbalize pain, it nevertheless limits the choice of descriptors to a predefined list with no option to indicate alternatives. Thus, patients are ‘forced’ to select descriptors that may not accurately reflect their experience or capture all aspects of it (Ho, Spence, & Murphy, 1996). As such, these methods do not permit a detailed elaboration of the pain experience.

In addition, problems are likely to arise in the interpretation of these measures at two stages: 1) in the initial interpretation of measures by patients and 2) in clinicians’

interpretation of patients' responses to these measures. For example, when asked to interpret the maximum value (i.e. the highest score) on a visual analogue scale, some patients interpreted it numerically, some emotionally, and others in functional terms, while individual pain scores were confounded by factors such as tiredness, distress, and presence of other distinct pains (Williams, Davies, & Chadury, 2000). **Research has also indicated that different people give different ratings to identical stimuli, i.e. one patient's '8' might be another patient's '3' on a 1 – 10 scale, suggesting that the scores on these tools are relative only to the sufferer and are not comparable across people (Ho, et al., 1996).** One study also revealed that over 50% of nurses were concerned that such tools were subjective, inaccurate, and subject to problems of under- and over-treatment (Simons & MacDonald, 2004), a concern that is supported by empirical evidence that pain is often underestimated on the basis of these measures, especially at high levels (Sjöström, Haljamäe, Dahlgren, & Lindström, 1997). This has obvious implications for treatment as if pain is underestimated then patients are likely to receive inadequate treatment and pain relief. The fact that these tools are subject to interpretation issues at two distinct stages means that, to some extent, these measures are more problematic than simple verbal self-report.

Finally, although guidelines recommend the use of pain assessment tools within clinical settings (e.g., National Institute for Health and Clinical Excellence, 2011; Royal College of Physicians, British Geriatrics Society, & British Pain Society, 2007), these are not enforced and there is no single guideline for the UK (Simons & MacDonald, 2004; Wood, 2008). Further, research into their use by pediatric nurses revealed that less than 25% documented pain intensity scores and there was no evidence of other pain assessment tools being used (Jacob & Puntillo, 1999). Other research revealed that nurses perceive numerous barriers to the use of current assessment tools, including inadequate training and lack of knowledge, concerns about the extra time and work involved and the possibility of patients becoming

frustrated at being given too much paperwork (Simons & MacDonald, 2004). Taken together with the suggestion that these tools tend not to provide more detailed information about the pain experience than that obtained by verbal self-report and the fact that they are not widely utilized within clinical practice suggests that there is an urgent need for alternative approaches.

3.2. Observational indicators of pain

People often communicate pain through nonverbal behaviors such as pre-verbal utterances (e.g. 'ow'), sighing, and facial expressions (e.g. Labus, Keefe, & Jensen, 2003; McCahon, Strong, Sharry, & Cramond, 2005; Sullivan et al., 2006). These behaviors allow others to make inferences about the presence of pain and associated distress (Craig, 1992), and may be useful for recognizing pain needing immediate attention, as well as for the identification of pain in populations with cognitive difficulties or language impairments (Swann, 2010). However, although these behaviors may be the only overt sign that a person is in pain and can be important in determining the presence of pain, there are some limitations in terms of the information they provide and their interpretation.

Firstly, observational indicators tend to be generic across pain experience, meaning that they cannot be used to distinguish between different types of pain or to glean specific information about the experience. For example, research on the facial expression of pain indicates that there is a 'prototypical' pain expression, in which the same basic expression is produced in response to various types of pain (Prkachin & Craig, 1995), signaling the presence of pain but not providing information about what type of pain it is. Further, they are often an immediate and brief response to intense transitory pain, limiting their utility to the identification of acute pain and making them less useful when discussing pain retrospectively (Craig, 1992; Prkachin, 1992; Prkachin & Craig, 1995).

