

Differences in the communicative use of gesticulation and pantomime in a case of aphasia.

Karin van Nispen (k.vannispen@uvt.nl)

¹Tilburg center for Cognition and Communication (TiCC), PO box 90153
Tilburg, 5000 LE NL

Mieke van de Sandt-Koenderman (m.sandt@rijndam.nl)

Rotterdam Neurorehabilitation Research (RoNeRes), PO box 23181
Rotterdam, 3001 KD NL

Lisette Mol (l.mol@uvt.nl)¹

Emiel Krahmer (e.j.krahmer@uvt.nl)¹

Abstract

Pantomime and gesticulation, two different gesture modes, can each be comprehensible without speech. Little is known still on how either one of these gesture modes may add to the communication of a person with aphasia. The current study aims to find out whether gesticulation and/or pantomime can add to the comprehensibility of a person, QH, with severe fluent aphasia and what differences there may be between the two. For this aim we asked QH to perform two tasks; naming objects and retelling a story. He did this once in a verbal condition (which allowed for gesticulation to occur) and once in a pantomime condition. Gestures were analyzed for their comprehensibility and the representation techniques used. The results showed that pantomimes for naming objects were comprehensible, whereas gesticulation was not. The latter again was comprehensible for retelling a story, while pantomime was not. When pantomiming objects QH uses simpler representation techniques than healthy controls do. These results indicate that both gesticulation and pantomime may contribute to QH's comprehensibility despite a possible impairment of one or both gesture modes. Their benefits however differ across tasks. These findings imply that, in clinical practice, each gesture mode should be assessed separately for different communicative situations. In these assessments the emphasis should be on comprehensibility rather than on the correct use of a representation technique.

Keywords: Aphasia; pantomime; gesticulation; apraxia

Introduction

Gestures can convey meaning, in co-occurrence as well as in absence of speech (e.g. Beattie & Shovelton, 2002). In this study, we call gestures that occur with speech 'gesticulation'. What we define as 'pantomimes' on the other hand, are gestures that occur in absence of any speech only (McNeill, 2000). Not much is known still on the use of either of these gesture modes. When speech is impaired, as is the case in severe aphasia, could one make use of pantomime, gesticulation or both to support communication? The current study aims to find out whether above named gesture modes can be comprehensible and

therefore beneficial to the communication of a person with a severe fluent aphasia, QH.

As said, both gesture modes can convey information and are therefore potentially useful in communication. Although this function may seem to be similar across gesture modes, it is very likely that the two gesture modes differ in their comprehensibility. As pantomime relies purely on content expressed in gestures, it should convey all relevant information. In gesticulation, however, (part of) the message may be conveyed in speech and as a consequence may be absent in gesture. Therefore, although both gesticulation and pantomime can be communicatively useful, their comprehensibility may differ.

A second difference between the two gesture modes may lie in their production processes as it is thought that gesticulation and pantomime probably result from (partly) different processes (Goldin-Meadow et al., 2008). Whereas the production of gesticulation occurs spontaneously and is closely linked to the production of speech, this is not the case for pantomime, which is a more purposeful mode of gesturing (McNeill, 2000).

If gesticulation and pantomime in fact result from (partly) different processes, this may be clinically relevant as they may be differently affected in people with brain damage and more specifically in aphasia. Pantomime for instance may be affected by ideomotor apraxia, a disorder which is thought to influence learned purposeful gesturing (Rothi & Heilman, 1997). Gesticulation in contrast is thought to remain unaffected hereby (Rose & Douglas, 2003). Gesticulation on the other hand is a process which is closely linked to the production of speech (McNeill, 2000). Speech or language difficulties may therefore potentially influence the use of gesticulation, but possibly not pantomime.

For clinical practice, we are interested in the communicative use of gestures in aphasia and therefore their comprehensibility. As the previous paragraphs indicate, this might be different for each gesture mode. Surprisingly, little is known about the communicative value of gesticulation and pantomime in healthy speakers, let alone in people with

aphasia. Most studies that did address gesturing in aphasia either looked at gesticulation, or at pantomime and only a few report on the comprehensibility of gesticulation (e.g. Cocks et al., 2010; Hogrefe et al., 2011) or pantomime (e.g. Caute et al., 2012; Marshall et al., 2012)

Instead of comprehensibility, many studies only report on the correct use of a representation technique, which is often 'pantomime of tool use'. This however is only one out of various representation techniques which can be used in representing objects or actions (Müller, 1998). By assessing only 'pantomime of tool use', these studies overlook a number of other representation techniques, which might be useful and comprehensible in the communication of someone with aphasia.

