ROCZNIKI HUMANISTYCZNE
Tom LXXI, zeszyt 10 – 2023
ZESZYT SPECJALNY / SPECIAL ISSUE
DOI: http://doi.org/10.18290/rh237110sp-6

JOLANTA SAK-WERNICKA

DO BLIND PEOPLE NEED GESTURES TO COMMUNICATE EFFECTIVELY?

INTRODUCTION

Hand gestures are widely known to serve various roles in communication, for both those who make them and those who see them. For speakers, among other things, gestures assist them in conveying a message, adding emphasis to their speech, helping establish and maintain the audience's attention, or even replace words (Sharkey et al., 2000). People often gesture more when they encounter word-finding difficulties (Morrel-Samuels & Krauss, 1992), when their speech is highly improvised (Chawla & Krauss, 1994), or when they are engaged in mental problem solving (Pouw et al., 2016). This is because gesturing reduces the speaker's cognitive load, increases fluency and facilitates speaking (Eielts et al., 2018; Hadar, 2018; Rauscher et al., 1996; Krauss, 1998). Preventing speakers from gesturing adversely affects their abilities to produce communicative speech (Graham & Argyle, 1975), as a result of which their articulation becomes impaired and vocabulary size is reduced (Gunter et al., 2015).

For a hearer, a gesture "provides a unique window into a speaker's mind" (Clough & Duff, 2020, p. 5), facilitating comprehension of a speakers' message. In other words, gestures communicate information which is not provided in a speech signal and therefore "successful communication involves the integration and interpretation of both verbal and non-verbal signals" (Clough & Duff, 2020, p. 2). For example, young learners and bilinguals with low-proficiency in their second language (Goldin-Meadow et al., 1999; Sueyoshi & Hardison, 2005;

JOLANTA SAK-WERNICKA, PhD, Assistant Professor at the John Paul II Catholic University of Lublin, Institute of Linguistics, Department of Applied Linguistics; e-mail: jolanta.sak-wernicka@kul.pl; ORCID: https://orcid.org/0000-0002-8548-5873.

McNeil et al., 2000) have been reported to better understand explanations of teachers who frequently used gestures. In addition, gestures can provide important non-verbal information about a gesturer's attitudes, emotions and intentions. For example, large and frequent gestures are often associated with dominance, affection or involvement, whereas small and closed gestures may indicate vulnerability of a speaker (Sharkey et al., 2000). It is clear that the role of gestures is far more important than only supporting speech, and although people gesture at different rates in different contexts, in communication they heavily rely on gesture. The available literature demonstrates, however, that gesture does not serve the same functions for all populations. This, among others, concerns people with visual impairment.

Vision plays a crucial role in gesturing, since "the properties of vision are as important to gesture perception as the properties of the auditory apparatus are to the perception of spoken language" (Gullberg & Holmqvist, 1999, p. 36). Vision is also important in gesture development, as it is through observation that children normally learn to use gestures. What is more, studies show that people who can see their interlocutors, gesture more than people who communicate over the phone or intercom (Mol et al., 2011; Cohen & Harrison, 1973; Bavelas et al., 1992; Bavelas et al., 2008). This strong correlation between vision and gesture has been well documented in literature. To this day, however, it is unknown to what extent the lack of vision impacts gesture occurrence and production. Unlike people who are sighted, blind individuals cannot learn to use gestures through observation and have no model for gesture. As a result the gestures which sighted children observe and imitate, blind children must learn to use and incorporate into their personal repertoire. For this reason, people with blindness can be expected not to rely on gestures to the same extent as sighted people, which may have a negative effect on their social encounters with sighted people (Sharkey et al., 2000).

Early anecdotal observations of blind children showed that the population did not produce any communicative gestures such as pointing, showing, giving or requesting (Mills, 1998; Urwin, 1979). More recent studies, however, have shown that such children do gesture, but they demonstrate different gestural activities than sighted children. Children who were born blind have been observed to produce some gestures, but compared to individuals with normal vision, they generally gestured significantly less and not in all contexts (Iverson et al., 2000; Iverson & Goldin-Meadow, 1998). For example, unlike their sighted peers, blind children used gestures to communicate about objects nearby and not about objects distally located (Iverson et al., 2000). The children hardly ever (if at all) used conventional and metaphoric gestures (Frame, 2000; Iverson et al., 2000; Man-

gusson & Karlson, 2008), but the gestures they used (mostly iconic and deictic) were observed to resemble those used by sighted children both in form and content (Iverson & Goldin-Meadow, 1997). This suggests that visual input is not necessary for the emergence of gesture, but the lack of vision still has an impact on how often and in what way the children gesture.

