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Signum

THE INTERPRETATION OF SIGNS BY (HEARING AND DEAF) MEMBERS OF DIFFERENT CULTURES

A METONYMIC MODEL FOR ASSIGNING MEANING TO SYMBOLIC GESTURES.

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ABSTRACT

In this chapter we describe and discuss two related studies based on data from a European project in which hearing and Deaf participants of six European countries (England, Holland, Denmark, Switzerland, Portugal, Spain) were asked to guess the meaning of 40 videotaped signs from Italian Sign Language (LIS), a sign language they did not know. An earlier study (Grosso 1993, 1997) had found that for Italian hearing non-signers, the meanings of 20 of these LIS signs were highly 'transparent' and 20 were non-transparent or 'opaque'. The first study we discuss here aimed to ascertain the following: a) Are the LIS signs that were found to be transparent for hearing Italians also similarly transparent for hearing speakers and/or Deaf signers of other countries? b) Are the LIS signs that were found to be non-transparent for hearing Italians similarly opaque for hearing speakers and/or Deaf signers of other countries? The second study focuses on the additional question: c) Are there any general strategies used by all participants for attributing meaning to symbolic gestures? The analytical framework for the second study proposes a hierarchy of meanings types used in attributing meaning. Closer to the top of this hierarchy are more universally understood symbolic gestures whose meanings are most directly interpreted from visibly present referents or to meanings that can be shown by pantomimic expression. More embedded in the hierarchy are meanings that involve some kind of metonymic association and which are usually more culturally specific.

Introduction

The underlying hypothesis of this study is that there is a common basis for all human manual gestures, whether they be highly conventionalized gestures used by hearing persons, linguistically codified gestures used in the sign languages of the Deaf, or less consciously used gestures made by hearing persons as accompaniments to their speech (Calbris 1990, McNeill 1992) or by conductors of classical music (Boyes Braem & Bräm 2000).

The subject of this report is the type of manual gesture that, used consciously or sub-consciously, has a symbolic function; it indicates some part of the content of the message being linguistically communicated. We are not concerned here with 'nonverbal communication' signals that indicate the speaker or signer's emotional or physical state, attitude towards the addressee, towards the content of the message, etc.

In signed languages, the manual gestures are consciously communicated and are usually the primary conveyers of the content of a message. A specific sign denotes a specific meaning, much as a word of a spoken language denotes a meaning. The gestures used by speakers to accompany their spoken language are usually more subconsciously produced, but also denote symbolic meaning. For example, the spoken word 'not' accompanied by the negating gesture in which the hand, palm down, moves out horizontally in a straight line.

Obviously, symbolic meanings can be indicated by means other than manual gestures – for example, by facial expressions, eye gaze, the posture and movement of the body. These other kinds of signals can interact with the manual gestures and sometimes totally replace them. However, any research attempting to describe the complicated, many-layered visual communication systems available to human beings must begin with some small part, and so this study is limited primarily to the manual gestures, although some reference will be made to these other kinds of nonmanual signals.

The manual gestures used in signed communication or used to replace or accompany speech (or music, as in orchestral conducting) have in common the tools, which are used to convey the message. Signals in all these situations are produced by different parts of the human body which are visibly perceivable. From the pioneering work of Stokoe (1960/1976) and Klima & Bellugi (1979), through the countless number of publications that are now available on a wide variety of world's sign languages, research on sign languages has shown that the structure of these corporal-visual forms is not that of a global, un-analyzable unit but rather that of a unit composed of sub-components. (See Joachim & Prillwitz for a bibliography of such studies.) Sub-components of the manual sign which have been found to be important for the structure of sign language include the following: the location of the sign in the space around the body, the specific handshape, orientation of palm and fingertips, arrangement and contact of the hands in respect to each other, as well as several aspects of the hands' movements. What is especially fascinating about this corporal, visual language is that many of these simultaneously produced sub-components can carry separate meanings. Thus in some polymorphemic signs, while the movement component can convey a verbal meaning (such as 'to give'), the handshape can refer to 'what' is being given (a book vs. a cigarette vs. a suitcase, etc.), at the same time that the beginning and end location components refer to who is giving to whom (See, for example, the description in Boyes Braem 1990/1995).

The same kind of analysis of the sub-components of form which has been made for the signs of Deaf sign languages can also be applied to the manual gestures used by hearing persons. Hearing persons use gestures usually as accompaniments to what they are speaking. This 'accompanying' or 'coverbal' character means that gestures of hearing persons usually do not have to carry the full burden of symbolic meaning, unlike the gestures in sign languages. Sometimes, however, a speaker's gesture will have no equivalent in the spoken utterance, in which case, the gesture functions as a speech replacement. Calbris (1990) has done a study of symbolic gestures used by French hearing persons, in which she shows that not only do some gestures as a whole have definite, conventionalized meaning, but also that the sub-components such as handshape, hand orientation and movement can carry their own meanings. A componential analysis of gestures used by

hearing Italians has been done by Kendon (1995), and McNeill and his co-workers have done extensive studies of gestures produced by speakers (McNeill 1992, 2000).

What all these gestural systems have in common is the fact that they are symbolic productions of human cognition. Lakoff & Johnson (1980) have argued that much of our cognition about abstract and emotional concepts is made possible through a metaphoric and metonymic process of association to what we know about the physical world. These and other linguists have shown how our use of spoken language reflects this metaphoric cognitive process. The study of the perception of gestures is especially interesting, because whether or not the gestural signals are consciously produced, they are usually interpreted by the perceiver as having some kind of meaning. This metaphoric-metonymic cognitive model will be used here to analyze how hearing and Deaf persons attribute meaning to signs from a sign language, which they do not know.

Previous Studies of Iconic and Transparent Features in Sign Languages

Many symbolic gestures used in sign languages exhibit a prominent, much debated feature: One can detect an iconic relationship of resemblance between the form of the sign and its referent, i.e. the form of the sign resembles or may bring to mind the form of the object, action or event it denotes. For example, in Italian Sign Language (LIS), as in American Sign Language (ASL) and many other sign languages, the shape and motion of the hands used for the sign meaning 'car' visually resembles the action of holding and turning a steering wheel. One important consequence of a sign's iconicity is that even naive, hearing observers who are not familiar with a particular sign language may more or less appropriately «guess» the meaning of a sign, or at least see some connection between the sign and the object, event or action for which it stands.

Early studies on ASL by Bellugi and Klima (1976) took a closer look at how well hearing persons who knew no sign language could guess the meanings of 90 signs, all of which referred to concrete and abstract nouns. These studies found that, when the participants were given no other clues, they could guess correctly only ca. 10% of the signs. The signs in this 10% group would then be termed 'transparent'. The same 90 signs were shown to a different group of hearing participants, but this time the English translation of each sign was included. The participants in this second study had to describe the relationship between the form of the sign to the English translation, for example the relationship of a 'sawing-like movement' of a sign to its meaning, 'wood'. In this condition, ca. 50% of the descriptions matched the conventional meaning; these signs were termed 'translucent'. The remaining signs, for which no connection could be made between their form and their meaning, were termed nontransparent or 'opaque'. On the basis of these studies, it seems that many, but not all, signs in ASL exhibit iconic-transparent features, but to different degrees.