Aim & set-up:

For clinical practice, there is a need to know about the communicative use and therefore comprehensibility of gesticulation and pantomime by people with aphasia. Not much is known on this topic so far. The current study aims at analysing the comprehensibility of each gesture mode in a single case-study regarding a person with aphasia, QH. QH, who has fluent but incomprehensible speech, is dependent on other ways of communication. His fluent speech though gives us the opportunity to assess not only pantomime but gesticulation as well. We aim to find out whether the use of either one of these gesture modes can be comprehensible and therefore useful in his communication and whether there is a difference between both gesture modes.

To answer the proposed research question, we analyse gesticulation and pantomime produced by QH and healthy controls when performing two different tasks: object naming and retelling a complex visual-spatial story. The gestures used for both tasks are analysed in two separate studies. In a first analysis we assess the communicative effectiveness of each gesture mode in a forced-choice task. A second analysis gives a more qualitative insight into the representation techniques used.

Data collection

This study received medical ethical approval from the Medical Ethical Review committee of the Erasmus Medical Center, Rotterdam. QH and all other participants in this study provided informed consent before being involved in any of the study procedures.

Participants: Case

QH is a 68 years old, right handed man, who suffered from an ischemic stroke in the parietal region of the left hemisphere. At the moment of testing he was 3 months post-onset.

QH was diagnosed with a Wernicke's aphasia with relatively good auditory comprehension. His spontaneous speech is fluent but incomprehensible. It contains paraphasias, neologisms and some stereotypical utterances.

His verbal communication is severely affected as indicated by the ANELT (Blomert et al., 1994); score of 12/50.

QH has functional use of both hands. Based on his performance on a test for pantomime of tool use and imitation of hand and finger postures, (Goldenberg, 1996; Goldenberg et al., 2007), he was diagnosed with mild limb- apraxia. QH's spontaneous speech is almost always accompanied by gesticulation.

Behavioural data

QH performed two different tasks: verbal naming and retelling a story. In the first task, he was asked to name the first 20 pictures of objects from the Boston Naming Test, BNT (Kaplan, Goodglass, & Weintraub, 1983). For the second task QH was asked to retell three episodes (3, 6 & 7) from an animated Tweety & Sylvester cartoon, T&S, called Canary row (McNeill, 1992). Both tasks were assessed twice: once in a verbal condition, to collect material on gesticulation, and once in a non-verbal condition in which QH was asked to convey his message by using pantomimes only.

We assessed the comprehensibility of QH's spoken production for the verbal conditions of the two tasks. The comprehensibility of speech was assessed by a clinical linguist. For both tasks it was perceived as incomprehensible. QH was unable to correctly name any of the objects; score correct = 0/60 (rating on a 4 point scale 0-3 for 20 items).

Forced-choice task

Judges:

Fifteen native Dutch students and employees from Tilburg University (12 female), who were no experts on gesture or aphasia, acted as judge (age 18-33).

Stimuli:

We cut the video of QH naming objects (BNT) into stimuli per item (N=40). The video of QH retelling a story was cut into stimuli per episode (N=6).

Stimuli were presented one by one on a computer screen. Each stimulus was accompanied by two answer options. These consisted of a target and a distracter. Distracters were randomly assigned from the other items/episodes QH was tested on. Both answer options were presented on the computer screen, under the stimulus video of QH. All stimuli were presented without sound.

First, we presented stimuli of QH naming objects (BNT) and secondly stimuli of QH retelling a story (T&S) to the participants. Each block contained a mixed random order of gesticulation and pantomime stimuli.

Design & Analyses:

We test the dependent variable 'comprehensibility', which is the percentage correct of judges' answers for each stimulus. The independent variables 'pantomime' and 'gesticulation' are compared for their comprehensibility

scores. This was done in a one sample t-test against a chance level of 50% correct. A paired samples t-test was used to analyze differences in comprehensibility between gesticulation and pantomime.

Results

Figure 1 shows that pantomimes used by QH when naming objects (BNT) were interpreted correctly ($M = 82\%$, $SD = 15\%$). This is significantly different from chance (50%), $t(14) = 0.705$; $p = 0.040$. Pantomimes were better comprehensible than gesticulation ($M = 48\%$, $SD = 11\%$), $t(14) = -8.362$; $p < 0.00$. The latter did not significantly differ from chance, $t(14) = 0.705$; $p > 0.05$. A reversed pattern was observed for retelling a story (T&S), see Figure 1. Here, gesticulation was interpreted correctly ($M = 78\%$, $SD = 21\%$) of the stimuli, which is significantly different from chance (50%), $t(14) = 5.229$; $p < 0.000$. Gesticulation was better comprehensible than pantomime ($M = 47\%$, $SD = 40\%$), $t(14) = 2.226$; $p = 0.043$. The latter did not differ significantly from change level, $t(14) = 0.312$; $p > 0.05$.