Secondly, caution is needed in the interpretation of these behaviors as their display is influenced by factors such as culture, personality, and motivations (Craig, 1992; Prkachin & Craig, 1995), and they are susceptible to reinforcement and conditioning (Fordyce, 1976; Keefe & Block, 1982). Research has also indicated that observers are unable to discriminate effectively between real and exaggerated pain on the basis of these behaviors. For example, Prkachin, Berzins and Mercer (1994) found that for facial expressions, observers significantly underestimated the level of pain relative to levels reported by sufferers, and that, while self-reported pain consistently correlated with the production of painful facial expressions, observers' ratings did not. Further, even if observers' pain ratings are correlated with amount of pain behavior, there may still be a difference in the absolute pain scores provided by observers and sufferers (e.g. if observers systematically underestimate pain). Thus, while observers can use observational indicators to make simple distinctions between whether or not a person is in pain, they cannot accurately estimate the level of pain based on these cues (Hadjistavropoulos, Craig, Hadjistavropoulos, & Poole, 1996). Importantly, this underestimation may lead to under-treatment, indicating that a reliance on these methods may have detrimental consequences for pain sufferers. While clinicians and concerned others should by no means ignore these pain-related behaviors produced by pain sufferers, they nevertheless do not appear to address the challenges of verbal pain communication as a means of obtaining meaningful information about the precise nature of the experience.

3.3. Visual representations of pain experience

Recently, researchers have begun to explore the utility of visual representations as an aid to pain communication. Patients' drawings of their headaches have been found to contain detailed information about features of the pain such as location and quality, as well as emotional and behavioral reactions to pain (Broadbent, Niederhoffer, Hague, Corter, & Reynolds, 2009; Wojaczynska-Stanek, Koprowski, Wróbel, & Gola, 2008). Further,

clinicians are able to differentiate with some success between migraine and non-migraine headaches based on these images (Stafstrom, et al., 2002; Wojaczynska-Stanek, et al., 2008). Although initial findings appear promising, the utility of these methods may depend on patients' skills and abilities to express themselves creatively; patients who lack ability or confidence may be less able to portray pain in this manner.

Other work has considered photographs as a means to express pain and facilitate dialogue. Baker and Wang (2006) asked older adults with chronic pain to photograph objects that reflected their pain experience and compose narratives to accompany these. Participants reported that this process was beneficial and gave them the opportunity to share their pain experiences with others, although the utility of these photographs in medical consultations was not explored. Following a collaboration with chronic pain sufferers to produce photographs representing their pain (Padfield, 2003), Padfield and colleagues gave patients 64 pain images (e.g. a tightly twisted steel wire being heated by a flame) from which they could select those that best reflected their pain to use within medical consultations (Padfield, Janmohamed, Zakrzewska, Pither, & Hurwitz, 2010). Post-consultation questionnaires revealed that doctors and patients found the photographs useful for facilitating discussion, improving communication and creating a shared understanding of the experience. However, this method increased consultation length, constrained patients to a limited choice of images, and was felt by some to deflect the focus of the consultation away from the actual pain.

3.4. Interim summary

The evidence so far indicates that there are numerous limitations to current methods of pain communication. In particular, while methods such as using photographs and drawings within the pain consultation may allow more information to be shared, others, such as facial expressions and numerical rating scales do not appear to contribute detailed information about the pain over and above that provided by speech. Further, many of these methods need

be utilized in addition to verbal self-report, requiring additional consultation time and making them impractical within real medical consultations. In order to reach a more workable solution to the problems of verbal pain communication it may be necessary to consider the benefits of improving or enhancing the spontaneous self-report of pain rather than attempting to bypass this process. The next sections of the review will discuss a possible means by which this can be achieved, by focusing on ‘co-speech hand gestures’ produced spontaneously alongside natural speech.

