Learning and Individual Differences 39 (2015) 73–80

Contents lists available at ScienceDirect

Learning and Individual Differences

journal homepage: www.elsevier.com/locate/lindif

A brief self-rating scale for the assessment of individual differences in gesture perception and production

Arne Nagels [a,b,*], Tilo Kircher [a], Miriam Steines [a], Michael Grosvald [c], Benjamin Straube [a]

[a] Department of Psychiatry and Psychotherapy, Philipps-University Marburg, Rudolf-Bultmann-Str. 8, 35039 Marburg, Germany
[b] Department of Germanic Linguistics, Philipps-University Marburg, Deutschhausstr. 3, 35037 Marburg, Germany
[c] Department of English Literature & Linguistics, College of Arts & Sciences, Qatar University, PO Box 2713, Doha, Qatar

ARTICLE INFO

Article history:
Received 30 April 2014
Received in revised form 12 January 2015
Accepted 15 March 2015

Keywords:
Individual differences
Gesture
Rating scale
Production
Perception

ABSTRACT

Gesture production and perception have a strong impact on speech perception and social-communicative functioning. Consequently, we created the 'Brief Assessment of Gesture' (BAG) tool, a set of 12 subjective statements relating to gesture production and perception in everyday life. German native speakers (n = 220) were asked to rate each statement. Individual differences in empathy were assessed to disentangle sensitivity to gesture production and perception from general empathic/social functioning. A PCA revealed a four-factor solution, reflecting one production and one perception factor, each occurring with and without an empathy component. The current investigation yielded good psychometric results, with a high reliability and internal consistency. Our findings suggest that BAG is a straightforward and useful tool to assess individual differences in gesture production and comprehension, as well as related empathic/social functioning. As such, BAG may serve as an important instrument for research in speech comprehension, cognitive development, language learning and social-communicative functioning.

1. Introduction

Gesture perception and production are closely connected to language and to social functioning (e.g., Bates & Dick, 2002; Goldin-Meadow, 1999; Goldin-Meadow & Alibali, 2013; Kendon, 1994; McNeill, 1992). Thus, individual differences in gesture perception and production might be associated with individual differences in language-related, cognitive or social tasks. Consequently, research in a wide range of fields could profit from considering these differential aspects of gesture use and sensitivity, either for controlling variance of no interest or to directly investigate these aspects of human communication. However, up to now there has been no simple means to assess such individual differences. Moreover, the relation between these differences and empathic behavior is essentially unknown. The latter can be assumed to play a central role in gesture perception and production.

In order to address this issue, we present a brief self-rating scale for the assessment of individual differences in gesture perception and production.

1.1. Gesture perception

There has been a substantial debate about whether the use of gesture primarily enhances listener comprehension or speech production (Driskell & Radtke, 2003). While some researchers argue that gesture's main function lies in the facilitation of lexical retrieval by the speaker (Chawla & Krauss, 1994; Krauss, 1998), others have shown that the presence of gestures also benefits a listener's comprehension (Hostetter, 2011). A host of studies have demonstrated the benefit of gesture perception for speech comprehension, language learning and memory. It has been shown that gesture facilitates language comprehension, can convey additional meanings not mediated in speech (see discussion in Goldin-Meadow & Alibali, 2013) and speeds lexical access when used as a prime (Yap, So, Yap, Tan, & Teoh, 2011). In addition, the benefit of gestures is particularly obvious in situations in which communication is hindered by noise, in that people rely on gestures to disambiguate homonyms, a strategy that hearing-impaired individuals use in an automatic fashion (Obermeier, Dolk, & Gunter, 2012).

Apart from benefitting speech comprehension in general, gesture perception has also been shown to facilitate language learning, for example with regard to verb learning in an artificial language in children and adults (Goodrich & Hudson Kam, 2009) as well as foreign language acquisition in adults (Kelly, McDevitt, & Esch, 2009). Other studies have supported the view that gesture perception has a positive effect on memory performance in general. For example, sentences accompanied

* Corresponding author at: Department of Psychiatry and Psychotherapy, Philipps-University Marburg, Germany, Rudolf-Bultmann-Straße 8, 35039 Marburg, Germany, Tel.: +49 0 6421 58 67041; fax: +49 0 6421 58 6893.
E-mail address: nagels@med.uni-marburg.de (A. Nagels).

http://dx.doi.org/10.1016/j.lindif.2015.03.008
1041-6080/

by gestures that accord well with their meaning are better recalled than sentences with meaningless or mismatching gestures (Feyereisen, 2006) or sentences presented in audio form only (Thompson, 1995). However, age effects were also observed in Thompson's study; while younger adults took greater advantage of gesture use, older adults' memory performance benefited most from visible speech (see also Thompson & Guzman, 1999).

Several factors that influence the benefit of gesture for communication have been identified: gestures have the greatest facilitative effect when they depict motor actions, when information conveyed through gestures is absent in language and thus non-redundant, and when listeners are children (see Hostetter, 2011).

1.2. Gesture production

As mentioned above, gestures not only benefit listeners who perceive them, but also speakers who actively produce goal-directed hand and arm movements. A review by Goldin-Meadow (2009) highlights the fact that gestures which reflect knowledge not found in speech can play a role in learning, and deficits or other abnormalities in gesture usage can potentially provide an early sign of developmental trouble. Furthermore, gesture use precedes and predicts progress in language acquisition, has an impact on language learning and can promote knowledge change (Goldin-Meadow & Alibali, 2013).

