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The Role of Gesture in Verbal Communication

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Introduction

„Fie, fie upon her!
There's language in her eye, her cheek, her lip,
Nay, her foot speaks; her wanton spirits look out
At every joint and motive of her body.”
Shakespeare wrote in “Troilus and Cressida” (act IV, scene 5, line 55). But what is language and how can we communicate so effectively?

There are a number of animals able to communicate through some sort of symbols, might it be a bee's dance or specific cries produced by a variety of mammals. But it seems that only the human kind is able to use language to produce messages about objects that are not present or even non-existent, which is one of the design features of human language, called displacement.¹ We, much like other animals, use signals to denote our percept or sensation, but we also use symbols, which help us communicate our *inner world*.²

Saying that ‘the communicative system constituted of symbols is language’ doesn't do justice to the system that people utilize. We strongly depend on our interlocutor to understand what we intend-by what we say. Gomez even thinks that simple situation such as a request (for example asking “May I have some salt, please?”) requires the fifth-order level

¹ See C. Hockett, “The Origin of Speech”.

² P. Gärdenfors, *How Homo Became Sapiens: The Evolution of Thinking*, pp. 141-196.

of intentionality – we want someone to understand that we want them to understand that we want the salt.³

In order to create higher-order intentions we must assume that our interlocutor has the ability to represent that they have representation of our inner world nested in their inner world. We must consider not only our own inner world but also listener's inner world (*mental mirrors*).

What is Language and Why Don't Animals Talk?

It is the concept of symbols that seems to be the problem for other animals to learn a human language. Language refers to a detached representation which may be too complex for them. As the ethologist, Sverre Sjölander put it:

"The predominant function of language is to communicate about that which is not here and not now. A dog can 'say': I am angry, I want water, I want to go out, I like you, etc. But it has no communicative means enabling it to 'say': I was angry yesterday, nor can it 'say': I will be angry if you lock me up tonight again, and I will chew up the carpet. Likewise, the dog can 'say': There is a rat here! but it cannot 'say': There is a rat in the next room .

[. . .] Clearly, if you live in the present, communicating mainly about how you feel and what you want to do in the moment, the biological signals inherent in each species are sufficient. A language is needed only to communicate your internal representation of what could be, what has been, and of those things and happenings that are not present in the vicinity."⁴

In other words, people can talk about something without having to actually have access to it immediately. That is why we often talk about places we've been to, our memories or distant future plans. Dunbar claims that language might not have been primarily used to communicate per se, but we people used it to strengthen social bonds (the phenomena known as "phatic communion", a phrase coined by Bronisław Malinowski, a term used to describe an expression whose only function is to perform a social task, as opposed to conveying information⁵). According to Dunbar, with the growth of social groups, humans had to come up with way of keeping the group together that was more efficient than grooming.

³ J. Gomez, "Mutual Awerness In Primate Communication: a Gricean Approach", p. 73.

⁴ S. Sjölander, "Some cognitive breakthroughs in the evolution of cognition and consciousness, and their impact on the biology of language", pp. 5-6.

⁵ B. Malinowski, "The Problem of Meaning in Primitive Languages", pp. 146-152.

Another reason why spoken communication is so important is co-operation. As Gärdenfors put it:

“Human beings as well as other animals co-operate in order to reach common goals. Even seemingly simple animals like ants and bees co-operate in building complex societies. However, their co-operation is instinctive - they have no detached representation of the goal their collaboration is aimed at. For lack of representations, they cannot create new goals of co-operation.”⁶

Of course, animals can also work together, but their goal must be something present in the immediate environment, it cannot be something that doesn't exist yet or is far away. In other words, most animals are not able to work together co-operate on something that requires symbolic communication. The joint action alone is not sufficient.

The question remains: how did humans start using language as we know it today? What were the steps that led to communicative systems with complex word stock and advanced grammar?

Bickerton claims that one of the stages of language evolution was what he calls “protolanguage” – a system containing the semantic but not the syntactic, component of language.