In more recent studies, using the same general design employed by Bellugi and Klima (1976) in their work on ASL, Grosso (1993, 1997) explored the comprehensibility of LIS signs by hearing Italians who knew no sign language. We briefly describe here only one of the studies conducted by Grosso that is directly relevant to the work described in this

chapter. In this study, 24 hearing Italians who knew no sign language looked at 92 common LIS signs on videotape and had to write down their guesses as to the sign's meaning. The responses were considered 'correct' if they used the same word as the Italian Deaf community's own glosses for the sign, or if they had a related meaning (e.g. 'walk' for the Deaf gloss 'run'). Results of this study showed that 24% of the stimulus signs were correctly interpreted from the form alone, or were 'transparent', whereas 76% were half-transparent or totally opaque. As noted by Pizzuto and Volterra (2000), the 'transparent' signs often had helpful perceptual features ('a more or less direct relationship of physical resemblance to the action or object they represented' such as in the signs for 'hear' and 'break'), or they were similar to gestures conventionalized in the hearing Italian culture (as the signs meaning 'well/good' and 'hunger'). The nontransparent LIS signs didn't resemble any gestures of the hearing community. Comparing the studies of iconicity in the two sign languages, it seems that a large number of signs in both languages are non-transparent or 'opaque' (90% in the ASL study, 76% in the LIS study). Interestingly, however, more LIS signs are transparent for hearing Italians (24%) than ASL signs are for hearing Americans (10%). This suggests that, when it comes to interpreting signs, the hearing Italians may benefit from being immersed in what Kendon (1995) has characterized as a "gesture-prominent" culture. This kind of culture in which hearing adults frequently use, along with spoken words, a fairly large number of conventional, often iconic gestures has been described in several publications. (See for example De Jorio's, 1832/2000 early work on Neapolitan gestures; Munari's 1963/1994 'dictionary of Italian gestures'; Diadori's 1990 description of 100 Italian gestures for foreign learners of Italian). However, the studies described in this chapter will suggest some other possible reasons for this discrepancy.

STUDY 1: A EUROPEAN CROSS-LINGUISTIC AND CROSS-CULTURAL STUDY OF THE TRANSPARENCY OF LIS SIGNS

A European Union project, in which sign language researchers from seven different European countries participated was done in order to explore the comprehensibility of LIS signs by hearing and Deaf participants of different national cultures and language communities (Pizzuto & Volterra 1996). This study aimed to clarify the role that culture-specific, language-specific or language-universal, presumably iconic and/or perceptual features may play in determining the relative transparency and/or opacity of a set of signs of a specific sign language.

The first analyses of the data from this European Union project were done primarily by Pizzuto and Volterra (1996; 2000) and are summarized in this section. Additional analyses of the 'incorrect' responses provided by the participants of the different countries were done primarily by the first author of the present chapter and are the bases of the model and strategies for assigning meaning to gestures which are proposed in the remainder of the chapter.

Methodology

Forty of the original list of 92 LIS signs from the Grosso (1993, 1997) study were selected with the following distribution: 20 which Grosso had found to be highly transparent for Italian hearing participants (i.e. that had been guessed correctly by most or in any case more than 50% of her sample of 24 hearing Italians), 20 which were highly non-transparent (i.e. that none, or at most one, of the 24 hearing Italians examined by Grosso had guessed correctly). Examples of the transparent and non-transparent signs that were selected are given in Figure 1.



Figure 1: Transparent signs: (a) TO-LISTEN; (b) CAR, (c) SPRING
 Culturally transparent signs: (d) WELL/GOOD, (e) PAY, (f) BEAUTIFUL
 Nontransparent signs: (g) WOMAN, (h) FIANCE, (i) TOURISM

The set of transparent signs included several signs that are likely to be very similar or even identical across different sign languages, at least in western cultures (e.g., in Fig. 1a, b, c: LISTEN, CAR, SPRING). This set also included five signs which exhibited more culture-related transparent features, i.e. that were identical or very similar to gestures used with the same meaning within the Italian culture (e.g., in Fig 1d, e, f: WELL/GOOD, PAY, BEAUTIFUL). In contrast, and to the extent that it was possible to evaluate beforehand, non-transparent signs were included that had no evident similarities with corresponding signs of the European sign languages involved in the study, or with known European gestures used among hearing persons (for example, 1g, h, i: WOMAN, FIANCE, TOURISM).

The forty signs were videotaped in a randomized list form by a native LIS signer and shown to six signing Deaf and six non-signing hearing participants in each of the following countries: Spain, Portugal, German Switzerland, Holland, Britain, Denmark. The participants were told these were signs from LIS and that their task was to write down a word in their language for what they thought the sign meant. The viewing of the sign was repeated, if the participants so wished and sufficient time was given for noting a response.

The participants' responses were rated in a similar fashion as in the Grosso's study, being regarded as 'correct' if the gloss was identical or closely related in meaning to the meaning of the gloss which Italian Deaf persons have given that sign. All the answers that significantly differed from the signs' glosses were considered 'wrong' (e.g. 'smell' for the LIS sign meaning 'bad') but the words given by the participants were in all cases annotated for subsequent, more detailed analyses (see Pizzuto and Volterra, 2000, and below for more details).

First Study: Questions Addressed and Hypotheses Formulated

The first analyses of the data addressed two major related questions:

1. Whether LIS signs that were found to be transparent for hearing Italians were also similarly transparent for hearing speakers and/or Deaf signers of other countries.
2. Whether LIS signs that were found to be non-transparent for hearing Italians were similarly opaque for hearing speakers and/or Deaf signers of other countries.

The hypotheses formulated were the following. The more general hypothesis was that the LIS signs that had been found to be transparent for hearing Italians were likely to be also transparent for non-Italians (hearing and Deaf). It was also hypothesized that transparent signs that exhibited more culture-related features were likely to be non-transparent for non-Italians (e.g. a LIS sign such as Fig. 1d: WELL/GOOD, most transparent for Italian hearings, would not be correctly guessed by non-Italians). With respect to non-transparent signs, the major hypothesis was that, insofar as their understanding appeared to require the knowledge of a specific sign language, LIS, they would be similarly non-transparent for non-Italian participants. Finally, it was hypothesized that the patterns of responses of non-Italian Deaf participants would more or less significantly differ from those of hearing participants, and this was likely to be the case with respect to both transparent and non-transparent LIS signs. The rationale underlying this latter hypothesis, grounded in earlier observations made on this topic (Boyes Braem, 1986), was that Deaf signers' knowledge

of a sign language could influence, to a degree to be ascertained, their perception and processing of the iconic-transparent and/or non-transparent features of the LIS signs.

First Study: Major Results

The results of the first analyses supported all of the hypotheses that were initially formulated. In accordance with the first hypothesis, 13 out of the 20 signs which had been found by Grosso to be highly transparent for hearing Italians were also transparent for non-Italians (hearing and Deaf). Also, in accordance with hypothesis 2, the five transparent signs which were thought to be typical of hearing Italian culture were not guessed correctly by all participants in other cultures. In addition, many of the signs which were nontransparent to the hearing Italians were also nontransparent to hearing and Deaf participants in other cultures, upholding hypothesis 3, although there were some and quite meaningful exceptions, where the non-Italian Deaf participants did better than their hearing counterparts.

Finally, and in accordance with the fourth hypothesis, it was found that the performance of Deaf participants markedly differed from that of the hearing ones, with the Deaf providing a greater number of correct guesses compared to the hearing. A c^2 test revealed that this difference was highly significant not only for the transparent ($p < 0.001$) but also, and more interestingly, for the non-transparent signs ($p < 0.001$). Further details on the initial analyses of the data in connection with these hypotheses can be found in Pizzuto and Volterra (2000).

The remainder of this chapter focuses on a comparison of both the 'correct' and 'incorrect' responses of the Deaf and hearing participants, and on the models and strategies that may be hypothesized to account for the patterns observed.

STUDY 2: STRATEGIES USED FOR GUESSING MEANINGS OF SYMBOLIC GESTURES

Purpose of the Second Study. The data from Deaf and hearing participants who tried to guess the meaning of the 40 LIS signs can reveal patterns of guesses which might indicate different strategies which the participants were using. Most interesting for this kind of analysis are the 'incorrect' responses, i.e. the guesses which did not correspond exactly to the conventionalized meaning of the Italian signs. Do these 'incorrect' responses reflect a wide spectrum of different and unrelated meanings, or do the guesses form subgroups along some dimensions?

The analysis will attempt to see if there are patterns of 'incorrect guesses' which might reflect different strategies in guessing, which are specific to the different groups of participants.

For the cases where participants (Deaf or hearing) from different countries give incorrect but similar responses to a stimulus, the following explanations might apply:

- a) All the participants have a similar gesture with that conventionalized meaning in their culture.

- b) They are applying a more general 'gesture-guessing' strategy which is used perhaps by all people, or at least by all members of the same Western European culture.

Analysis of the sub-groupings of the Deaf participants' responses might support an additional hypothesis that the Deaf signers, on the basis of their experience with a codified visual-gesture system as primary language, can more readily employ some kinds of strategies than can hearing speakers, who use gestures primarily to support information carried in their speech.