Because blind children do not access the information conveyed by gestures, naturally they do not experience the communicative function of the cues. For the individuals gestures apparently have different roles in the language learning than for their sighted peers (Iverson et al., 2000) and they are perceived not as an effective tool for communication, but as "a way of extending the capabilities of the mind" (Jelec & Jaworska, 2014). In this way, from the perspective of a blind person, gestures have a function for a speaker, not merely for a listener (Iverson et al., 2000).

Even fewer studies so far have been performed to examine the use of gestures by blind adults. The early available research indicated that blind adults produced very few gestures (mostly adaptors having no communicative function), they did not gesture at all or used "atypical" nonverbal behaviours such as unusual hand postures, head turning, body rocking or rhythmic swaying (Blass et al., 1974; Sharkey et al., 2000; Jelec & Jaworska, 2014). The same patterns were observed in blind children. More recent studies indicate that blind people do gesture, but at different rates and following different conversational rules than those who are sighted. Surprisingly enough, blind individuals have been found to gesture even if they knew their interlocutor was blind (see e.g. Sharkey et al., 2000; Iverson & Goldin-Meadow, 1998), which further supports the view that they may need gestures for individual rather than conversational purposes. The study by Özçalışkan, Lucero and Goldin-Meadow (2016) reveals that blind speakers of a language not only use gestures, but also their gestures resemble those of sighted speakers of that language. This suggests that blind speakers learn language-specific gestures by learning to speak the language, not by watching others. Also, as observed by Mangusson and Karlson (2008), adults with visual impairment (VI), compared to sighted individuals, tend to express themselves in more functional and concrete manner, but they have limited experience with abstract and symbolic non-verbal cues. This is probably because abstract forms of expression require visual experience, which people who are blind do not have. The question remains what effects the above-mentioned limitations have on blind people's success in communicating intended messages and whether people with VI are less effective communicators than people with normal vision.

The studies on the blind population provide a significant insight into gesture as a robust component of human communication, showing that the lack of vision does not have to prevent individuals from using the non-verbal cues. Unfortunately, the available studies have not been carried out systematically, which makes the area seriously underexplored. What is more, many of the studies have been performed on individuals or very small groups of people, which makes the interpretation of the results very limited. Surprisingly, the available studies have reported large individual differences in gesture production of visually impaired people, to the effect that some individuals were observed to gesture more, some to gesture less and still others not to gesture at all. It is unknown whether these idiosyncrasies are a characteristic feature of the entire population or they result from the fact that in the studies individuals with total blindness and low vision were grouped together. Although so far no studies have been performed to examine the extent to which people with total blindness and partial vision differ in gesturing, it can be expected that the two groups do not constitute one homogenous group. A similar effect may be observed if congenitally blind and adventitiously blind people are tested as one group.

The aim of this article is to investigate the impact of blindness on gesturing and effective communication. In other words, this article is intended to investigate whether the lack of vision indeed reduces (or blocks completely) gesture production in individuals who are born blind and those whose access to visual information is temporarily limited, as well as whether this reduction (or lack) of gestures has an effect on their abilities to communicate their intended messages.

1. METHOD

PARTICIPANTS

The study involved 30 normally sighted, 30 sighted blindfolded and 26 congenitally blind adults with no functional vision (aged between 19 and 36 years). Participants with low vision, partial vision or who were adventitiously blind did not take part in the experiment. No participant had had any diagnosed communicative disorders. The group of sighted participants included 40 women and 20 men who were students at the John Paul II Catholic University of Lublin (Poland). In the group of blind participants there were 13 women and 13 men who were students or graduates of the John Paul II Catholic University of Lublin, the University of Warsaw, the University of Gdańsk, and the Warsaw University of

Technology. All participants were Polish native speakers. The participation in the study was voluntary and all participants gave informed consent. Participant characteristics are given in Table 1.