In order to support his claim he shows four cases in which protolanguage is still in use:

- 1) Children use two-word sentence-like structures. The grammar of those structures is very simplified or even non-existent. It is also worth noticing, that young children are not yet able to use fully detached representations.
- 2) Apes taught sign language are not taught grammar and their use of language resembles the level utilised by young children.
- 3) Children who have been deprived of normal communication in the early years of their lives, despite normal intelligence, usually cannot reach further than two-year-olds in terms of grammar use.
- 4) Pidgin languages, whose users also develop simple structures with simplified grammar.

It seems that the crucial ability that differentiates people from other animals is the ability to create detached representations. Describing not only signals but also operating on symbols. The rapid evolution of language helped our ancestors to maintain large social groups and work together to achieve common goals.

Spoken language is in most cases accompanied by hand movements. We may not know how important gestures are. They are phenomena that are found in every culture, among people of all ages, performing

⁶ P. Gärdenfors, *How Homo Became Sapiens: The Evolution of Thinking*. p. 177.

a broad variety of tasks. Even those people who are congenitally blind gesticulate.

We can see how important gestures really are by having a closer look and examining the situations when we use them. Children try to communicate ideas that they cannot yet express in speech. People with impaired speech use them, namely gestures, in the way that other people use spoken language.

Role of Gesture in Predicting Onset of Multi-Word Combinations

Using gestures seems to be an important developmental step in children's ability to convey simple and also more complex information. During the phase in which children produce no more than just one word at a time, gestures often supplement their speech, turning a single word into sentence-like meaning. In the process of language acquisition children have words referring to actions, objects and people but hardly ever do they combine those words into strings resembling sentences. At the earliest stage of learning a language, children also fail to simultaneously combine their words with gesture.

Usage of deictic gestures (indicating real, implied or imaginary persons, objects, directions; also known as 'pointing gestures') and iconic gestures (visual representations of referential meaning, e.g. rapid hand movement up and down may indicate the action of chopping onion) starts roughly at about 10 months of age, but the gestures do not go along with words, despite the fact, that during the same period babies are able to combine gestures with meaningless sounds such as grunts.

Combining words with gestures takes place several months before 'word-plus-word' combinations occur. The age at which children first produce gesture-speech combinations conveying sentence-like information (for example, saying "mommy" and pointing at a cup) seems to be correlated with the age at which they begin to produce their first two-word utterances. The onset of redundant combinations doesn't predict the onset of two-word combinations, which seems to be related to a child's inability to understand rules of creating sentence-like information. It is the relation between word and gesture and not the presence of gesture itself that helps to predict the onset

of multi-word-utterances. A child's ability to convey sentence-like meanings across gesture and speech is therefore a signal that the child is on the right path towards conveying intended content within speech entirely.

Children use deictic gestures to convey information about objects and iconic gestures to send predicate information – those gestures can be used combined with words to build more complex meanings.

“For example, a child could produce a point at a peg along with the word “mommy” to request mommy to act on the peg, thus conveying two arguments of a simple proposition (the agent mommy in speech, and the patient peg in gesture). Or, the child could produce an iconic hit gesture along with the word “mommy” to make the same request, this time conveying the predicate and argument of the proposition (the action hit in gesture, and the agent mommy in speech). If gesture–speech combinations are precursors to linguistic constructions, we might expect children to produce argument + argument and predicate + argument combinations across gesture and speech before they produce these combinations within speech (“mommy peg,” “mommy hit”).”⁷

As we can see from this excerpt children should be able to take another step in the development of sentence-like communicates (more complex constructs containing two predicates) using gesture-speech combinations before they are able to do it using speech alone.

The question posed by Özçalışkan and Goldin-Meadow was whether the types of gesture–speech combinations that the children produced presage oncoming changes in their speech and thus serve as forerunners of linguistic advancement.⁸ To examine the authors' assumptions, forty children at the ages of 14, 18 and 22 months were videotaped, while playing with their primary caregivers.

The analysis of the gathered data shows that children produce certain sentence constructions first in combination of speech-gesture before they produce synonymous construction using speech alone. Children, who used one of the formats (either speech-gesture or speech alone), very rarely produced the construction entirely using speech and very few children using both formats produced the construction in speech first. For an individual child, the typical development path seems to be to produce a construction using a combination of speech and gesture and only later to produce the same construction entirely within speech.