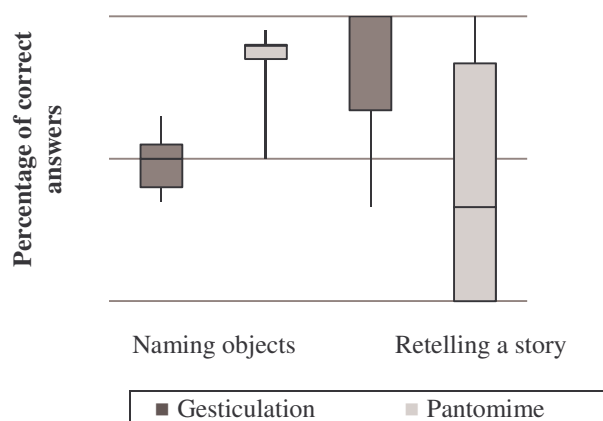


Figure 1 Percentage correct of judges' answers for pantomime versus gesticulation;

Representation techniques

Methods

Participants

We drew a comparison between QH and the performance of control participants. For naming objects these were 11 healthy speakers (10 female; age 41 - 58 years). For retelling a story, we included 6 control participants (3 female; age 53 - 66).

Control participants performed the same tasks QH did. Data collection was performed similarly to the data collection for QH, see 'data collection'.

Coding

To analyse the representation techniques used in both pantomime and gesticulation, we developed a coding scheme based on Müller (1998), see Mol et al (2012).

Relevant codings will be further explained in the results section.

Results

When naming objects, QH showed gesticulation for almost every item tested. He mostly used *deictic* (pointing gestures) and *handling* (pretending to use an object) techniques. Healthy controls in contrast, hardly showed any gesticulation for the 20 items tested.

In pantomiming, QH used *shape* techniques (showing the outline of an object) for almost every item tested. These pantomimes were sometimes accompanied by other representation techniques. Healthy controls showed specific strategies. In an analysis per item, we see that across control participants, there is consistency in the techniques used for a certain object. That is, for 16 out of 20 items, a specific technique is used by all participants (*for instance all participants used a 'handling' technique for the item 'toothbrush'*), also see Van Nispen et al. (2012). Pantomimes by QH did not match these patterns.

For retelling a story, QH showed gesticulation for every episode tested. The techniques he used seem to be similar to the techniques used when naming objects. Only three (half) of the participants in the control group showed (significant) gesticulation. Still, the ones who did show gesticulation gestured a lot. The representation techniques used do not seem to distinctively differ from the techniques used by QH.

In pantomiming, QH used a more varied range of representation techniques overall than he did for naming objects. Now however, he mostly used *deictic* and *other* techniques. These were only sometimes accompanied by a different technique. Healthy controls showed more varied combinations of techniques per episode.

General Discussion

In this paper we studied the communicative use of gestures by a person with fluent aphasia. Results from the forced-choice task indicate that both gesticulation and pantomime may add to QH's communication. Their benefits however differ across tasks. The representation techniques he uses differ per task and from techniques used by healthy controls. The latter indicates that he does not, or is not able to make full use of every gesture modes' potential. Here we wish to discuss several potential explanations for this observation.

First, we wish to discuss a possible consequence of the tasks we used. Our control participants hardly gesticulated when naming objects, but when describing a Tweety & Sylvester cartoon they gesticulated frequently. As a consequence one might expect gesticulation for Tweety and Sylvester to be better comprehensible than for naming objects. This would explain why gesticulation by QH was comprehensible for retelling a story but not for naming objects. It however, does not explain the qualitative differences we found between QH and healthy controls

neither does it explain why pantomimes for retelling a story were not comprehensible.

Another explanation may lie in the differences between each gesture mode. As they are thought to result from (partly) different processes (Goldin-Meadow, et al., 2008), they might be differently affected by QH's brain damage.

For one, QH's ideomotor apraxia may influence his use of pantomimes. This was shown in the 'simpler' representation techniques used for naming objects and explains the incomprehensible pantomimes for retelling a story.

Secondly gesticulation, as it accompanies speech may benefit from content that is planned or expressed in it (Kita & Özyürek, 2003; De Ruiter, 2000). As QH has an intact semantic system, his speech and gesture production at an early stage are still intact. Difficulties that occur at later stages in speech production turn his speech into an incomprehensible verbal message. His gesticulation however, seems to remain unaffected and may even benefit from the content and timing that is planned in speech.