4. The role of co-speech gestures in communication

Co-speech gestures are the movements of the hands, arms, and other body parts that spontaneously accompany everyday talk (Kendon, 2004; McNeill, 1985, 1992). These gestures can be categorized as ‘representational’ or ‘non-representational’ (Alibali, Heath, & Myers, 2001; Jacobs & Garnham, 2007). Representational co-speech gestures are related to the semantic content of speech and thus can convey a range of information about entities and events in the real or imagined environment of the speaker (McNeill, 1992). For example, a representational gesture may involve moving the hand in a circular motion when describing a ‘round’ table. Conversely, non-representational co-speech gestures are linked with speech primarily in a pragmatic manner and serve discourse and interactive functions such as adding emphasis, marking the delivery of information or managing turn-taking (Bavelas, Chovil, Coates, & Roe, 1995; Bavelas, Chovil, Lawrie, & Wade, 1992; Kendon, 2004; McNeill, 1992). While non-representational gestures are an important aspect of communication, the focus here will be on representational gestures because of their close relation to the propositional content expressed in speech and their ability to represent semantic information in a visible manner, both aspects that are directly relevant to the argument that gestures may allow us to obtain more information about the precise nature of pain experiences.

It is important to note here that co-speech gestures are a crucially different from bodily behaviors traditionally categorized as ‘nonverbal communication’, such as eye gaze, posture, and facial expression. Rather than serving interpersonal or emotional functions (e.g. smiling while someone is speaking) or providing cues to an emotional state (e.g. grimacing when in pain), co-speech gestures serve functions analogous to those of speech in that they convey propositional information (e.g. using the hands to indicate the size of an object). Thus, although ‘non-verbal communication’ in the traditional sense is indeed an important aspect of pain communication (and is discussed in section 3.2), it is not the focus of the rest of this paper, which instead will focus on representational co-speech hand gestures. From this point onwards we will use the term ‘gestures’ to refer to representational co-speech hand gestures unless otherwise stated.

The close semantic integration of gestures and speech has led to suggestions that together they constitute language, with gestures allowing the speaker to visibly express ideas in a way that is not permitted by speech (Kendon, 1980, 2000, 2004; McNeill, 1992, 2005). Research into the communicative function of co-speech gestures has demonstrated that the differences between speech and gesture allow not only for the same information to be expressed differently within the two modalities, but also that gestures can represent unique information that is not contained in speech at all (e.g., Holler & Beattie, 2002, 2003a; Kelly & Church, 1998; McNeill, 1992). For example, a speaker may say, “and she chases him out again”, while performing a gesture in which the hand appears to swing an object through the air (McNeill, 1992, p. 106). Here, the gesture adds information about the way the act of chasing is performed (while swinging an object) that is not contained in the speech. Quantitative analyses of the amount and type of information in speech and gestures during cartoon narration tasks (one of the traditional paradigms in the field of gesture research) indicate that around a quarter of the overall information is represented uniquely in gesture (Holler &

Beattie, 2003a). This important semantic contribution of gestures is further highlighted when speech is ambiguous (Holler & Beattie, 2003b) or when information is difficult to express verbally (Bavelas, Kenwood, Johnson, & Phillips, 2002; Bergmann & Kopp, 2006; Emmorey & Casey, 2001).

Research into the comprehension of gestures by untrained recipients (as opposed to trained analysts) has revealed that gestures communicate a significant amount of information to addressees both on their own and in conjunction with speech (see Hostetter, 2011, for a meta-analysis of studies of gesture comprehension). For example, naïve observers were able to recount 11% more information when they could see gestures as well as hear speech (Beattie & Shovelton, 1999). Studies using techniques from the field of cognitive neuroscience, such as EEG and fMRI, reveal that the brain processes and semantically integrates gestural information with the accompanying speech (e.g., Dick, Goldin-Meadow, Hasson, Skipper, & Small, 2009; Green et al., 2009; Holle, Gunter, Rüschemeyer, Hennenlotter, & Iacoboni, 2008; Kelly, Creigh, & Bartolotti, 2010; Skipper, Goldin-Meadow, Nusbaum, & Small, 2007; Straube, Green, Bromberger, & Kircher, 2011; Wu & Coulson, 2007). This further supports the behavioral evidence that untrained recipients are able to use the information in gestures when trying to comprehend the message a speaker is trying to convey.