For the purposes of this analysis, and in order to explore as thoroughly as possible cultural-related factors, data were also included on the responses provided to the 40 LIS signs by 6 hearing Italians, randomly selected from the larger sample of 24 hearing Italians originally examined by Grosso (1993; 1997). A total of 78 responses were thus analyzed: those provided by the 12 participants (6 hearing, 6 Deaf) examined in each of the six European countries specified above, and those provided by the 6 hearing Italians drawn from Grosso's sample.

Caveats. Some conditions affecting this analysis must be stressed at the onset. The first coding of the responses was the translation into English of the non-English participants' written responses in Italian, Dutch, Danish, German, Portuguese and Spanish. These translations were done by the sign language researchers in each country who collected the data and their accuracy couldn't be fully verified. A second limiting condition of this analysis is that the attribution of possible underlying metaphors and metonyms, albeit based on the observations reported by all sign language researchers involved in the project, and discussed among the three co-authors of the present chapter, was done primarily by the first author. Some of the researchers asked their participants after the test about their motivations for their responses; however, this was not done uniformly or consistently across all groups. Thirdly, due to the time and resource limits of the study, possible sign interference from the Deaf participants' sign language could not be accurately reported or evaluated. (This factor is discussed later in this chapter.) These limiting conditions mean that the analyses and conclusions made on this data are, however suggestive as a preliminary approach and avenue for future research.

Theoretical Bases for a Model for Assigning Meaning to Symbolic Gestures

Sub-components of Gestural Form and Meaning. One basic assumption of this study is that the hearing person's gesture, like the sign in a Deaf sign language, is not perceived as an un-analyzable whole but rather that attention is paid to specific sub-components of the gesture. Among these sub-components are the location where the gesture is made, the handshape, palm and fingertip orientation as well as the shape, direction and manner of movement and the arrangement of the hands in respect to each other. These manual components of the gesture may be accompanied by specific facial and/or bodily expressions. The formal sub-components of the sign in sign languages of the Deaf have been extensively researched, as mentioned earlier. The formal sub-components of the speaker's gesture have also begun to be researched (cf. for example, Calbris 1990; Kendon 1995).

The interpretation of gestures in isolation is not absolutely free, but there is a range of meaning that one can choose from. Calbris (1990) points out in her study of gestures used by French speakers, gestures are polysemous, depending upon which aspect of the gesture you choose to focus upon. For example, the flat hand held vertically combined with a twisting movement can signify 'negation', 'crazy', or 'maybe', depending on the context. If the gesture is seen in context, the choice from among the many possible meanings is simplified and the gesture becomes monosemic. For example, a gesture involving a index finger pointing upwards, if used as a gestural response to a question yelled from a friend at a fast-food takeout counter (for example, 'How many orders of french-fries?') would have a different interpretation (i.e. 'one'), than when used in a discussion to mean 'wait a moment, I want to think'.

Most communication of any sort takes place within particular contexts, which help to determine which of many possible meanings of the signals is actually intended. In the Italian Sign experiment reported upon here, however, there was no context. The participants saw the signs performed in isolation, one after the other, on videotape. This meant that these participants had to use criteria other than context in order to choose what meaning they would put down as their response.

Proposed Strategies for Assigning Meaning. The underlying presumptions of the analyses of this data are as follows: Most of the responses to unfamiliar sign/gesture stimuli such as used in this study are not randomly chosen, but rather the participants follow some general strategies in assigning meaning to the sign stimuli. Which strategy is used, is to some extent dependent upon the group to which the participant belongs (hearing or Deaf, member of a specific culture).

Based on these presumptions and on the analysis of the data, the following argument will be made for the 'unprejudiced' observer – i.e. one who, when faced with a gesture does not already have a meaning assigned to its form based on the knowledge of a sign language or of a conventionalized gesture system used in the hearing culture. Such an observer, when confronted with a stimulus sign or gesture in isolation, will resort to a strategy in which the first step is focussing upon the particular sub-components of the sign's form. These components of the form are then used as the basis for assigning a meaning. This meaning is derived from one, or a combination of, the following three possible assumptions:

- The gesture component is a deixis that points to some referent visible in the setting;
- The components are associated to an action schema that the human body can perform;
- The components refer to non-visible, non-demonstrable meanings by a process of metonymic association.

These ideas will be described in more detail in the following sections.

Metonyms and Metaphors. As the concept of metonym is central to this analysis, it is necessary first to take a closer look at what is meant here by 'metonym' and how this concept relates to 'metaphor'

Metonyms and metaphors are similar, in that both make connections between two things. However, the type of connection is different, as several researchers point out (Lakoff & Turner 1989, Lakoff & Johnson 1980, Sweetser 1990). In metaphors, the association is made between two different conceptual domains; a whole schematic structure and logic from one domain is mapped on the other domain. One uses the 'source' domain to understand the 'target' domain. An example of this is the basic metaphor, 'people (target) are plants (source)', which is the basis of a large number of German as well as English expressions. (For example, 'Sie blüht auf./'She is blossoming'; 'Er welkt dahin./'He's wilting'; 'Die Früchte seiner Arbeit./'The fruit of his work'; 'Schnitter Tod./'Reaper death'; 'Er ist noch grün hinter den Ohren./'He is still green behind the ears'; 'Sie ist eine zartes Pflänzchen, eine Knospe, eine Mimose./'She is a tender plant, a bud, a mimosa.)

In contrast, the elements in metonymic association all come from one domain. A metonym can be an association in which a part of a schema evokes the whole schema. Examples of this 'part for whole' association are 'the head' standing for the 'whole person', a place standing for an event, a person for an institution. A metonym can also be one element of a schema standing for another element in the same schema. An example of this 'part for part' (or 'part for user') association would be a rocking cradle standing for the baby sleeping in it. Lakoff & Turner (p. 103) also consider the following evoked association as a kind of metonym: a crow stands for death via the metonymic associations of crow as scavenger that feeds on dead animals.

Metaphors, Metonyms and the Structure of Human Conceptual System. Lakoff and his co-authors point out that both metonyms and metaphors are conventionalized and can be used automatically without conscious awareness. As such, they are an important means of extending the linguistic resources of a language. These researchers go beyond this, however, to maintain that not only poetic expression but most of our abstract concepts can only be understood by metaphoric association: "We claim that most of our normal conceptual system is metaphorically structured; that is, most concepts are partially understood in terms of other concepts." (Lakoff & Johnson, p. 56)

The prevalent use of the basic metaphors in our thinking and language is, according to Lakoff & Johnson, due to the common human experiences from which they derive. These areas include the following:

- Everyday physical experience of our bodies in a physical environment (spatial concepts such as up-down, front-back, near-far, etc.; interaction with the physical environment)
- Body functions (light-dark, warm-cold, male-female, etc.)
- Cultural experience (assumptions, values, attitudes)
- Emotional experiences

All of these kinds of experiences are basic, Lakoff & Johnson 1980 and Johnson 1987 maintain, but some have a 'more sharply delineated conceptual structure'. Significant for our study of symbolic gestures is their hypothesis that space has a more delineated conceptual structure than do, for example, emotions. It is for this reason that humans often use concepts from the spatial and physical domain to conceptualize emotion. Examples of this is the conception of happiness as 'an erect posture', 'up', 'high', 'super', 'ich fühle mich himmlisch./'I feel heavenly' (ibid, p. 57). Sadness, on the other hand, is correlated

with a slumping posture, downward lines of the face and expressions such as 'Ich bin niedergeschlagen, am Boden'/'I am beaten-down, on the ground'. Thus, while physical experiences are not more 'basic' than the other kinds of experiences listed, they are more readily available for structuring conceptual domains: "we typically conceptualize the non-physical in terms of the physical – that is, we conceptualize the less clearly delineated in terms of the more clearly delineated" (Ibid, p. 59).