Table 1
Participant Characteristics

	Sighted (N = 30)	*Blindfolded (N = 30)*	*Blind (N = 26)*
Mean age (*SD*)	21.96 (.32)	23.43 (.28)	29.50 (5.35)
Gender			
male	10	10	13
female	20	20	13

Material and procedure

The experiment was designed to investigate whether people who do not have access to visual information differ from sighted people in the use of communicative gestures and how effectively they can communicate. For this purpose sighted, blindfolded and blind participants were divided into smaller groups of five or six, and they played the word-guessing game TABOO (modified for the purpose of this experiment). The game was used to create a communicative situation similar to real-life circumstances during which the participants could freely interact. The participants were not competing with one another, but they played as one team to win as many points as they could. As a cognitively challenging task, the game was chosen to provoke high production of gestures, which are known to reduce speakers' cognitive load and facilitate their speaking.

In the game the participants took turns to prompt other participants in a group to guess a word in the limited time of 60 seconds. Each participant (clue-giver) was asked to draw one card from a facedown set of cards. The card contained one bolded guess-word and five "taboo" (forbidden) words which the participant could not use when giving clues about the guess-word. For the blind participants the cards were prepared in Braille. The blindfolded participants were given cards with black print and they wore blindfolds only to give clues. A total of 64 Polish words were used in the game. The words were common and proper nouns, verbs and adjectives (for examples of guess-words and taboo words see Table 2).

Table 2
Examples of Guess-Words and Taboo Words Used as Stimuli

	Guess-word	Taboo words
Noun	**mistake**	error blunder make wrong right
Verb	**whisper**	speak softly ear sound shout
Adjective	**private**	public property army detective eye

The taboo words were the related words such as synonyms, antonyms or collocations, which people most frequently associate with a given guess-word. For example, the taboo words for MISTAKE were 'error', 'blunder', 'make', 'wrong' and 'right'. The clue-giver could not use these words when giving prompts and s/he had to put in some effort to find other ways to make participants guess the word without mentioning the taboo words. The individual was also forbidden to use forms or parts of the words such as 'err' or 'erroneous'. What is more, all participants were specifically instructed not to say which other word a guess-word rhymes with or is an abbreviation of. No drawings or sound making (e.g. barking) were allowed either. The groups were not informed about the purpose of the experiment before it was completed. This was to make sure the participants did not focus unnaturally on gesture performance, which would have had an undesirable effect on obtained results. After explaining the rules, the participants could ask questions and a training session was performed to check whether all of them understood the instructions and were ready to take part in the experiment. The cards used during the training session were not used during the experiment.

Every participant in each group could be a clue-giver only once during the experimental session and after drawing a card the individual was given 30 seconds to read the card and prepare. During this time the participant had to remember words from the card. Next, they gave the card to the experimenter and from this

time the participant had one minute to have group members guess the word. During this time, the experimenter was checking whether the participant followed the rules and did not use any of the words listed. If the clue-giver was found to accidentally use any of the forbidden words, the experimenter used a buzzer and stopped the game. If the participant did not know the guess-word or thought it would be too difficult to explain it, they could exchange the card once during the session. If the clue-giver did not make other participants guess the word in the time limit, broke the rules and used a taboo word, the guess-word and a word similar to these, the next participant took a turn. During the game the cards which had been used (both those that the guessing participants got correct and those on which a participant giving clues accidentally said the guess-word or any of the taboo words) were put aside and they were not used again. The cards which participants decided to swap were placed to the bottom of the pile.

During the game participants were sitting in a circle. The participant whose turn was to give clues was not permitted to hold anything in their hands when giving clues. This was to make sure the gestures they performed were not confused with object manipulations. The experiment was recorded using a digital HD camera. In the analysis non-communicative gestures (e.g. adaptors) and incomplete gestures (i.e. those without an identifiable beginning or end) were rejected.