These studies suggest that gestures play a considerable role in communication about external objects and events. However, there have been few gesture studies focusing on the communication of internal experiences such as pain. We propose that gestures have a number of properties that will make them valuable in the communication of pain. Specifically, because gestures are imagistic, idiosyncratic representations they are likely to present an alternative means by which patients can visually represent their pain experience. Of particular relevance here is the possibility that gestures may add information that is not contained in

speech at all or which further clarifies the verbal pain description. Thus, gestures may ease the communicative burden for pain sufferers, overcoming the problems of finding appropriate verbal labels for their pain. Further, gestures may aid the recipient by allowing them to obtain more information about the pain experience and reduce misunderstanding. If attention to gestures does give rise to a greater understanding of the pain experience in these ways then this is likely to have a positive impact on doctors' understanding of patients' pain experiences and thus their ability to provide appropriate treatment and support.

5. Co-speech gestures and pain communication

In recent years, a number of researchers have initiated investigations of the role of gestures in pain communication, particularly from the perspective of what these gestures may add to our understanding of the pain experience¹. For example, Vyasse (1992, cited in Albarran, Durham, Chappel, Dwight, & Gowers, 2000) found that when describing chest pain, patients used gestures to show the location and quality of their pain (e.g. by tapping on the chest to represent the sensation of cardiac dysrhythmia). More recently, qualitative research into the spontaneous hand gestures produced by patients during medical consultations and interviews reveals that patients use gestures in three key ways: 1) to specify the location of pain, 2) to demonstrate painful actions, and 3) to depict pain sensation (Heath, 2002; Hyden & Peolsson, 2002). These findings¹ suggest that gestures can indeed contribute information about various aspects of the pain experience and are used by pain sufferers within the context of clinical communication about pain. However, although these studies illustrate potential functions of gestures within pain communication, they are based on

¹ Other studies have considered the role of gestures in distinguishing between myocardial infarction (MI) and non-MI chest pain within an emergency setting (Albarran et al, 2000; Marcus et al., 2007), by considering whether the form of the gesture (e.g. a point to the chest versus a palm laid flat on the chest) can predict the onset of MI. Results revealed that although patients did use their hands to indicate the location of the pain, the form of the gesture was not a reliable indicator of outcome. While this suggests that these particular gestures are not useful for diagnosis in this context, the researchers did not consider whether gestures can tell us anything about the sensory experience of pain. Further, patients were asked to 'show' their pain, thus the focus was not on the co-speech gestures that are the focus of the present article.

detailed descriptions of a limited number of individual gestures. As such they do not provide information on the frequency of these gestures in pain communication, and, crucially, their relationship with the verbal pain message (in terms of whether they are able to add to or clarify the spoken information), and whether they aid an observer's understanding of the experience is also not well understood.

A recent study made a first attempt to systematically investigate how semantic information is represented in speech and gestures during pain communication (Rowbotham, Holler, Lloyd, & Wearden, 2012). This involved detailed analyses of video-recorded interviews with individuals who had recently experienced physical pain, using a semantic feature approach that attempts to quantify the information contained in gestures and speech. Using this method, gestures and the accompanying speech were coded according to whether they contained information about various aspects of pain (including location, sensation, size and intensity), allowing the researchers to establish whether gestures contribute any information that is not contained in the accompanying speech. The findings indicated that gestures frequently accompany pain descriptions. Moreover, 41% of the overall information about pain was represented in gesture alone, with gestures contributing unique information primarily about location, size and quality of pain that is not contained in the accompanying speech. For example, a speaker might say "It's really bad headache", while producing a gesture in which a hammering motion is made, thus conveying gestural information about the pain sensation (hammering) that was not contained in speech². Further, 36% of information was represented simultaneously in speech and gestures, particularly pain sensation, suggesting that gestures and speech can interact to convey information about the same aspect of the experience. A qualitative investigation of the role of gestures when similar