⁷ S. Özçalışkan and S. Goldin-Meadow, “Gesture is at the cutting edge of early language development”, p. B102.

⁸ S. Özçalışkan and S. Goldin-Meadow, “When gesture-speech combinations do and do not index linguistic change”, pp. 190-217.

Children usually don't produce utterances with two arguments or an argument and predicate in speech until circa 22 months but the same types of constructions appear in communications combining speech and gesture in children as old as 18 months. In 22 month old children, rarely do we see constructions within speech using two predicates but this type of sentence-like communication is produced in speech-gesture format.

Gestures provide children with an intention to convey increasingly more complex ideas and, shortly afterwards, they are able to express those ideas using speech only. Speech proves not to be a perfect indicator of a child's (and perhaps any user of a language) knowledge. The fact that children can produce a construction, like predicate+argument, in a gesture-speech combination "makes it clear that their inability to produce the construction entirely in speech does not stem from an inability to understand predicate frames—the children not only know that arguments need to be related to predicates, but they can even communicate about this relation, albeit across modalities".⁹

There are a few possible explanations why children first use gestures and not words. First of all, it seems that manual modality is less demanding than expressing the same information using speech. Children use gestures in word-like ways several months before using actual words to communicate the same messages. In fact, deaf and mute children start signing a few months earlier than speaking children, although there is a disagreement whether these first signs are indeed signs or gestures. Using hands might require less motor control than using a tongue and a mouth to produce sounds.

Gestures may put less strain on memory than words that are conventionalised and must be recalled before production. Not only is a pointing gesture physically easy to produce but also to remember. Iconic gestures also can be generated immediately with resources the child has available at the particular moment. "As a result, children might find it cognitively less demanding to flesh out their predicate frames with a spontaneous gesture than with a conventional word form" (ibidem). Indeed, gesture + word combinations are produced a few months before sign + word utterances in a hearing child learning both spoken and signed Italian, possibly because a conventional sign puts more strain on memory than a gesture whose form is not conventionalised but constructed on an ad hoc basis.¹⁰

Taking a more general approach to the subject, gesturing while talking is associated with a reduction in the speaker's cognitive load. Speak-

⁹ S. Goldin-Meadow, "The role of gesture in communication and thinking", pp. 419-429.

¹⁰ O. Capirci, S. Montanari and V. Volterra, „Gestures, signs, and words in early language development”, pp. 45-60.

ers, both children and adults, when asked to remember a list of objects (words or letters) while explaining their solutions to a mathematical problem, remembered more of those objects when they gestured during their answer.¹¹ Gesturing eases the process of speech production, providing speakers with extra cognitive resources that could enable them to produce more complex constructions. The aforementioned findings place gestures at the edge of an early language development. Gestures both precede and signal changes in speech. At a point when children do not have the necessary skills to convey complex information, gestures provide them with an easier, alternative way to convey that information.

Gesture and Speech in Understanding Cause

How do gestures help children to further language skills acquisition? It turns out that preschool children also use gestures to express cause. In physical causal events, one object, often a causal agent, acts upon another object (the 'patient', to borrow terminology from linguistics) by contacting the object and by changing the end state of the second object's motion.

Upon their first birthday toddlers seem to comprehend physical causal relations, but the production of sentences seem to lag in relation to understanding. Children understand cause but often misuse causal verbs and connectives that may be necessary to carry certain information. Usually preschool children produce sentences expressing their understanding of causal relations.

At this point it is important to mention that early gestures have two crucial and diverse purposes. Firstly, early gestures preview language. As we could see from the analysis carried out by Özçalışkan and Goldin-Meadow, they act as indicators for upcoming changes in verbal expressions.¹² Babies start communicating by using deictic gestures before producing words. Once children start producing words, they use gestures in more diverse forms and functions. In addition to deictic gestures, toddlers produce representational gestures; referring to an object's action or attribution. Both of those early gestures, deictic and representational, have two primary functions:

- 1) to complement spoken information by reinforcing meaning;
- 2) to supplement speech by providing additional information in the form of gestures - this function is the key to communicat-

¹¹ S. Goldin-Meadow, H. Nusbaum, S.D. Kelly and S. Wagner, "Explaining math: gesturing lightens the load", pp. 516–522.