An example of how physical concepts are used in other abstract domains can be seen in the following uses of the spatial 'container' metaphor:

"Ann is in the kitchen" (This is a clearly delineated spatial experience)

"Ann is in the Liberal Party" (This is a metaphoric use of container: "Social groups are containers")

"Ann is in a hole" (Metaphor = "Emotional state is a container")

"He finished that within 10 minutes" (Metaphor = Time is a container)

Studies have already been done on the metaphoric/metonymic structure of some aspects of the lexicon of Deaf sign languages (Boyes Braem 1981, 1984, 1986; Brennan 1990; Wilcox 2000, Taub 2001). Bräm & Boyes Braem 2000 have done a metaphoric analysis of the expressive gestures of orchestral conductors. Here, we apply similar reasoning to the symbolic gestures viewed in isolation by Deaf and hearing persons in different European cultures.

For present study of symbolic gestures presented in isolation, the device of metonymy seems to be involved more frequently rather than does metaphor. One explanation for this is that metonym is used primarily for making reference (Lakoff & Turner, p. 103). Lakoff & Johnson also point out that "the grounding of metonymic concepts is in general more obvious than is the case with metaphoric concepts, since it usually involves direct physical or causal associations" (p. 39). This would also make metonymic association more likely to be used by the participants for the kind of stimulus data used in this study.

Summary of Hypotheses. The basic reasoning for the hierarchical model proposed here can be summarized as follows:

- a) Gestures can be polysemic, especially when viewed in isolation with no context, which was the situation posed by this study.
- b) This polysemy is partly due to the following factors:
 - Gestures, like signs of Deaf sign languages, are composed of formal sub-components. A gesture, like a sign, involves one or both hands, each of which has a distinct handshape, hand orientation, location, movement shape, direction, path, and manner.
 - Persons trying to interpret an unknown gesture can focus on different sub-components upon which to base their guesses of the meaning of the gesture.
- c) The guessed meanings can be based on
 - 'Visible' referents (specifically, deictic reference to something in the environment or on pantomimic depictions of actions or shapes which the hands or body is capable of making), or on
 - Metonymic and metaphoric meanings, which are derived from the 'visible' meanings.

ANALYSIS OF THE DATA

Hierarchical Coding of the Responses. In the reasoning summarized above, there is an implicational hierarchy in the attribution of meaning to isolated gestures. In order to attribute a metonymic meaning, one must first have seen some component of the gesture as having a more 'visible' meaning related to the body's actions. A hierarchy of meaning attribution is proposed, which is based on the following assumptions:

- The most basic meanings for symbolic gestures are either spatially deictic (indicating places, directions, persons, or body parts), or pantomimic (manipulative actions, body movements, illustrations of forms and dimensions). Gestures with these meanings utilize communicative tools available to all humans (two arms/hands plus facial and body expressions). They are frequently used by young hearing children (see among others Volterra & Erting 1990; Iverson, Capirci & Caselli 1994; Capirci, Iverson, Pizzuto & Volterra 1996), and are quite probably found in all cultures. These kinds of gestures are therefore placed at the highest, most readily accessible, levels of the proposed hierarchy.
- Basic 'deictic' and pantomimic gestures can take on additional, more specific or different meanings by a process of metonymic association. The less dependent the interpretation is on what can be pointed to or illustrated by a human body, the more decontextualized the meaning becomes from the visible experiences in the physical world. These metonymically derived meanings are therefore more deeply embedded in the hierarchy.
- Additional metonymic associations, often for more abstract concepts, can be made to existing metonyms. While some of these more abstract, highly imbedded meanings may be universal, most are probably specific to some cultures.

Table 1 shows some examples of how increasingly abstract meanings can be derived by metonymic associations to (a) more basic deictic indications of a body part and (b) the pantomiming of a manipulative action:

	<i>(a) Correct</i>		<i>(b) Incorrect</i>	
	<i>Hearing</i>	<i>Deaf</i>	<i>Hearing</i>	<i>Deaf</i>
<i>England</i>	1	2	speak (2), be quiet, me, quite	beer (2), baby, support
<i>Holland</i>	0	2	eat, child, talk, beautiful, myself, to invent	baby, mother, nice, who
<i>Denmark</i>	2	1	put-in-mouth, eat, me, I	beer bottle (2), baby (3)
<i>Ger. Switzerland</i>	5	3	in-the-mouth	water (3)
<i>Portugal</i>	6	5		father
<i>Spain</i>	6	5		water
<i>Italy</i>	6	6		

Table 1: (a) Correct and (b) Incorrect Guesses to the LIS Sign 'To Drink'.

Coding of the Stimulus Sign TO-DRINK. This hierarchical coding can be illustrated by a relatively simple case of the responses to the 'transparent' LIS sign, 'to drink'. The form of this sign is a fist with outstretched thumb, which moves towards the direction of the mouth (cf. Figure 2).



Figure 2: LIS transparent stimulus sign TO-DRINK

Of the total 78 responses, 42 (54%) were the same as the conventionalized meaning for the sign ('drink') in LIS. Most of these 'correct' interpretations came from participants in Switzerland, Portugal, Spain and Italy, which suggests that this meaning of this gesture is probably strongly conventionalized in these cultures. There were fewer 'correct' interpretations of the signs by the English, Danish and Dutch participants, which suggests that this meaning is not so strongly associated with this gesture in these cultures. (See Table 2.)

Techniques:	Visible showing via (a) deixis or (b) pantomimic actions of hands	+ Metonymic Association	
Type of Referent:	visible/concrete →	invisible/concrete →	abstract
Examples :	(a) mouth →	ingesting →	eating, drinking, hunger
	(a) head →	head→	thinking, crazy, philosophy
	(a) torso →	heart →	emotions (Western European cultures) thinking (American Indian cultures)
	(b) twisting something with the hands →	to exchange objects → to change-positions →	change ones mind sport (in many European sign languages)

Table 2: Examples of meanings derived by metonymic association with (a) a body part or (b) the manipulative action:

However, even for the highly transparent gesture of TO-DRINK, there were several 'incorrect' guesses about the meaning of this sign including meanings such as 'baby', 'support', 'speak', 'be-quiet', 'nice', 'who', 'eat', 'talk', 'myself', etc.). More interestingly, these 'incorrect' guesses do not seem to have been random but seem to have been motivated. The incorrect guesses form subgroups which themselves seem to be related in an implicational hierarchy; that is, they involve metonymic associations that are dependent on more basic associations to other metonyms or to visible referents or actions in the physical world. Table 3 shows the coding of all responses to the LIS sign TO-DRINK.

Categories of responses for the transparent sign, TO-DRINK		
Component focussed upon and attributed level of meaning	Responses of Hearing Subjects (n=42)	Responses of Deaf Subjects (n=36)
Focus A: Location (head level) +Movement direction (toward mouth) + Handshape (single digit-pointing) 1. Deixis (Body part) 1.1. Metonym (manipulative action) 1.1.1. Metonym: Function (biological) 1.1.1.1. Metonym: Object 1.1.2. Metonym: Person 1.2. Metonym: Function (secondary)	in-the-mouth put-in-mouth to eat (2), <i>to drink (26)</i> child to speak (2), to talk, be quiet!	<i>to drink (18)</i> beer (2), beer bottle (2), water (1) baby (5)
Focus B. Movement direction (Deixis to signer) + Handshape (single digit) 1. Deixis (Person)	I, me (2), myself	
Focus C. [Handshape (single digit: Thumb) + Orientation (tip up) [1. Deixis (Number)] [1.1. Metonym: One → being 'first/number one'] 1.1.1. Metaphor (conventionalized in European Cultures) Thumb-up → positive qualities	beautiful	nice
Possible Sign Interference		water (3) mother, father
No category assigned (for deaf, possible sign interference)	quite, to invent,	who, support
No Response		

Table 3: Hierarchical structuring of meaning categories for all responses for the sign TO-DRINK

In our analyses, most of the 'incorrect' responses to this sign appear to be based initially on focussing on different components of the gesture. This, in turn, led to attributing meanings of three different kinds of deixis: pointing to a body part (the mouth); pointing to indicate the signer himself; and a deictic indication of number using the fingers.

Explanation of 'Focus A' Responses. The meanings in the first group in Table 3 are based on the presumption that the participants focus on the location component (high placement of the gesture), the direction of the movement towards the signer's mouth, as well as a single outstretched digit. The outstretched thumb, like the outstretched index finger, can also be used for pointing.

The response, 'in-the-mouth', results from the uppermost, most visible, level of meaning interpretation, the deictic indication of a body part.