² Of course, in this example the speech also contains information that is not depicted in gestures, e.g. about the type of pain ('headache') and to some degree the intensity ('really bad'), but the current argument is concerned with what gestures can add to speech. It is accepted that speech will also contain information that is not in gesture, hence our suggestion that both modalities should be attended to as they interact in the representation of meaning.

information (in this case pain sensation) is represented simultaneously in speech and gesture together indicates that gestures perform two key functions, to 1) add completely new information about aspects of pain quality that are not represented in speech at all (e.g. with speech indicating that the sensation is ‘sharp’ while the accompanying gesture shows it to have a ‘throbbing’ element), and 2) clarify the verbal description by containing more specific information about the same aspect of pain sensation that is described in speech (Rowbotham, Wearden, Lloyd, & Holler, 2013). A follow-up quantitative study confirmed that gestures do indeed contribute additional detail about pain sensation that is not contained in speech, and do so in nearly half of instances, while gesture was also used to provide a more specific representation than the accompanying speech in a small proportion of instances (Rowbotham, Holler, Wearden, & Lloyd, 2013).

These initial investigations of gesture use in pain communication highlight the potential value of this modality in the communication of information about characteristics of the experience that may be difficult to express in speech. In particular, they suggest that attending to gestural communication alongside speech will allow us to obtain a fuller and more specific representation of the pain experience than we would from speech alone. This is likely to have important implications for the diagnosis and treatment of pain and for the provision of empathy and understanding. The National Cancer Institute (2011) recommends that medical professionals “listen to the patient’s words about the quality of the pain; these provide valuable cues to its etiology”. Based on the research reviewed in this article, we would recommend that we should also be attending to the gestures produced during pain descriptions.

6. Discussion and Conclusion

6.1. Discussion

Although initial research into co-speech gesture use during pain communication appears promising, it is still in its early stages and there are a number of potential limitations still to address. Firstly, the studies by Rowbotham and colleagues focus on pain communication within a university setting, usually with student participants being interviewed about their pain by a researcher. Although the researchers tried to make the interview situation as similar to a medical consultation as possible, there are inherent differences that may affect the communication process. For example, participants were asked to “describe the pain in as much detail as possible”, meaning that they may focus more on depicting sensory characteristics than would a patient in a medical consultation, potentially leading to inflations in gesture use. Further, the motivation behind pain descriptions in experimental and clinical contexts is necessarily different as patients are more likely to be seeking help and support for their pain. Thus, further research is needed to establish whether the results of studies conducted to date can be corroborated by findings within clinical settings. We would argue that, given their increased motivation to communicate pain in a clear and unambiguous manner to a clinician who may be able to provide treatment and support, patients may well use these gestures to a greater extent within the clinical setting.

Secondly, although research has demonstrated that people do use co-speech gestures to depict information about their pain experience, what we do not yet know is how recipients understand this information. Although for concrete concepts (such as objects or actions), recipients are able to glean information from the speakers’ gestures, with this information aiding their understanding of the overall message (see Hostetter, 2011 for a review), it is not yet apparent whether this is also the case for more abstract, sensory information, such as those that constitute pain descriptions.

Research also needs to explore whether it would be beneficial to provide formal training to clinicians to help them to glean information from gestures. There is evidence that when

viewing children's descriptions of Piagetian conservation tasks, adults are able to glean significantly more information from gestures following a short training session (Kelly, Singer, Hicks, & Goldin-Meadow, 2002). Evidence that clinicians spend a considerable amount of time looking at patients' notes and tend to orient their posture and gaze towards medical records on the computer screen, rather than towards the patient (Hartzband & Groopman, 2008; Makoul, Curry, & Tang, 2001; Margalit, Roter, Dunevant, Larson, & Reis, 2006; McGrath, Arar, & Pugh, 2007; Noordman, Verhaak, van Beljouw, & van Dulmen, 2010; Rouf, Whittle, Lu, & Schwartz, 2007; Ruusuvuori, 2001) also highlights the potential need for training, to prevent the information in gestures being missed. Encouraging doctors to visually attend to patients during pain communication should lead to improvements in the amount and clarity of pain information obtained. Initial investigations are currently underway in our lab, but further research is needed within the clinical setting to systematically investigate how clinicians attend to the information contained in gestures and whether directing attention to this modality leads to increases in understanding and subsequently to better treatment and support.