¹² S. Özçalışkan and S. Goldin-Meadow, *When gesture-speech combinations do and do not index linguistic change*.

ing sentence-like meanings and help predict further language development.

Secondly, children's gestures reveal the thinking underlying various cognitive tasks, for example tower of Hanoi and piagetan conversation - gestures tap into unspoken knowledge by supplementing the information given in speech.

Both of these functions of children's gestures imply that gestures assist and preview-early language development as well as children's transitional knowledge in many tasks. These functions of gestures are not mutually exclusive. Gesture becomes a crucial part of the communication system; providing a tool both to express information and to face challenging cognitive information.¹³

By the time of their first birthday, infants perceive causal events as a different form of non-causal. What is more, research shows that within causal events, 12-month-olds are also sensitive to the direction of cause through elements like the source and the goal. Thus, infants have an early representation of causal relations in the physical domain. Causal understanding undergoes major developmental changes during the first 3 years of life. For example, a 3-year-old can identify invisible causal agents such as light or sound.

Research suggests that in the second year of life, children have several causal verbs in their productive vocabulary (e.g., break, cut).¹⁴ In the beginning of the third year of life, children make productive errors and use non-causal words to indicate causal relations such as "how would you flat it?" (ibidem). These data show that even after children produce several lexical causatives (e.g., break), they continue to express causal relations using non-causal sentences. It is not until around the age of 4 that children use causal verbs reliably and causal connectives to express causal relations in complex sentences.

Göksun examined children's understanding of a causal relation with an instrument by performing a task in which the experimenter used a cane to push an object (either a ball or a ring) across a pool of water.¹⁵ The researchers were focused on children's verbal and gestural expressions in a simple causal event and asked children to express what happened in the event.

¹³ See e.g. D. McNeill, *Hand and mind: What gestures reveal about thought*; E. Kidd and J. Holler, "Children's use of gesture to resolve lexical ambiguity", pp. 903-913.

¹⁴ See e.g. M. Bowerman. „Learning the structure of causative verbs: a study in the relationship of cognitive, semantic and syntactic development”, pp. 142-178; S. Carey, "The Child as Word Learner", pp. 264-293.

¹⁵ T. Göksun, K. Hirsh-Pasek and R.M. Golinkoff, "How do preschoolers express cause in gesture and speech?"

Firstly, children's speech was examined, to see whether they expressed a possible causal event component. Secondly, the role of an accompanying gesture was examined by analysing different gesture types and categories. The gesture category included three kinds of gestures: reinforcing, supplementary, and gesture-only expressions.¹⁶ Reinforcing gestures produce the same information as the speech (pointing at the ball while saying "ball"). Supplementary gestures conveyed different information than offered in the concurrently used speech (pointing at the ball while saying, "you pushed"). Gesture-only expressions were produced without concurrent speech (pointing at the ball in silence).

As for children's use of gestures, the researchers had two hypotheses:

- 1) the younger children would use more gestures to preview what they would later express in their speech;
- 2) the older children would produce reinforcing gestures to highlight causal information that is present in verbal modality.¹⁷

The first hypothesis was partially confirmed. The younger children only pointed at the location to reinforce their speech. However, the older children produced more gestures than the younger ones, using gestures to both reinforce and supplement their speech.

Although these results seem to contradict the previous findings, which showed a decrease in children's supplementary gestures while developing a more advanced language, the older children rely on gestures to supplement their speech before they form complex sentences that express causal relations.¹⁸

"If children reinforce speech with gesture, they might use gesture and speech together to refer to the same causal event components. The findings support this conclusion, showing that children at all age groups produced more reinforcing gestures than other categories. However, gesture referents varied by age. Similar to verbal descriptions, younger children were very goal-directed and used location reinforcing gestures. In contrast, older children's sentences expressing causal relations were more likely to be reinforced by instrument and direction gestures. As children

¹⁶ See S. Özçaliskan and S. Goldin-Meadow, "When gesture-speech combinations do and do not index linguistic change"; S. Özçaliskan and S. Goldin-Meadow, "Gesture is at the cutting edge of early language development".