The response 'put-in-mouth' involves the additional association of a manipulative action to this basic deictic meaning. The outstretched thumb is not itself a 'grasping' handshape, which would be necessary for a pantomimic enacting of 'putting something in the mouth'. This meaning for this extended thumb form is therefore coded as an additional metonymic association at a more embedded meaning level (1.1.)

The responses 'to eat' and 'to drink' are coded at level 1.1.1, as they are further metonymic associations of a biological function (ingesting) which are dependent on the deictic indications and metonymic meanings higher up in the hierarchy.

The responses 'beer' and 'water' are noun referents which are even further embedded in the hierarchy (1.1.1.1.). These meanings are dependent on the chain of meanings beginning with a basic deictic indication of the mouth → manipulative action of putting something in mouth → biological function of ingesting, and ending with → object ingested.

The responses 'baby' and 'child' are coded as a metonym derived from the manipulative action level (a baby associated with putting something – a thumb? – in the mouth).

The responses 'speak', 'talk', 'be-quiet' are also associations with the mouth, but to a 'secondary function' of the body part, (speaking) as opposed to a 'biological function', such as ingesting.

'Focus B' Responses. A second group of responses to the stimulus sign TO-DRINK is based on the participants' presumably having paid attention primarily to the outstretched thumb handshape and its movement toward the body. However, the exact location of the sign (near the mouth) seems to have been ignored and instead the movement of the sign towards the signer is interpreted as an indication of the signer himself: 'I', 'me', 'myself'. This kind of response has been categorized as Person Deixis.

'Focus C' Responses. The third group of responses ignores the high placement of the hand near the mouth as well as the movement toward the body, but rather focuses on the vertically outstretched thumb. For these responses, however the association with this handshape is not spatial deixis but rather a deictic indication of the number one. The association of '1' with the outstretched thumb seems to be widely conventionalized in many European (but not North American) cultures. In the coding system, this kind of deictic enumeration is considered to be at the same level of the hierarchy as visual deictic reference and miming manipulative actions. The meanings of the responses in the data are not the number 'one' itself, but rather an addition metonymic association, "being first, number

one". This level in the implicational hierarchy is not represented in any response in the data, and is therefore marked by square brackets. 'Being number one' is, especially in Western European cultures, associated with positive qualities such as 'good', 'ok', 'super', etc. The specific positive qualities reflected in the data here are 'nice' and 'beautiful'. This metonymic association of positive attributes with the outstretched 'one' thumb handshape plus a slightly upwards movement is conventionalized in many European hearing cultures (Calbris 1990) and European Deaf sign languages.

Possible Sign Interference. Responses were strongly suspected as being the result of 'Sign Interference' if two or more Deaf persons from the same country – but no hearing participant – gave the same 'incorrect' interpretation. In these cases, the participants could be simply giving the meaning the form has in their own sign language or another sign language with which they are familiar. Many of the responses that we suspect were due to possible sign interference could also have been coded into hierarchical meaning types. Although our coding these responses as sign interference weakens our argument for the hypothesized strategies and metonymic devices used to interpret gesture, it also avoids attributing false etymologies to conventionalized signs from different national sign languages.

No Category. The above categories do not, of course, account for all of the responses to the stimulus sign in our data. Some responses were therefore coded as 'No Category Assigned'. Of the Deaf participants' responses, 3.13% were not categorizable, of the hearing participants, 5.42%. The lower number for the Deaf participants was probably influenced by the fact that some of their responses went into the category 'possible sign interference'. Most of the not categorizable responses (71%) were to what had previously been predicted to be 'non-transparent' signs, 16% to transparent signs, and 13% to culturally transparent signs.

No Response. The 'No Response' category included the responses where the participant wrote in a question mark (?), or left the space on the answer sheet blank. Approximately 4% of the responses fit none of the categories and were thus put in the 'No Category' group.

All 'no category' and 'sign interference' figures were deducted from the totals used to figure percentages in subsequent calculations.

Not all of the stimulus signs could easily be associated with a body part. For example, the LIS sign NAME (Figure 3) is made in neutral space in front of the signer. Some participants did, however, seem to make an effort to associate this sign anyway with a body part, by focussing on the relatively high location close to the throat. One group of responses resulting from this focus seem to be based on a gesture widely conventionalized in Europe (cf. for example, Calbris) of a slicing motion to the throat meaning 'to stop' (finish, end).

Many of the other responses to this sign focussed on the direction and shape of the movement component (straight, horizontal), resulting in associations with 'passing by' (drive-by, to-cross-street, something-goes-by). Other responses focussed upon the handshape which involves two outstretched fingers (index and mid), resulting either in an association with the number two (two, together, double, couple, etc.) or cutting something in two (cut, piece, half).

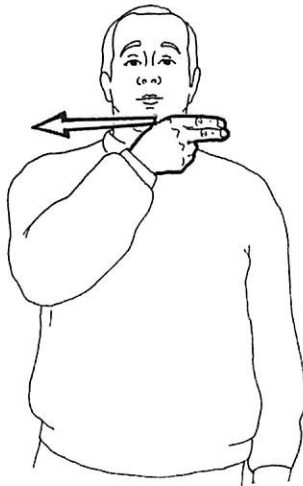


Figure 3: LIS non-transparent stimulus sign NAME

RESULTS AND DISCUSSION

Different Ranges of Meaning Types for Transparent and Nontransparent Signs. As it was possible that one difference between the Deaf and hearing groups' responses might be in the kinds of meanings ascribed to the stimulus signs, tabulations were made of meaning types which accounted for the responses. The different meaning types that account for this data are listed in Table 4.

Meaning Category	Examples
Person	(I, you, he)
Body part	(head, ear, waist)
Association with body part	(brain, heart)
Direction/Location	(up, down, under)
Dimension	(large, short, this height)
Form Trace	(round, triangle)
Form Orientation Change	(to turn)
Enumeration	(1, 2, 3)
Pantomimic Manipulation	(twist, put in, knock)
Pantomimic Arm Movement	(to arrange, to ski)
Function – biological	(eating, breathing)
Function – secondary	(speaking, smiling)
State	(drunk, hungry, crazy, happy, doubt)
Attitude/Opinion	(wrong, better)
Attribute	(odious, dirty, smooth, blind)
non pantomimic Movements	(to cross street, go to bed, go away)
Abstract Verb	(to marry, to study, to understand)
Locative Verb	(to switch, come and go)
Nominal Referent – person	(baby, gardener, boss)
Nominal Referent – animal/bird	(duck, fish, goat)
Nominal Referent – concrete object	(grapes, tea, wind)
Nominal Referent – abstract	(marriage, request, equation, friendship)
Locative Relations (static)	(on top of, together, behind)
Speech Act	('speak to me!', 'hurry up!')

Table 4: Meaning types represented in the data (with example responses)

Some of the sign stimuli were evocative of a larger number of different meaning types that were other signs. The signs which had a small number of different meanings and meaning types associated with them were, not surprisingly, the signs which had originally been labeled 'highly transparent' (for example, the sign TO-LISTEN in Figure 1). Across all participants, the transparent signs represented an average of 2.1 different meaning types per sign associated with them. Signs hypothesized to be 'nontransparent' were more polysemic, eliciting a larger range of meanings types (an average of 4.4 meaning types per sign).

Differences Between Deaf and Hearing Participants in the Number of Meaning Types Used per Sign. As shown in Figure 4, the range of meaning types used per sign was 1 to 9. The responses of the hearing participants typically involve more meaning types per sign than do the responses of the Deaf participants. The responses from the Deaf participants have an average of 1.75 types per stimulus sign, with a range from only one type for a sign, to a maximum of 5 types for a single sign. The average number of meaning types per sign for the hearing participants' responses is 3.03, ranging from 1 to 9 different meaning types per sign.