While gesture has been shown to facilitate speech comprehension, there is also evidence indicating its positive influence on the speaker's lexical retrieval. For example, it has been shown that spontaneous narratives contain a greater amount of content-related gestures than rehearsed narratives do (Chawla & Krauss, 1994). Further support for the lexical retrieval theory comes from the finding that gestures and their lexical affiliates are produced simultaneously, and speech tends to be more fluent, when the speaker is also gesturing (Krauss, 1998). Similarly, faster object naming times are found when participants adopt a congruent gesture in contrast to an incongruent gesture or no gesture (Pine, Reeves, Howlett, & Fletcher, 2013). Furthermore, it has been shown that participants use more gestures when describing objects that are difficult to encode verbally and show lower speech rates when instructed not to move their arms during the description task (Morsella & Krauss, 2004). Similar effects of more gesture use and dysfluency without gesture have been reported for retelling of spatial content in contrast to non-spatial content (Rauscher, Krauss, & Chen, 1996).

Despite studies demonstrating the impact of gesture on lexical retrieval, there is evidence that speakers also produce gestures for the benefit of the listener (Jacobs & Garnham, 2007). Specifically, it has been shown that gesture rate does not significantly vary when the same comic is described to three different listeners, but it declines when different comics are described to a listener who can also see the pictures. Furthermore, higher rates of representational gestures are found in face-to-face interactions than when the speaker is not clearly visible (Alibali, Heath, & Myers, 2001). These findings and the fact that reduction of gesture use is seen when listeners appear inattentive support the communication hypothesis. Thus, it seems that speakers do not only employ gestures for their own benefit but sometimes adjust their gesture usage in order to facilitate comprehension for the listener (Jacobs & Garnham, 2007).

Another area in which gesture plays an important role is that concerned with language acquisition, development and learning processes (Kelly, 2001). Many studies have demonstrated that language learning is highly connected to the development of gesture use (Bates & Dick, 2002). The employment of gesture enhances language development, can provide predictions of later language use, and can facilitate language learning (e.g., Capone & McGregor, 2004). For example, it was found that of children from high socio-economic status (SES) families, those who more frequently used gesture to communicate at 14 months, had a larger vocabulary at 54 months (Rowe & Goldin-Meadow, 2009a). It was argued that the helping function of early gesture use and exposure might explain the discrepancies between the different vocabulary sizes of the groups with high and low SES. Similarly it has been shown that different types of gesture use at 18 months predicted specific linguistic abilities at 42 months, supporting a tight connection between gesture production and language acquisition (Rowe & Goldin-Meadow, 2009b).

Besides furthering language development, gesture production also appears to improve general problem-solving and memory performance, for example during artificial language learning (Macedonia, Müller, & Friederici, 2011). In addition to having a direct influence on word learning, there is evidence that gestures also influence learning by revealing new strategies not found in speech or reducing cognitive load. It was demonstrated that children who are explicitly told to gesture while explaining their solutions to, or being instructed about, math problems acquire new strategies, retain more knowledge and perform better on subsequent tasks (Broaders, Cook, Mitchell, & Goldin-Meadow, 2007; Cook, Mitchell, & Goldin-Meadow, 2008). Similarly, gesture use can benefit problem-solving in spatial visualization tasks, although these tasks did not require language production and were purely non-communicative (Chu & Kita, 2011). Furthermore, children who have to gesture while explaining equality judgments and simultaneously have to remember two unrelated words perform better on the memory task than those instructed not to move their hands (Ping & Goldin-Meadow, 2010). A host of studies have also found that the frequency at which gestures are produced is linked to the conceptualisation and conveyance of information, with subjects employing more gestures when describing difficult-to-conceptualize pictures (Hostetter, Alibali, & Kita, 2007; Kita & Davies, 2009; Melinger & Kita, 2007). These findings thus support the claim that gesturing while talking reduces cognitive load and benefits strategies for problem-solving.

In summary, gesture generally facilitates speech production (Rose & Douglas, 2001) and speech comprehension (Kelly, Ozyürek, & Maris, 2010) as well as language learning and memory processes (Straube, Green, Weis, Chatterjee, & Kircher, 2009; Straube, Meyer, Green & Kircher, 2014). Gesture therefore provides a 'second channel' (Goldin-Meadow & Alibali, 2013) for facilitating communication.

1.3. Gesture and empathy

In general, gesture use is considered to facilitate both language production and perception. However, in communicative situations social aspects such as the interpersonal relationship and personality traits of the interlocutors are of particular importance. It can further be assumed that people employ more or different kinds of gestures in specific situations depending on how empathetic they are. Alternatively, the ideomotor framework of human actions — which assumes a common representational format for action and perception that facilitates imitation and consequently empathy (e.g., Gallese 2001; Iacoboni, 2009), suggest that people who perform more gestures are in general more empathic. Empathy is generally described as a person's ability to understand other people's feelings and behaviors either by having a similar emotional and visceral reaction or through perspective-taking (Leibetseder, Laireiter, & Köller, 2007). Accordingly, empathy is often analyzed as consisting of an affective and a cognitive component (Davis, 1983; Jolliffe & Farrington, 2004). Overall, empathic people can be described as being highly sensitive to emotional and situational cues and able to easily relate those to each other, an ability which might be learned or supported by the so called mirror neuron system via action/perception matching (e.g., Iacoboni, 2009; Mainieri, Heim, Straube, Binkofski, & Kircher, 2013).

In social situations, empathetic behavior represents an important quality for successfully communicating one's own intentions and reacting appropriately upon the expression of those of other people. This is why the ability to exert and show compassion, attentiveness