¹⁷ T. Göksun, K. Hirsh-Pasek and R. M. Golinkoff, "How do preschoolers express cause in gesture and speech?"

¹⁸ See e.g. See S. Özçaliskan and S. Goldin-Meadow, "When gesture-speech combinations do and do not index linguistic change"; S. Özçaliskan, and Goldin-Meadow, "Gesture is at the cutting edge of early language development", pp. B101 – B113; E. Kidd & J. Holler, Children's use of gesture to resolve lexical ambiguity.; J. Iverson and S. Goldin-Meadow, Gesture paves the way for language development, pp. 367-371

produce more sentences expressing causal relations, they use more gestures to convey the same information. Thus, gesture and speech encode strongly related meanings.¹⁹ Importantly, gesture might offer an alternative way to code and organize spatial-perceptual information and engage in the conceptual planning for speech.²⁰ ²¹

The data also suggest that children use many supplementary gestures referring to components other than those expressed in their speech. Only older children (4-year-old and older) produce instrument gestures that might later be conveyed in speech format. Göksun's findings demonstrate that even children as old as 5 years use extra information in gesture before they form a complete sentence with causal relations. It is suspected that there might be a decline in the number of supplementary gestures once a child begins to express instruments in sentences.

All of the aforementioned research shows us what an important developmental step it is for a child to supplement some spoken information with gestures. We can see how we can predict a child's progress in acquiring a complex set of skills necessary to provide information using words as a main source of communication. Gestures that are the most important to both; speakers and listeners, are codified and conventionalised hand movements that can be used instead of speaking. However, we cannot forget about other forms of gestures, which are usually not in the spotlight, and which, therefore can potentially give a sign of information that was not intentionally put into the message.

There are three levels of systematic relationship between speech and gesture. Firstly, we can see a semantic overlap between information conveyed in these two domains, meaning that gesture usually conveys information similar or related to information concluded in speech. Secondly, speech and gesture are temporarily aligned. Gesture has three phases: preparation (starts usually about one second before information appears in speech), gesture stroke (coincides with relevant speech segment) and retraction or hold. Lastly, gesture and speech serve a similar purpose, which is to deliver information to the addressee.²²

¹⁹ M. Gullberg, K. de Bot and V. Volterra, „Gestures and some key issues in language development”, pp. 149-179.

²⁰ See e.g. M. W. Alibali, S. Kita, and A Young, „Gesture and the process of speech production: We think, therefore we gesture”, pp. 593-61; S. Kita, „How representational gestures help speaking”, pp. 162-185.

²¹ S. Özçaliskan and S. Goldin-Meadow, „Gesture is at the cutting edge of early language development, pp. B111-B112.

²² D. McNeill, *Hand and mind: What gestures reveal about thought*.

Types of Gesture

For the sake of this article, we can divide gestures into four types²³:

1. Universal gestures, emblems.

This type of gesture has a meaning independent of speech and often occurs by itself. Emblems sometimes have different meanings in different cultures (for example, “thumbs up” gesture means “approval” in western culture, but is considered obscene in Turkey).

Moreover, this type of gesture is usually used to regulate the behaviour of an interlocutor. Universal gestures and emblems are produced and deciphered consciously and do not make longer sentence-like structures.

2. Creating a language system for the hearing-impaired people.

Within this category we can distinguish two subcategories, namely gestures learnt in the form of a sign language and spontaneous gestures produced by deaf children of hearing parents.

Sign languages, such as American Sign Language (ASL) or British Sign Language, are independent from spoken language systems and follow their own paths of development. Nevertheless, both spoken and sign language share some common features found in all natural languages; such as: rapid fading, interchangeability, total feedback, semanticity, displacement, productivity and traditional transmission.²⁴

Deaf children of hearing parents that have no contact with communities of deaf people; tend to invent their own systems of signs. This form of communicating is usually maintained for a few years, which means that gestures produced by children are, in fact, gestures and not mere hand movements. They have meanings attached to them. Children produce longer structures showing at least residual features of some of natural languages. Gestures are used as a spoken language and children use them to describe the past, their expectations, talk about absent people and objects and even talk to themselves.