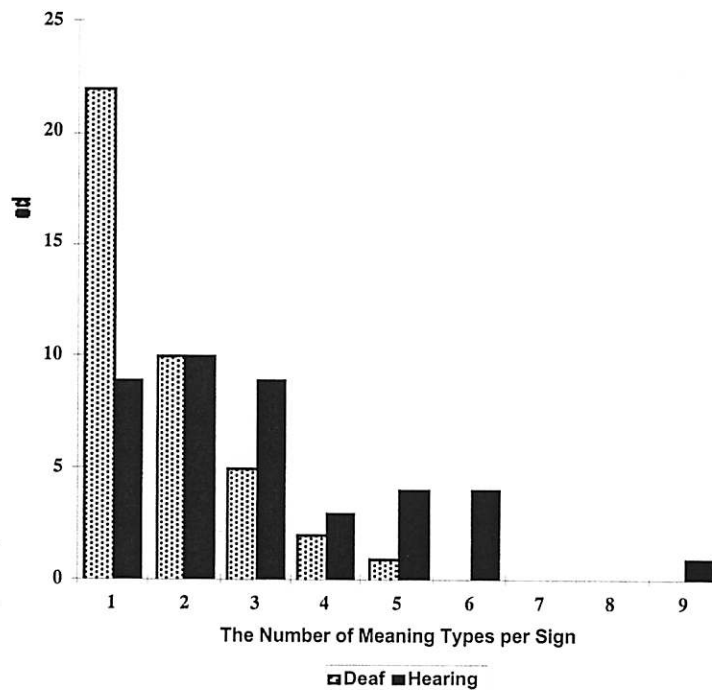


Figure 4: Number of Meaning Types Used per Sign by Deaf and Hearing Participants

This difference in range of meaning types per sign seems to indicate that the signs are more polysemous for the hearing participants than for the Deaf. As will be discussed later, this might reflect a certain looseness in the hearing participants' association of meanings

to components of the sign's form. This difference might also be the result of different strategies in the process of interpreting unknown signs or gestures in isolation.

Comparisons Between Deaf and Hearing Participants in the Types of Meaning Assigned. The two groups of participants seem to differ not only on the number of associations that are associated with a gesture, but also on the kinds of meanings which are assigned. This difference is evident in Figure 5, which shows the categories into which more than 5% of the Deaf and hearing participants' responses fall. Both groups have similar tendency for interpreting just two kinds of meanings: biological functions (such as eating, drinking, hearing) and emotional or physical states (such as sad, warm). For all the other types of meanings, the responses of the Deaf and hearing participants differ.

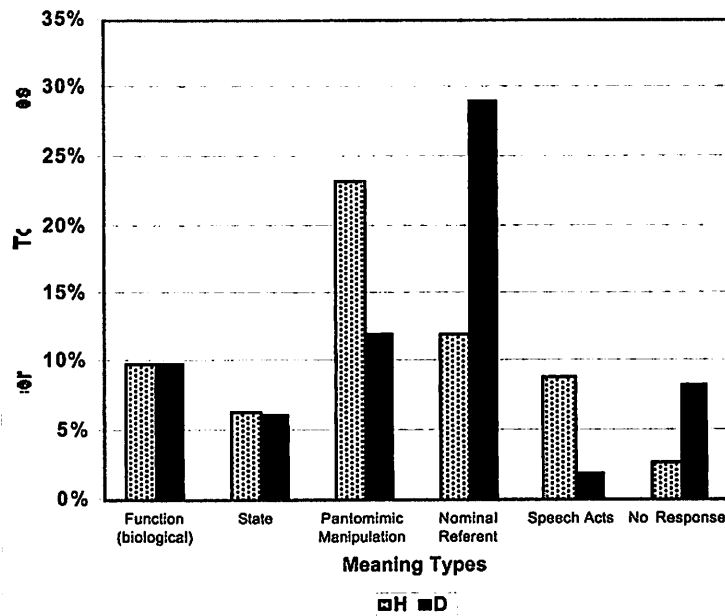


Figure 5: Meaning Types Used by More than 5% of Responses

Differences in Assigning Nominal and Verbal Meanings. One major difference between the Deaf and hearing is that the hearing have a greater tendency to ascribe verbal-like meanings to the stimulus signs. This can be seen in Figure 5 in the hearing participants' greater number of responses with pantomimic manipulative actions (such as 'to-put-in'). The Deaf participants, unlike the hearing, tend more often to interpret a stimulus sign as a nominal referent. When the hearing do associate a nominal referent with the sign, the nouns are usually concrete ('ring') whereas the Deaf also assign abstract nominal meanings ('marriage').

The hearing also more often associate a sign with a whole action schema which includes agents, objects and actions. For example, for the stimulus sign RENTAL, illustrated in Figure 6, one hearing response is 'post a letter' which specifies a particular action

(dropping an object) together with a semantic patient (letter). This contrasts with a Deaf response which picks out a nominal element of an underlying metonymic schema, for example from the schema 'dip a teabag', the nominal 'tea'. By referring to only one element of the underlying action schema, the reference becomes less pantomimic, and thus in a sense more linguistically coded.

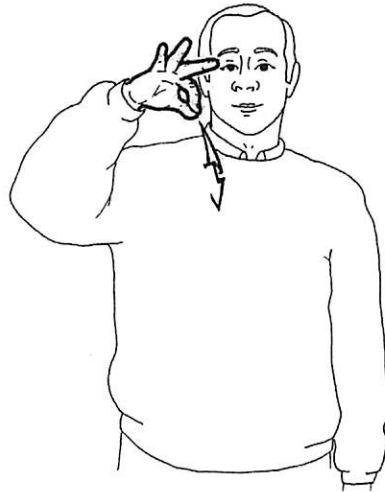


Figure 6: LIS stimulus sign RENTAL

The fact that the hearing participants give more 'verbal' than 'nominal reference' interpretations could reflect the different language situations of the two language groups. In the list of conventionalized meanings for French speakers' gestures in Calbris (1990), very few components or component combinations of gestures stand for a nominal referent alone. Hearing persons are most used to interpreting gestures accompanying speech as a deictic indication of a reference present in the environment ('here', 'that direction', 'up', 'you', 'me'). Gestures accompanying speech also often show particularly manipulative actions such as 'breaking', 'dipping'. Also conventionalized in many hearing cultures are gestures which indicate attributes or attitudes (big, small, crazy). Deaf signers, from experience with their sign languages, are used to symbolic gestures that not only have these meanings, but in addition have codified signs for a wide range of nominal referential meanings.

This tendency of Deaf signers to give more nominal referent responses than do speakers might be an alternative explanation as to why the hearing speakers in the study of iconicity in ASL (Bellugi et. al.) discussed earlier gave fewer 'correct' answers (10%) than did the Italian hearing persons in Grosso's study for LIS signs (24%). One important difference between the two studies was that the stimulus signs in the ASL study were all nouns, whereas in the Italian study, the signs were nouns, verbs and attributes. If hearing persons are more likely to give 'verbal' meaning interpretations to gestures, they would probably give more incorrect answers in an experiment where the signs all had only nominal referent meanings.

Deaf and Hearing Differences in Focus on Form Components. When the hearing participants do interpret a sign as a nominal referent, they appear to ignore components of the form which don't quite correspond to the presupposed underlying image for the metonymic association. For example, in the LIS sign BAD (Figure 7a) the location of the sign is in reality too low for a 'toothbrush', which was one hearing participant's response to this sign. The attribution of the meaning 'fight' to the sign STUDY (Figure 7b) seems to be based on a gesture meaning 'smash', which is widely conventionalized in hearing cultures (cf. Calbris 1990, p. 221). However, the arrangements of the hands in the hearing gesture is back to palm, whereas in the LIS sign the hands make contact at the little finger edges. The Deaf participants, on the other hand, make few or no associations that involve ignoring formal components of the sign.