The participants' speech and gestures were coded by three researchers whose unanimity was randomly checked. In the analysis gestures produced with speech and without speech were separately computed. The co-speech gestures were further classified into one of four categories: iconic, metaphoric, deictic and beat gestures distinguished by McNeill (1992, p. 76). As described by the author, these gesture categories "distinguish references to concrete event, to abstract concepts and relations, to orientations and reorientations, and to discontinuities". In other words, iconic gestures resemble physical phenomena e.g. holding hands to represent a ball. Metaphoric gestures represent some abstract ideas by, for example, presenting the concept of a question as a cupped hand. Deictic gestures, on the other hand, involve pointing to a hearer, a speaker or some other entity in the conversational space. The gestures are used to direct the hearer's attention to a specific referent. Finally, beat gestures are short, rhythmical movements of the hands used to accentuate the topic or emphasize certain words or phrases in speech. Beats do not convey a specific meaning, but they indicate what is relevant in a message.

The study was intended to investigate whether the lack of vision impacts the number and types of gestures people produce during communication. It was also aimed to explore whether visually impaired and blindfolded participants would find it more difficult to convey their messages and therefore would need

more words and more time to make other people understand what they meant. For this purpose, the participants' speaking time was measured and the number of words they used was calculated. Finally, in order to examine whether the blind and blindfolded participants were as successful in communicating their messages as the sighted participants, one point was given to each participant who managed to make other participants guess their words. The scores of the groups were compared.

2. RESULTS

In order to ascertain whether the sighted (S), blindfolded (BF) and blind (B) participants differed in gesture production, the number of all gestures produced during the speaking time in all group was calculated (see Table 3 for means in the groups).

Table 3
*Mean Number of Gestures Produced by the Groups (*SD *in Brackets)*

	Sighted	Blindfolded	Blind
Mean no. of gestures	18.43 (13.63)	10.53 (8.47)	0.42 (0.90)

The analysis showed that the individuals with normal vision gestured more than those who were blindfolded and significantly more than those who were blind. Compared to the sighted and blindfolded, the blind participants produced a very low gesture rate. Nearly 70 per cent of the blind participants did not produce any communicative gestures, and the remaining 30 per cent used from 1 to 3 gestures. In the sighted and blindfolded groups all participants used gestures when giving clues.

Prior to performing statistical analyses the preliminary assumption testing was conducted. A Shapiro–Wilk test was performed and showed that the distribution of gestures departed significantly from normality ($F = .21$, $p = .00$; $F = .19$, $p = 00$; $F = .45$, $p = .00$). Based on this outcome, a non-parametric test was used. A Kruskal–Wallis H test showed that there was a statistically significant difference in gesture production between the groups, $\chi^2(2) = 55.53$, $p = .00$*, with a mean rank of 62.90 for S, 49.20 for BF and 14.54 for B. The post hoc comparisons using a Bonferroni correction revealed that the differences in the number of produced gestures were significant between the blind and sighted groups ($p = .00$*) and between the blind and blindfolded ($p = .00$*). No statistically significant differences were found between the sighted and blindfolded participants ($p = .09$)

Next, the gestures produced with speech and without speech were separately computed (see Table 4 for details). All groups produced more gestures with speech than without speech. However, irrespective of the category, the blind and blindfolded participants were observed to use much fewer gestures than the sighted participants.

Table 4

*Mean Number of Gestures Produced With and Without Speech in Groups (*SD *in brackets)*

	Gestures with speech	Gestures without speech
Sighted	13.40 (8.53)	5.03 (7.53)
Blindfolded	9.60 (8.14)	0.96 (2.25)
Blind	0.31 (0.62)	0.04 (0.19)

The statistical analysis revealed significant differences among the groups in the use of gestures with speech ($\chi^2(2) = 59.09$, $p = .00$*, mean ranks for S 61.15, for BF 51.12 and for B 14.35) and without speech ($\chi^2(2) = 30.97$, $p = .00$*, mean ranks for S 60.17, for BF 40.05 and for B 28.25). The data showed that the differences in the use of gestures with speech were significant between the blind and the sighted participants ($p = .00$*) and between the blindfolded and the blind ($p = .00$*). No significant differences were found between the sighted and blindfolded participants ($p = .35$). As for gestures produced without speech, the statistically significant differences occurred between the sighted and blindfolded ($p = .00$*) and between the blind and the sighted ($p = .00$*). No such difference was found between the blind and the blindfolded participants.

Next, the co-speech gestures were further classified into one of four categories: iconic, metaphoric, deictic and beat gestures. In order to check whether the distribution of gestures across these categories was different in the groups, the mean number of gestures in each of these categories was calculated (see Table 5 for details).