In addition to understanding how clinicians attend to the information contained in gestures, it is also important to establish the role of these gestures within the wider communicative context during pain communication. Previous research indicates that speakers use various devices to orient listeners' attention towards gestures, including directing their own gaze towards gestures (e.g., Enfield, 2009; Marianne Gullberg & Holmqvist, 1999, 2006; Marianne Gullberg & Kita, 2009) placing gestures in prominent places within the gesture space (e.g. directly in front of the recipient; Heath, 2002), and using multi-modal utterances in which lexical items are replaced with a gesture (e.g. "it's like that kind of pain" while performing a gesture in which the hands are clenched and unclenched to indicate a cramping sensation). Further research needs to establish whether clinicians attend to gestures

in these instances, and if not, how this affects the subsequent interaction. For example, if the gesture goes unnoticed, patients may attempt to convey the information through another modality or reattempt to direct the clinicians' attention to their gestures. It is also important to consider how both parties use gestures within the context of a developing interaction. In particular, gestures may be used to build a shared understanding of the pain experience, with the patient performing a gesture which the clinician then repeats back, followed by clarification or acceptance on the part of the patient. Laboratory studies have provided some evidence of the use of gesture in the process of creating shared understandings of meaning as well as gesture mimicry for grounding, but these have focused on the communication of concrete conceptual information (Holler, Tutton, & Wilkin, 2011; Holler & Wilkin, 2011; Kimbara, 2006). The use of gestures by both patients and clinicians in the context of pain communication may, too, reflect the extent to which a shared understanding of the pain has been achieved. Heath (2002) provides some evidence for this when describing an interaction in which the doctor mimics the patients' earlier gestures (which depicted the sensation of a band tightening around the head) while explaining his assessment of the pain. Thus, there is some evidence to suggest that these gestures are used by doctors and patients to build up a shared understanding but more work is needed in this area, particularly in terms of whether this is something which occurs regularly within pain-focused interaction.

Although the focus of the present paper is on the role of co-speech gestures in conveying information about the pain experience, successful pain communication is likely to involve a combination of all the various channels of communication, including speech, co-speech gestures, and non-verbal behaviors such as vocal tone and facial expression, with each modality contributing to the message in its own way. Thus, we are not suggesting here that clinicians should focus on co-speech gestures to the detriment of other channels of communication. Instead we recommend that clinicians ensure that they visually attend to

patients in such a way that they are able to pick up the information in gestures and other nonverbal cues, in order to ensure they obtain as detailed an understanding of the pain experience as possible. Pain communication is a complex process, the success of which depends on a number of factors, including characteristics of both the patient (such as motivation, affective and cognitive response to pain, and communicational competence) and clinician (such as empathy, attention, and time), characteristics of the pain, and previous consultations. We are not proposing that gesture provides the ‘answer’ to these diverse communicational challenges, but that by attending to co-speech gestures alongside other communicative channels, clinicians may be able to glean more information about the sensory characteristics of the pain, aiding them in building a better understanding of the patients’ experience. It is hoped that by encouraging clinicians to attend to the visual modality of co-speech gestures, they will also be more likely to pick up cues from other visible channels of communication alongside the information obtained from speech.