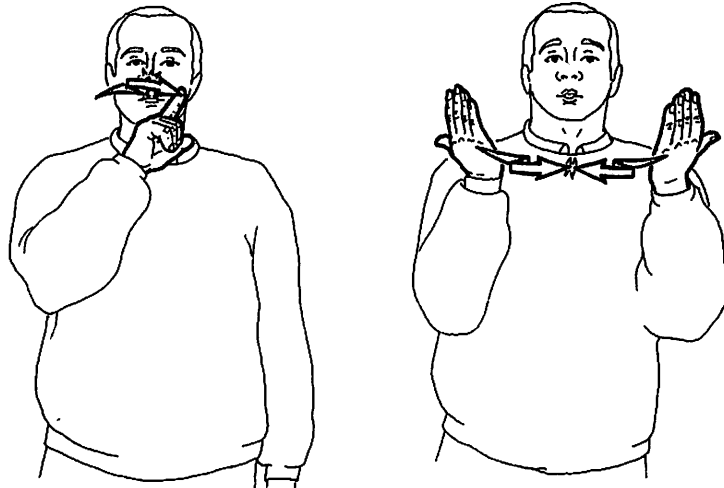


Figure 7: LIS stimulus signs (a) BAD, (b) STUDY

The Deaf also pay much more attention to the exact handshape, especially if it is a marked one – that is, not a handshape which human beings use in their normal everyday manipulative or gestural activities. Many of these marked handshapes are conventionally associated with a particular kind of meaning in Deaf sign languages and this is reflected in several of the Deaf participants' responses. For example the marked handshape that involves extended but not spread index and mid fingers is associated in many sign languages with 'reading'. It is therefore perhaps not surprising that 40% of the Deaf responses to the LIS sign NAME, which is made with this handshape, are interpretations such as 'word', 'captions', 'equation', 'to read', etc. as well as the correct response 'name'. The responses of the hearing participants to this sign, in contrast, vary over a wide range of meanings, none of which is associated with the written word ('backwards', 'come-here', 'half', 'together', 'finish', 'be-quiet', etc.) The attention of the Deaf participants to the exact handshape, location, orientation, etc. of the stimulus sign is quite probably due to their use of these components in the phonological structure of their sign language.

Deaf and Hearing Differences in Attributing a 'Speech Act' Meaning. When hearing persons do use gestures alone as speech substitutes, the gestures often function as

complete speech acts, often commands, such as 'no', 'don't do that', 'stop', 'come here', etc. In the data from this study, the hearing participants attribute many more 'speech act' meanings (average 9%) than do the Deaf participants (average 2%) as shown in Figure 5

Deaf and Hearing Differences in the 'No Response' Category. In general, more Deaf (8%) than hearing (3%) participants chose not to make a guess about the meaning of a stimulus sign. (See Figure 5). All of the '?' written as responses by the Deaf participants were for nontransparent signs and for 4 of the 5 signs which had been hypothesized to be transparent only in the Italian culture. This suggests that for sign stimuli which are clearly not conventionalized widely across cultures and which also do not exist in any sign language they know, the Deaf participants seem to prefer responding with a '?' rather than offering a meaning which might 'misinterpret' the potential meaningful components of a sign from another sign language. Put another way, this might be the expression of a general language attitude of signers in which the 'arbitrariness' or 'non-iconicity' of signs in another Deaf sign language, which one doesn't happen to know oneself, is nevertheless respected.

The hearing participants, on the other hand, are more likely to hazard a guess at the meaning of these same signs. Presumably, they have not had as much opportunity to experience highly conventionalized (and hence often more 'arbitrary') gestures in their normal conversations with other hearing persons.

General Differences in Use of 'Visible Deictic/Pantomimic' and 'Metonymic' Interpretations. The types of meaning represented in the data can also be grouped according to whether (a) the meaning could be attributed by means of a readily visible referent of a deixis or a pantomimic action, or (b) if additional metonymic associations are implicated. 'Deictic/pantomimic' interpretations include all meanings involving any kind deictic reference (to person, body part, directions, locations, and enumeration) and all pantomimic 'showing' of actions (manual manipulation of objects, large arm movements). All the other meaning types such as functions of body parts, states, attitudes and attributes, non-deictic nominal referents, speech acts and non-pantomimic verbs are considered to have involved additional metonymic or metaphoric associations.

When the data are viewed in terms of these techniques, there are, once again, differences between the Deaf and hearing participants. As shown in Figure 8, a larger percentage of the Deaf participants' responses appear to involve some kind of metonymic association whereas the hearing participants seemed to rely on the more directly perceivable deictic/pantomimic techniques of interpretation.

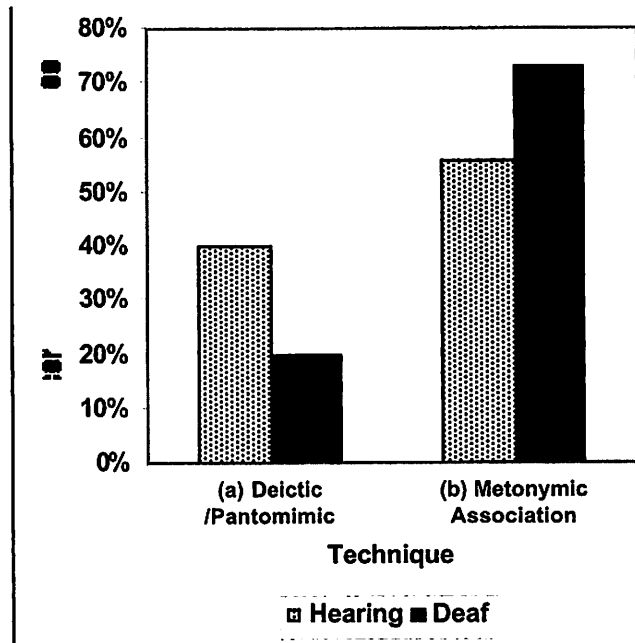


Figure 8: Use of Techniques (a) Deictic/Pantomimic (b) Metonymic Association

This difference in kinds of techniques suggests that the Deaf and the hearing participants are making their decisions about meaning assignment at different levels of the implicational hierarchy of meaning proposed earlier. The further embedded the meaning is in the hierarchy, the further away it is from the immediately visible features and movements of the human body. This suggests that the more embedded the interpreted meaning (i.e. the more layers of metonymic association needed for the final assignment of meaning), the less 'obvious' and thus either more conventionalized or more creative it must be. The Deaf participants, perhaps drawing on their experience of embedded metonymic associations in the lexicon of their sign language, of coining new signs, and of playing with the elements of their sign languages for purposes of wit and poetry, seem to operate more readily at this 'deeper' – more linguistic? – level of the hierarchy.

Proposed Strategies for Assigning Meaning to Isolated Symbolic Gestures

In this section, strategies for assigning meaning to gestures are proposed, which seem to account for most of the hearing and Deaf participants' responses in these data. These strategies are formulated sufficiently broadly so that they could account for other experimental or natural situations in which persons are faced with the task of interpreting gestures, especially in situations where spoken co-text is missing.

The proposed strategies involve different techniques, some of which are more likely to be tried first. For the data in this study, the Deaf and hearing participants seem go down similar strategic paths in the process of interpreting gestures, with two differences:

- The two groups frequently choose different components of the gesture's form upon which to focus;
- The two groups' interpretations of the meaning often come from a different level in the implicational hierarchy.

The proposed steps for forming interpretations of gestures can be summarized as follows:

1. See if the gesture resembles a gesture which has a strongly conventionalized meaning in a hearing culture or in a sign language you know.
2. Look for clues at the facial expression and body posture.
3. If hands are in contact with or near the body, try to make an association with a nearby body part.
4. If an association with a body part is not possible, note if the gesture involves one or both hands.

Step 1. See if the gesture resembles a gesture which has a strongly conventionalized meaning in a hearing culture or in a sign language you know. The proposed first check a person confronted with a new gesture would make, would be to see if the gesture in any way resembles a gesture for which one already knows a conventionalized meaning. According to Calbris 1990, examples of gestural meanings which are probably widely conventionalized in all European cultures would be the metonymic associations of 'listen' to the gesture of holding a cupped hand to the ear, the meaning of 'good' for the thumb-up gesture, and the metaphoric association of 'seeing' with 'understanding'. Any repeated downward bending of the flat hand at the wrist is highly likely to be associated with the conventional greeting behavior, which most people learn as small children ('bye bye').

Not so widely spread are the culturally-specific gestures such as the following: the Italian thumb to index fingertip gesture meaning 'well or good'; the thumb to the mouth gesture meaning 'drink' which seems to be known in the Italian, Spanish, Portuguese and Swiss cultures but not in the more northern European countries; the thumb to bent index finger grasping gesture which means 'to pay' in the same four countries but which the other countries interpret as a pantomime of 'knock'.

Of course, the more widely traveled the person is (or the more cultures which are represented in ones own country, such as is the case of Switzerland), the better luck one would have at coming up with an appropriate interpretation of a new gesture by using this first strategy.