Conclusion

This study has shown that both gesticulation and pantomime can be used communicatively in a person with aphasia. Importantly however, this may differ per communicative setting. Furthermore, even though a gesture mode might be impaired it can be useful still. In clinical practice each of these gesture modes should be assessed separately in different types of communicative settings. In these assessments the emphasis should be on comprehensibility rather than on the correct use of a representation technique.

Acknowledgments

The authors would like to thank Alain Hong for carrying out part of the forced-choice study and all participants in our study with a special thanks to QH.

References

- Beattie, G., & Shovelton, H. (2002). An experimental investigation of some properties of individual iconic gestures that mediate their communicative power. *British journal of psychology*, 90, 35-56.
- Blomert, L., Kean, M. L., Koster, C., & Schokker, J. (1994). Amsterdam-Nijmegen Everyday Language Test: Construction, reliability and validity. *Aphasiology*, 8, 381-407.
- Caute, A., Pring, T., Cocks, N., Cruice, M., Best, W., & Marshall, J. (2012). Enhancing Communication through Gesture and Naming Therapy. *Journal of Speech Language and Hearing Research*, 1092-4388.
- Cocks, N., Dipper, L., Middleton, R., & Morgan, G. (2010). What can iconic gestures tell us about the language system? A case of conduction aphasia. *International Journal of Language & Communication Disorders*, 46(4), 423-436.
- Goldenberg, G. (1996). Defective imitation of gestures in patients with damage in the left or right hemisphere. *Journal of Neurology, Neurosurgery & Psychiatry* 61, 176-180.
- Goldenberg, G., Hermsdörfer, J., Glindemann, R., Rorden, C., & Karnath, H.-O. (2007). Pantomime of Tool Use Depends on Integrity of Left Inferior Frontal Cortex. *Cerebral Cortex*, 17(12), 2769-2776.
- Goldin-Meadow, S., So, W. C., Özyürek, A., & Mylander, C. (2008). The natural order of events: How speakers of different languages represent events nonverbally. *Proceedings of the National Academy of Sciences*, 105(27), 9163-9168.
- Hogrefe, K., Ziegler, W., Weidinger, N., & Goldenberg, G. (2011). Non-verbal communication in severe aphasia: Influence of aphasia, apraxia, or semantic processing? *Cortex*.
- Kaplan, E., Goodglass, H., & Weintraub, S. (1983). *The Boston Naming Test*. Philadelphia: Lea & Febiger.
- Kita, S., & Özyürek, A. (2003). What does cross-linguistic variation in semantic coordination of speech and gesture reveal?: Evidence for an interface representation of spatial thinking and speaking. *Journal of memory and language*, 48(1), 16-32.
- Marshall, J., Best, W., Cocks, N., Cruice, M., Pring, T., Bulcock, G., et al. (2012). Gesture and Naming Therapy for People With Severe Aphasia: A Group Study. *Journal of Speech Language and Hearing Research*, 55(3), 726-738.
- McNeill, D. (1992). *Hand and Mind: What gestures reveal about thought*. Chicago & London: The University of Chicago Press.
- McNeill, D. (2000). *Language and Gesture*. Cambridge: Cambridge University Press.
- Mol, L., Krahmer, E., & van de Sandt-Koenderman, M. (2012). Gesturing by speakers with aphasia, how does it compare? *Journal of Speech Language and Hearing Research*.
- Müller, C. (1998). Iconicity and Gesture. In S. Santi, I. Guatiella, C. Cave & G. Konopczyncki (Eds.), *Oralité et Gestualité* (Montreal, Paris: L'Harmattan.
- van Nispen, K., van de Sandt-Koenderman, M. W. M. E., Mol, L., & Krahmer, E. (2012). Specific pantomimes for specific objects. In M. Petterson (Ed.), *Proceedings of the 5th Conference of the International Society for Gesture Studies* (Lund).
- Rose, M., & Douglas, J. (2003). Limb apraxia, pantomime, and lexical gesture in aphasic speakers: Preliminary findings. *Aphasiology*, 17(5), 453 - 464.
- Rothi, L. J. G., & Heilman, K. M. (1997). Introduction to Limb Apraxia. In L. J. G. Rothi & K. M. Heilman (Eds.), *Apraxia: The Neuropsychology of Action* (East Sussex: Psychology Press).
- De Ruiter, J. P. (2000). The production of gesture and speech. In D. McNeill (Ed.), *Language & Gesture* (Cambridge: Cambridge University Press).