Because the focus of the present article has been on the communication of sensory characteristics of the pain experience, we have focused primarily on non-chronic pain. For more chronic pain conditions, the focus of the communication may not be geared towards sensory descriptions, which may be less helpful in the long-term management of pain, instead focusing on ways of reducing the impact of pain on daily functioning. However, for chronic pain patients, having their pain understood and validated by clinicians is highly valued, even when it is not possible to treat the pain (Hurwitz, 2003; Kenny, 2004; Peters, Stanley, Rose, & Salmon, 1998; Turk, 2002; Werner & Malterud, 2003). A recent conversation with a friend who developed chronic pain following a back operation highlighted this issue; on returning from a consultation with a pain management specialist she was frustrated by the fact that the clinician actively avoided discussion of the pain sensation, the very aspect of the pain that was bothering her the most. Thus, although clinicians may not be able to ‘treat’ chronic pain,

it may still be important to develop an understanding of what the pain feels like for the sufferer in order to provide empathy and validation of the experience. Heath (2002) argues that through bodily enactments and demonstrations of pain patients make their pain visible to the clinician, thus providing evidence that their experience is real and providing reasonable grounds for seeking medical attention. This suggests gestures have an important role to play within the context of chronic pain consultations although more research is needed to establish the specific role of co-speech gestures here, in particular to assess the types of gestures patients use, how these are responded to by clinicians and what impact this has on important outcomes such as patient satisfaction and feelings of being 'believed' about pain.

The potential role of gestures in pain communication has particularly important implications for children and non-native English speakers. Within these populations, the problems inherent in the verbal communication of pain are exacerbated due to limited English vocabulary, particularly concerning the specific words applied to pain. Co-speech gestures are produced by speakers from all cultural and linguistic backgrounds (Feyereisen & de Lannoy, 1991) and are relied on by both speakers and listeners during communication in the speakers' second language (M. Gullberg, 2011). Further, in children, gesture precedes language acquisition and children often use gestures to depict things they cannot yet express verbally (Acredolo & Goodwyn, 1985; Broaders, Cook, Mitchell, & Goldin-Meadow, 2007; Capone, 2007; Iverson & Goldin-Meadow, 2005; Özçalışkan & Goldin-Meadow, 2005). Thus, non-native speakers and children may produce gestures that convey pain sensation in a more detailed way than they are able to convey verbally. However, to date no research has attempted to investigate systematically the use of pain-related gestures within these populations.

6.2. Conclusions

We suggest that co-speech gestures represent an important source of information about characteristics of pain, with research suggesting that this modality can contribute important information that is not contained in speech and which clarifies the often ambiguous verbal description. As this is a relatively new area of research, more work is needed to fully establish the role of these gestures within a clinical setting, particularly in terms of how they influence understanding of the pain experience, and their implications for patient outcomes. We anticipate that the properties of the gestural modality will be particularly beneficial in communication about pain that is unusual (such as visceral pain) and thus difficult to convey verbally, and also in the pain descriptions of non-native speakers and children, who may rely more heavily on this modality to substitute a more limited pain vocabulary. In order to fully appreciate the role of gestures within a broader interactional context more research is also needed to establish how gestures interact with other communicative modalities and how they are used by patients across multiple consultations to build up an understanding of pain (and how this changes over time), as well as in consultations about more complex pain experiences such as chronic or cancer pain. Pain is a complex and multifaceted experience, and pain communication is subject to a myriad of challenges, only one of which is the communication of information about the sensory pain experience. Nevertheless, the communication of this aspect of pain is important, not only in terms of determining appropriate treatment programs, but also to allow the clinician to develop an appreciation of what the patients' pain is like so that they can empathize with their experience. We are not suggesting that co-speech gestures are the answer to the many problems associated with communicating pain, but we would argue that they are a valuable resource in obtaining information about characteristics of the pain experience, and thus have the potential to lead to improvements in this particular facet of pain communication.

To conclude, if the “purpose of communication is to arouse, within the mind of a recipient, a representation that is the same as the representation in the mind of the sender” (Salovey, et al., 1992, p.7), then we should look to co-speech gestures as well as speech if we want to understand the sensory characteristics of another person’s pain. We hope that this paper will spark further discussion and research in this exciting new area of pain communication.

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