Table 5

*Mean Number of Iconic, Metaphoric, Deictic and Beat Gestures Used by Participants (*SD *in Brackets)*

	Iconic	Metaphoric	Deictic	Beat
Sighted	3.06 (4.12)	.46 (1.83)	8.16 (7.44)	1.80 (2.85)
Blindfolded	1.80 (1.77)	1.50 (2.24)	4.67 (3.88)	1.90 (2.62)
Blind	0.31 (0.62)	0.04 (0.20)	0.00 (0.00)	0.00 (0.00)

The sighted and blindfolded groups used all the four types of gestures. They used deictic gestures the most frequently and metaphoric gestures were the least frequently. The blind participants did not use deictic and beat gestures at all, metaphoric gestures were very infrequent and iconic gestures were the most common in this group. A factorial ANOVA with group (S/BF/B) as a between-subject factor and gesture-type (iconic/metaphoric/deictic/beat) as within-subject factor was performed. The analysis revealed significant interaction between group and gesture type ($F = 8.31$, $p = .00$*) and significant main effects for group ($F = 31.61$, $p = .00$*) and gesture type ($F = 21.75$, $p = .00$*). The post hoc analysis using a Tukey test showed that with respect to the gesture types there were considerable differences between the blind and the sighted participants ($p = .00$*) as well as between the blind and the blindfolded participants ($p = .00$*), but no such difference was found between the sighted and the blindfolded ($p = 07$).

In order to ascertain whether the lower production of gestures in the case of the blind and the blindfolded participants was compensated by an increased number of words used to communicate an intended message, the mean number of words used in each group was calculated and compared (see Table 6 for details). A Shapiro-Wilk test was performed and no violations to the assumptions of normality were found ($F = .973$, $p = .615$; $F = .937$, $p = .075$; $F = .938$, $p = .121$).

Table 6

*Mean Number of Words Used in Groups to Communicate a Message (*SD *in Brackets)*

	Sighted	Blindfolded	Blind
Mean no. of words	36.27 (18.36)	39.53 (21.13)	26.11 (14.23)

Compared to the two other groups, the blindfolded participants used the greatest number of words and the blind participants the smallest number of words when giving clues. One-way ANOVA was performed in order to determine whether the differences were significant and the analysis revealed that the groups differed ($F[2, 85] = 4.00$, $p = .02$*). A Tukey post hoc test revealed significant differences between the blind and blindfolded participants ($p = .02$*), but no such difference was found between the blind and sighted ($p = .102$), and between the sighted and blindfolded participants ($p = .769$).

In order to determine whether the lower gesture production in the case of the blind and blindfolded participants meant longer speaking time, we measured the mean time the groups needed to communicate the message (see Table 7 for details).

Table 7
*Mean Speaking Time in Seconds in Groups (*SD *in Brackets)*

	Sighted	Blindfolded	Blind
Mean speaking time	36.86 (21.91)	36.06 (20.46)	35.27 (17.61)

The analysis revealed that all the groups were speaking for a comparable amount of time, which was slightly above the half of the time limit. One-way ANOVA indicated that there were no statistically significant differences in the speaking time between the groups ($F = .04$, $p = .96$).

Finally, in order to ascertain whether the performances of the participants in the three groups were equally successful and whether the lack of vision had an impact on effective communication of messages, the total number of clues which the participants got correct was calculated for each group. All the three groups were comparably successful in communicating their messages and their performances were above chance level. Surprisingly, the blind participants were the most successful obtaining 69 per cent of correct responses. The sighted participants managed to successfully communicate their messages in 60 per cent of cases and the blindfolded were successful in 59 per cent of cases.

3. DISCUSSION

The aim of the study was to examine what impact the lack of vision has on the way people gesture and how successful they are in communicating messages. To accomplish this goal, one group of blind people and two groups of sighted people (blindfolded and non-blindfolded) were tested on their gesture production during the word-guessing game TABOO.