Hearing-impaired children of hearing parents have no access to a structuralised sign language and have contact only with people using a spoken language, who produce more spontaneous and chaotic gestures. It seems that when people are unable to speak, gestures take some form of grammar.

3. Complementary gestures

This category of gestures is traditionally believed to show speaker’s emotions and feelings. Furthermore, they offer different perspective and can prove helpful in representing ideas that are easier to convey with gesture than with speech; such as size, shape and special relationship.

²³ S. Goldin-Meadow, “The role of gesture in communication and thinking”.

²⁴ C. Hockett, “The Origin of Speech”.

'Complementarity' is a term used by McNeill to characterise the fact that "speech and gesture refer to the same event and are partially overlapping, but the pictures they present are different."²⁵ McNeill's example is: at the moment the speaker says 'she chases him out again', "speech conveys the idea of pursuit and recurrence while gesture conveys the weapon used (an umbrella)" (ibidem).

4. Gestures conveying information not contained within speech

Due to the subject of this paper this category will be discussed in the most detail.

When gesture and speech convey different or even contradicting information it is known as "mismatch". It seems that producing a significant amount of mismatches might indicate the phase of cognitive instability. This phenomenon is quite easily observed with children. A six-year-old, while facing two rows of equal number of chess pawns but one of them with pieces spread out, will most likely say that there are more pawns in the spread-out row, but their pointing hand will suggest that they have some, even though unconscious, understanding that numbers of objects match in both rows.

Mismatches can be observed in every age group but occur most often with children and teenagers. Children producing mismatches frequently are more likely to fully benefit from proper instructions (i.e. learn faster and understand the issue more thoroughly) than peers conveying the same information through both means. There is no doubt that in order to fully understand a spoken message, the listener has to put some effort into integrating speech and a co-occurring gesture.

Interpretation of Mismatched Co-Speech Gestures and Elder's Communication

The study conducted by Cassell and her team consisted of three types of gesture-speech associations. Two of those pairs were constructed to convey contradictory information and one pair conveyed information that was not overlapping but was not contradictory either.

Gesture-speech associations used in the study consisted of:

1. Anaphor mismatches, which "set up two referents in space with deitic gestures and then violate the assumptions of referring back to the two referents by pointing to the wrong space".²⁶ In other

²⁵ D. McNeill, *Hand and mind: What gestures reveal about thought*.

²⁶ J. Cassell, D. McNeill and K.E. McCullough, "Speech-gesture mismatches: Evidence for one underlying representation of linguistic and nonlinguistic information", pp. 1-34.

words, the narrator would describe the movement of one object in speech and the movement of the other in gesture.

2. Orgio mismatches, in which gestures “provide a perspective on the action different from that assumed by the accompanying speech (ibidem).
3. Manner mismatches, which do not necessarily contradict the information given in speech, but provide additional (or different) information about the way in which an action is carried out. That information does not appear in speech.

The study was one of the first to see if linguistic and non-linguistic pieces of information have one underlying representation. In cases when gesture was not attended to, the listeners would not notice the mismatches and would retell stories correctly, using gestures corresponding to speech. Because it did not happen and all of the tellers produced inaccuracies, the authors could assume that there is, indeed, one underlying representation of linguistic and non-linguistic information.

The results show, that the effect of orgio and anaphor mismatches was not statistically different. 54% of manner mismatch stimuli had an impact on listeners’ retellings. The gesture was incorporated into the story either by speech or gesture. 50% of orgio mismatches had an impact on listeners’ retellings. “An example of retelling inaccuracy (...) is a subject who heard “and then Granny gives him a penny” but saw the narrator make a proffering gesture towards himself. She said,

Granny sees him and says “oh what a nice little organ grinder” [and she] gets –[goes to give him [a penny] – a little monkey excuse me and with her hand first makes a giving gesture towards her listener, and then towards herself and then towards her listener once again” (ibidem)

32% of anaphor mismatch stimuli had an impact on listeners’ retellings. Some of the retellers have reconciled information from the two modalities by adding an additional event to the story.