Step 2. Look for clues from the facial expression and body posture. If the gesture being observed doesn't resemble any gesture already known, the next strategy is to try to get clues from the facial expression and body posture. However, for the sign stimuli in this study, both facial expression and body posture were consistently fairly neutral and hence didn't seem to have much influence on the responses. The one exception is the signing of SAD, where the signer closes his eyes and lowers his brows. This sign is generally interpreted by Deaf and hearing alike as 'sad'. Interestingly, the meaning 'sad' is also attributed to other signs, usually those that involve downward movement of the hand together with a placement association with a body part such as the eye or chest.

Step 3. If hands are in contact with or near the body, try to make an association with a nearby body part. If the facial expression and body position haven't helped, the data

in this study indicate that the next most popular strategy to try is to make an association with a body part near the location of the gesture. It is at this step in the process that a wide variety of meanings are begun to be assigned to what have been labeled the 'non-transparent' signs in this study.

As discussed earlier, hearing participants are looser in their criteria for associating meanings with body parts. A beak-like handshape on the cheek, rather than the mouth, is enough to make an association to a bird. The hearing participants consequently have more interpretations based on body part associations than do the Deaf, who have more precise criteria for assigning meanings to locations. (This is especially true of signs that fall into what Siple 1978, has called the focus of the receiver's gaze in sign language communication.)

Further steps towards assigning meaning depend on which body part is focussed upon.

Forehead, Eyes, Nose, Ear, Mouth, or Chest. If these areas of the body are involved, the gesture will usually be interpreted by all participants as a biological or secondary function, attribute or state.

Deaf participants tend to carry the metonymic association process further and associate a nominal referent (object or person) with the body part function. Thus a sign made near the nose is interpreted by the hearing participant as 'seeing' (a biological function) or 'odious' or 'dirty' (a metonymic 'part for part'). The Deaf participant interprets the same gesture as 'clown' (a metonymic 'part for whole').

A sign made near the eyes is interpreted by the hearing as 'seeing' or as the widely conventionalized metaphor 'understanding', whereas the Deaf participant's response is a noun, 'glasses', based on metonymic association.

Cheek, Chin, Neck, Upper Arm or Waist. If these metonymically somewhat less evocative body parts are involved, then other components of the sign's form are drawn into play in order to make a meaning association

The movement, for example, can gain a special saliency in these locations:

- If the movement of the sign is towards or away from the signer, then the gesture will often be interpreted as a deictic first or second person, such as interpreting the LIS sign FIANCE (Figure 1h) to mean 'me-you', 'myself'. Hearing persons often leave it at that, or build the person reference into a speech act, 'in-my-opinion', 'speak-to-me'. Again, the Deaf participant tends to go further down into the metonymic layers and, for the same sign, move beyond the deictic 'me-you' to the noun, 'friend'.
- If the movement is straight or bending, such as in the LIS sign WOMAN (Fig. 1g), it can be associated with the bending of the hand in conventionalized waving and greeting gestures. For the same sign, the Deaf assign the meaning of an animal with droopy ears (donkey, rabbit), perhaps utilizing the phonological tendency in sign languages to move locations which were originally high on the body, as on the top of the head, to more low and central locations so that the sign will be more in the focus of the addressee's gaze.

Hand Moving Over Two Body Parts. The sign FIANCE (Fig. 1h) is an example of the hand moving over two body parts, from the chin and to the mid-chest. This potential asso-

ciation with two separate body parts seems to be more confusing to hearing participants, who usually pick one or the other of the locations upon which to build a metonymic association. The Deaf participants cope with the move through the two body part locations by associating the sign with a meaning having a location between the two body parts, such as 'ingesting', or 'beard'.

Step 4. If an association with a body part is not possible, note if the gesture involves one or both hands

One Hand. If the gesture is made only with one hand, it tends to be interpreted by the hearing participants as a deictic personal reference, a directional verb, a speech act or a manipulative action. The sign TO-GO-OUT, for example, is made clearly in neutral space. The hearing participants ignore the marked handshape (thumb and little finger extended from fist) and pay attention to the direction of the linear movement which curves out in front of the signer. The results are many responses referring to the non-first persons (you, everybody, yours). Deaf participants pay more attention to the sign's marked handshape which often has a conventionalized meaning in their sign language. For British Deaf, many of the responses to this sign have negative connotations, 'regret', 'terrible', 'dead', 'awful', 'bad'; for the Swiss German Deaf, the handshape has more positive associations, 'good', 'yes'.

The sign SHORT is also made with one flat hand making a vertical downward movement without repetition. Hearing participants pay attention to the direction of the movement and interpreted this either as a speech act ('sit-down!') or as a manipulative action ('press-down'). Deaf participants might note that no repetition of movement is involved which would not be typical of a pantomimic action such as object manipulation, and so rather assigned a meaning of dimension ('short'), or, further embedded in the hierarchy, associated a noun ('child') with the shortness.

The sign TOURISM (Fig. 1i) is made with a cupped hand, held vertically with the palm facing to the side at face level and with one sideways circular movement. Many hearing participants see a similarity between this sign and a widely conventionalized gesture meaning 'crazy', so had no need to try any other strategies. Some Deaf participants extend this conventionalized meaning type by adding more metonymic associations and end up with nominal meanings 'dream' and 'idiot'. Other hearing participants seem to focus more on the handshape than the location. The cupped handshape can be used for grasping a largish object and, when combined with the circular movement become associated with pantomimic actions resulting in responses such as 'washing', 'to-wipe', 'to-clean', 'to-rub'. The Deaf participants make no such associations to manipulative action, having perhaps noted, once again, that there was no repetition involved in the movement.

Two Hands. If the sign involves both hands, there seemed to be a difference in interpretation depending on whether the hands are close to each other or not. If the hands are close or touching, the type of movement became important. A circular or twisting movement (such as in the sign SPORT) is interpreted as a manipulation action such as 'to-turn', 'to-fit-in', 'twist', and 'unscrew'. If the movement is vertical and straight, as in COMPETITION, hearing participants assign meanings which involve an indication of a direction or path ('upwards', 'higher'). If the arrangement of the hands is noted at this point, locative meanings such as 'together', 'exchange', 'upside-down' are assigned.

If the two hands have no contact with each other, meanings connected with manipulation are rarely assigned, but rather associations with body movements that could be pantomimed with the upper body ('run', 'ski').

Concluding Remarks

The interpretation of any kind of communicative signal depends on more than the knowledge of the formal rules of the linguistic or communicative system, and an awareness of the context of the communication. What is needed in addition is what Grosjean (1998) among others has described as the participants' 'encyclopedic knowledge'. Several hypotheses have been presented here about a hierarchical structuring of meaning types that involve embedded metonymic associations to more visible deictic or pantomimic meanings. We suggest that the ability to make these kinds of hierarchically structured associations, as well as strategies proposed for guessing the meanings of isolated gestures, are important aspects of the encyclopedic knowledge of all persons, hearing or Deaf, of any culture when they are confronted with symbolic gestures of any kind, whether they be accompanying or replacing speech, part of a sign language, or occur in special situations, such as the gestures of traffic cops, deep-sea divers, of orchestral conductors, or of linguistic experimental situations.

Going back to the questions posed at the beginning of this chapter, the data we have described and discussed indicate that some gestures are more 'universally understood' and others are understood only within specific cultures. Within the categories of meanings attributed to isolated gestures, the data suggest the following:

- 'Visible' interpretations come first in the hierarchy as they involve deictic reference to something in the environment or pantomimic depictions of actions or shapes which can be made with the hands or the body. These visible 'showing' and pantomimic gestures utilize communicative tools available to all humans (two arms/hands plus facial and body expressions), are used from early infancy as previously mentioned, and are quite probably found in all cultures.
- The metonymic and metaphorical extensions of these visible meanings are more deeply embedded in the hierarchy and are probably more culture-specific.

The findings reported here also suggest that there are general strategies for attributing meaning to isolated gestures. Different paths can be taken, however, through the available strategies, according to the different mental spaces available to the observer, as shaped by culture, linguistic experiences as speaker or signer, or experience with other gestural systems.

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