The first important observation from the present research was that the blind participants produced fewer gestures than the sighted participants with and without blindfolds. The blind individuals produced communicative gestures, but they were very rare. This is in accordance with previous studies performed on blind children, adolescents and adults, and it confirms that visual impairment has a considerable impact on gesture production. Also in the study the blindfolded participants gestured less than the sighted individuals, but significantly more than the participants who were blind. This suggests that previous visual and gestural experience plays an important role in gesturing. On the other hand, the fact that people with no visual experience and no model for gesture occasionally use gestures during communication indicates that gesturing without vision is perfectly possi-

ble. It also suggests that speech and gesture have a stronger relation than gesture and vision.

As indicated above, in the study we obtained a very low rate of gesturing in the group of blind participants. Also, it was noticed that not all participants in this group gestured. One reason for that may be that we only looked at communicative gestures and other types of hand movements, e.g. self-adaptors (which occurred relatively frequently in this group) were completely ignored. This may be also because the participants were not instructed to use gestures, but they could decide whether to gesture or not. This was with an intention to investigate their gestural activities in circumstances similar to real-life communicative situations.

The next observation from the research was that all participants, irrespective of whether they were blind or sighted, made more gestures with speech than without speech. Nonetheless, the groups differed from one another in the frequency of gesturing with speech (B and S; B and BF) as well as without speech (B and S, BF and S). Surprisingly, no differences were found between the blindfolded and sighted participants in the frequency of gestures used with speech, and between the blindfolded and blind participants in the frequency of gestures produced without speech. This means that the blindfolded participants were more similar to people with normal vision in how often they gestured when their gestures were accompanied by speech, but they gestured comparably to the blind individuals when their gestures were used without speech. This observation may have important implications for previous and future studies in the area, showing that the lack of vision may have different consequences on gesturing with and without accompanying speech. This also demonstrates how much people who are congenitally or early blind and those who were blinded at some stage in their lives may differ in the way they gesture during communication.

Similarly to previous studies, in this experiment large individual differences among blind individuals were also observed. There were several people who did not produce any gestures at all, some whose gestures were very occasional and some who gestured distinctively more than other blind participants. For this experiment only congenitally blind individuals with no functional vision were selected and no partially sighted individuals were included. The above-mentioned differences may result from that fact that some participants had more experience with using gestures as a result of early intervention and social skills training providing them with effective support in gesturing.

The next finding was that the blind and sighted groups differed in the distribution of co-speech gesture (iconic, metaphoric, deictic, and beats), which indicates that not only blindness impacts on how often people gesture, but also in what way

they gesture. The frequency of using the gesture types corresponds to the functions they are meant to play in communication. The functions are apparently similar for the sighted and blindfolded participants; between these groups no significant differences were observed. The sighted groups used deictic gestures the most frequently (pointing to a person in their group who responded correctly to their prompts or who was very close to giving a correct answer), while the blind participants did not use them at all. Surprisingly, the blindfolded participants did not differ from the non-blindfolded in the use of these gestures. Even though they could not see their group members, they did not find it more difficult or unnatural to make pointing gestures towards the right person. This was very different from what was observed in the group of blind individuals. In accordance with previous studies, the research shows that blind individuals hardly ever use deictic gestures in reference to entities which are distally located (Iverson et al., 2000). The majority of gestures produced by the blind participants in the experiment were iconic; these were also common in the sighted groups. Metaphoric gestures were, however, very rare in all the groups. This might be because metaphoric gestures are the most complex or because the design of the experiment provided not enough context for the use of these gestures. Future studies should further investigate the differences in the use of different types of gestures between the blind and the sighted, paying special attention to the use of metaphoric gestures.

The final finding from this experiment was that the lower gesture rate in the case of blind participants co-occurred with the lower rate of words. The blind participants produced fewer gestures and used fewer words, but were speaking for a comparable amount of time as the two other groups. What is more, the blind participants were equally successful in conveying their messages to the sighted participants. This suggests that people who are blind can successfully communicate their intentions even if they use gestures differently than people who are sighted.

REFERENCES

Bavelas, J., Chovil, N., Lawrie, D. A., & Wade, A. (1992). Interactive gestures. *Discourse Processes*, *15*(4), 469–489.