The study supported the hypothesis that gesture and speech are two integrated systems. It also shows that the speaker’s gestures are integrated into the listener’s retelling of the story (for example by changing the story to include the information conveyed in speech).

The Elderly and Communication

We can see that even adults, who don’t normally produce mismatches, tend to incorporate them into their speech, which means that mismatches have a strong impact on understanding of what is being said. We can

also see the effect of gestures in general during development of language in young children.

One age group that has not been studied in context of gesture-speech mismatches are the elderly. Even with a typical aging process people undergo at least a subtle decline in communication skills. Ageing is responsible for physical changes in hearing and speech processes.

„A person's age can be predicted with fair accuracy by speech characteristics including voice tremor, pitch, speaking rate, loudness, and fluency. Some language skills remain intact, whereas others tend to decline. For example, vocabulary, grammatical judgment, and repetition ability are relatively stable with age; comprehension of complex utterances and naming may decline. Although changes in communication skills such as voice may be subtle and gradual, they have clear life consequences such as avoidance of social situations.”²⁷

Forty participants, divided into two age groups (adults between 20 and 30 years old (the average age: 24 years) and the elderly between 65 and 85 (the average age: 72 years), participated in the study. The groups were equal in number and consisted of 10 people each. None of the participants reported any neurological problems.

Each age group was divided into control and experimental subgroups. The controls were shown a version of a video with no speech-gesture mismatches and the experimental group was shown a version of the video containing five speech-gesture mismatches. In the video containing mismatched information gestures were contradicting the information conveyed in speech.

The participants were shown the video individually and then were asked five questions relating to the possible mismatch. The questions were also the same for all groups.

The results of the statistical analysis show that mismatched gestures had an impact on both age groups. There were no significant differences in the number of correct answers in both age groups when there were no mismatches in the video, but higher number of omissions could suggest the decline in memory of older subjects.

In the mismatched condition the elderly gave significantly fewer correct answers than the younger subjects, as well as omitting more information. This could be an indication, that older people have more problems processing two contradicting pieces of information; due to the asynchrony in speech and gesture.

This asynchrony could be the cause of gestural representation having impact on linguistic representation. Perhaps this kind of impact put more strain on the cognitive functions of the elderly, for example

²⁷ K. Yorkston, M. Burgeois, C. Baylor, "Communication and Aging", pp. 309-319.

memory. To see if this hypothesis is accurate another study should be conducted on another paradigm.

The presented study should be considered a pilot study. Perhaps a longer study consisting of more than five speech-gesture mismatches would be more suitable; as mismatches would not appear one by one, but would be separated by a sentence that would not include differences in information conveyed in speech and gesture. That would eliminate the risk of one stimulus having an impact on processing others.

What is more, it would be recommended to test the elderly suffering from various diseases of old age. That would give a proper insight into a broader spectrum of communication problems that the elderly face on a daily basis.

Another methodological issue was the way of testing the understanding of the video. Although the video was not long enough to cause major problems of remembering it, probably asking to retell the story would be more reliable.

Conclusion

I started this paper by analysing briefly how human language differs from other animals' forms of communication. I have also presented possible explanations of how mankind came to using spoken language and complex grammatical structures. I have shown how children's ability to convey messages with gestures precedes ability to do the same using speech only and how gestures can be seen as a predictor of child's progress in language acquisition. I have compared to what extent speech-gesture mismatches disturb the understanding of a story presented to adults and the elderly, showing that older people have significantly more problems processing two contradicting pieces of information.

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Summary

The paper focuses on the role of speech-gesture mismatches in both reading and producing verbal messages in different age groups. Starting from the review of ideas as to why human communication is so much different from the communication of other animals, it continues to show the role of gesture in relation to language acquisition and conveying meaning by children. The article also focuses on the way in which linguistic and non-linguistic information is represented and it deals with the subject of changes in reading gesture-based communication

in different age groups. Focusing mainly on speech-gesture mismatches, this paper expresses the importance of gesture in language development, learning and finally, understanding information conveyed by speech in adults and elders.

Keywords

language, communication, verbal communication, gesture, language acquisition, learning processes, speech-gesture mismatches