Bavelas, J., Gerwing, J., Sutton, C., & Prevost, D. (2008). Gesturing on the telephone: Independent effects of dialogue and visibility. *Journal of Memory and Language*, *58*(2), 495–520. https://doi.org/10.1016/j.jml.2007.02.004

Blass, T., Friedman, N., & Steingart, I. (1974). Body movement and verbal encoding in the congenitally blind. *Perceptual and Motor Skills*, *39*(1), 279–293. https://doi.org/10.2466/pms.1974.39.1.279

Chawla, P., & Krauss, R. M. (1994). Gesture and speech in spontaneous and rehearsed narratives. *Journal of Experimental Social Psychology*, *30*(6), 580–601. https://doi.org/10.1006/jesp.1994.1027

Clough, S., & Duff. M. C. (2020). The role of gesture in communication and cognition: Implications for understanding and treating neurogenic communication disorders. *Frontiers in Human Neuroscience*, *14*(232), 1–22. https://doi.org/10.3389/fnhum.2020.00323

Cohen, A. A., & Harison, R. P. (1973). Intentionality in the use of hand illustrators in face-to-face communication situations. *Journal of Personality and Social Psychology*, *28*(2), 276–279. https://doi.org/10.1037/h0035792

Eielts, C., Pouw, W., Ouwehand, K., van Gog, T., Zwaan, R. A., & Paas, F. (2018). Co-thought gesturing supports more complex problem solving in subjects with lower visual working-memory capacity. *Psychological Research*, 1–12.

Frame, M. J. (2000). The relationship between visual impairment and gestures. *Journal of Visual Impairment and Blindness*, *94*(3), 155–172.

Graham, J. A., & Argyle, M. (1975). A cross-cultural study of the communication of extra-verbal meaning by gestures. *International Journal of Psychology*, *10*(1), 57–67. https://doi.org/10.1080/00207597508247319

Goldin-Meadow, S., Kim, S., & Singer, M. (1999). What the teachers' hands tell the students' minds about math. *Journal of Educational Psychology*, *91*(4), 720–730. https://doi.org/10.1037/0022-0663.91.4.720

Gullberg, M., & Holmqvist, K. (1999). Keeping an eye on gestures: Visual perception of gestures in face-to-face communication. *Pragmatics and Cognition*, *7*(1), 35–63. https://doi.org/10.1075/pc.7.1.04gul

Gunter, T. C., Weinbrennen, J. E. D., & Holle, H. (2015). Inconsistent use of gesture space during abstract pointing impairs language comprehension. *Frontiers in Psychology*, *6*, Article 80, 1–10. https://doi.org/10.3389/fpsyg.2015.00080

Iverson, J. M., & Goldin-Meadow, S. (1998). Why people gesture when they speak. *Nature*, 396(6708), 228. https://doi.org/10.1038/24300

Iverson, J. M., & Goldin-Meadow, S. (1997). What's communication got to do with it? Gesture in children blind from birth. *Developmental Psychology*, *33*(3), 453–467. https://doi.org/10.1037/0012-1649.33.3.453

Iverson, J. M., Tencer, H. L., Lany, J., & Goldin-Meadow, S. (2000). The relation between gesture and speech in congenitally blind and sighted language-learners. *Journal of Nonverbal Behavior*, *24*, 105–130. https://doi.org/10.1023/A:1006605912965

Jelec, A., & Jaworska, D. (2014). Thoughts on the table: Gesture as a tool for thinking in blind and visually impaired children. *Yearbook of the Poznan Linguistic Meeting*, *1*(1), 73–88. https://doi.org/10.1515/yplm-2015-0004

Krauss, R. M. (1998). Why do we gesture when we speak? *Current Directions in Psychological Science*, *7*(2), 54–60. https://doi.org/10.1111/1467-8721.ep13175642

Mangusson, A. K. & Karlsson, G. (2008). The body language of adults who are blind. *Scandinavian Journal of Disability Research*, *10*(2), 71–89. https://doi.org/10.1080/15017410701685927

McNeill, D. (1992). *Hand and mind. What gestures reveal about thought.* University of Chicago Press.

McNeil, N. M., Alibali, M. W., & Evans, J. L. (2000). The role of gesture in children's comprehension of spoken language: Now they need it, now they don't. *Journal of Nonverbal Behavior*, *24*(2), 131–150. https://doi.org/10.1023/A:1006657929803

Mills, A. E. (1988). Visual handicap. In D. Bishop & K. Mogford (Eds.), *Language development in exceptional circumstances*, pp. 150–164. Lawrence Erlbaum Associates.

Mol, L., Krahmer, E., Maes, A., & Swerts, M. (2011). Seeing and being seen: The effects on gesture production. *Journal of Computer-Mediated Communication*, *17*(1), 77–100. https://doi.org/10.1111/j.1083-6101.2011.01558.x

Morrel-Samuels, P., & Krauss, R. M. (1992). Word familiarity predicts temporal asynchrony of hand gestures and speech. *Journal of Experimental Psychology: Learning, Memory and Cognition*, *18*(3), 615–623.

Özçalişkan, S., Lucero, C., & Goldin-Meadow, S. (2016). Is seeing gesture necessary to gesture like a native speaker? *Psychological Science*, *27*(5), 737–747. https://doi.org/ 10.1177/ 0956797616629931

Pouw, W. T., Mavilidi, M. F., van Gog, T., & Paas, F. (2016). Gesturing during mental problem solving reduces eye movements, especially for individuals with lower visual working memory capacity. *Cognitive Processing*, *17*(3), 269–277. https://doi.org/ 10.1007/s10339-016-0757-6

Rauscher, F. H., Krauss, R. M., & Chen, Y. (1996). Gesture, speech, and lexical access: The role of lexical movements in speech production. *Psychological Science*, *7*(4), 226–231. https://doi.org/10.1111/j.1467-9280.1996.tb00364.x

Sharkey, W. F., Asamoto, P., Tokunaga, C., Haraguchi, G., & McFaddon-Robar, T. (2000). Hand gestures of visually impaired and sighted interactants. *Journal of Visual Impairment & Blindness*, *94*(9), 549–563. https://doi.org/ 10.1177/0145482X0009400902.

Sueyoshi, A., & Hardison, D. M. (2005). The role of gestures and facial cues in second language listening comprehension. *Language Learning*, *55*(4), 661–699. https://doi.org/10.1111/ j.0023-8333.2005.00320.x

Urwin, C. (1979). Preverbal communication and early language development in blind children. In Eve V. Clark (Ed.), *Papers and Reports in Child Language Development* (Vol. 17, pp. 119–127). Stanford University.

DO BLIND PEOPLE NEED GESTURES TO COMMUNICATE EFFECTIVELY?

S u m m a r y

Gestures are known to play an important role in communication, but to this day it is still not clear what impact visual impairment has on gesture production. The main objective of this article is to investigate: (1) whether the lack of vision reduces (or completely blocks) gesture production in blind individuals, and (2) whether this reduction in (or lack of) gestures has an effect on their abilities to communicate. To address this issue, we performed an experiment in which congenitally blind and sighted people were compared on the number and types of gestures they produced when playing the word-guessing game TABOO. The results obtained confirm that, compared to people who are sighted, blind individuals produce significantly fewer gestures when they communicate. This, however, does not have any negative impact on how effective they are in conveying their messages. The analyses also show that gestures play different roles for blind and sighted people.

Keywords: gesture; blindness; communication; speech

CZY OSOBY NIEWIDOME POTRZEBUJĄ GESTÓW DO SKUTECZNEJ KOMUNIKACJI?

S t r e s z c z e n i e

Wiadomo, że gesty odgrywają ważną rolę w komunikacji, ale do dziś nie jest jasne, jaki wpływ na gestykulację ma dysfukcja wzroku. Głównym celem tego artykułu jest zbadanie: (1) czy brak widzenia zmniejsza (lub całkowicie blokuje) gestykulację u osób niewidomych oraz (2) czy ta redukcja (lub brak) gestów ma wpływ na ich zdolności komunikacyjne. Aby rozwiązać tę kwestię, przeprowadziliśmy eksperyment, w którym osoby niewidome od urodzenia i widzą-ce zostały porównane pod względem liczby i rodzajów gestów wykonywanych podczas gry słownej TABOO. Uzyskane wyniki potwierdzają, że w porównaniu z osobami widzącymi, osoby niewidome wykonują znacznie mniej gestów podczas komunikacji. Nie ma to jednak negatywnego wpływu na ich skuteczną komunikację. Analizy pokazują również, że gesty odgrywają różne role wśród osób niewidomych i widzących.

Słowa kluczowe: gesty; niepełnosprawność wzrokowa; komunikacja; mowa