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## MULTIMODALITY IN OWN COMMUNICATION MANAGEMENT

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### **Abstract**

*This study studies how gestures (here defined in a wide sense, including all body movements which have a communicative function) are used for Own Communication Management (OCM), an interesting and not completely well described part of the language system. OCM concerns how a speaker continuously manages the planning and execution of his/her own communication and is a basic function in face-to-face interaction. It has two main functions, i.e. “choice” and “change”. The study investigates how much of OCM involves gestures and whether there is a difference between choice and change OCM in this respect. It also concerns what kinds of gestures are used in OCM and what the relation is between vocal and gestural OCM. Some of the main findings are that roughly 50% of all speech based OCM cooccurs with gestures and that most of the OCM involving gestures (about 90%) is choice directed. Gestures occurring with OCM can illustrate the content of a sought after word, but also more generally induce word activation. They can also signal to an interlocutor that the speaker needs time. Gestures are often multifunctional and, thus, both choice and change are often integrated with more interactive functions. A final observation is that gestural OCM either precedes or occurs simultaneously with verbal OCM.*

**Keywords:** Gestures, Own Communication Management, choice, change, illustration, activation

# 1. Why study multimodality in Own Communication Management?

In order to function optimally, humans have evolved mechanisms for managing their communication. We can distinguish two main kinds of Communication Management (CM) – Interactive Communication Management (ICM) and Own Communication Management (OCM). Both of these types of management are continuously interwoven with each other and with the main message (MM) that is being communicated. (See below, figure 1.)

Own Communication Management concerns how a speaker continuously manages the planning and execution of the speaker’s own communication and is a basic function in face-to-face interaction, while Interactive Communication Management concerns managing the interaction with other communicators through systems for turntaking, feedback and sequencing. Both types of management serve to share the main messages with other communicators and make communication more flexible and fluent by adapting it to face-to-face interaction demands on production and comprehension. Both are also fairly systematic (cf. Allwood, Nivre & Ahlsén 1990, 1992), and exhibit systematic variation between different activities, individuals, languages, cultures and other conditions.

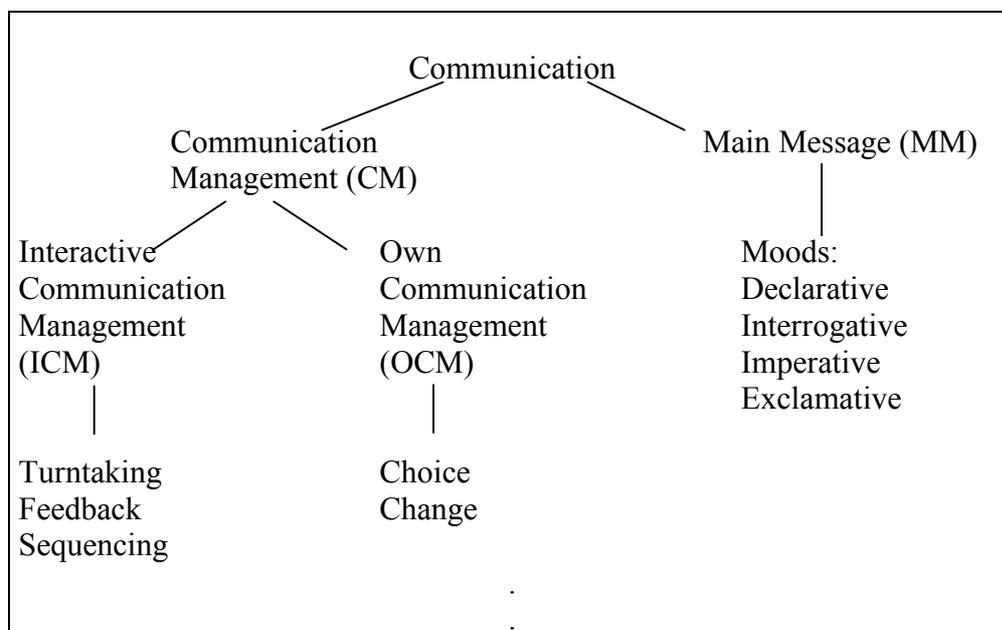


Figure 1. Main functions of Communication

The purpose of the present study is to study how gestures (here defined in a wide sense, including all body movements which have a communicative

function) are used for Own Communication Management, an interesting and not completely well described part of the language system.

As we have already mentioned, OCM concerns processes whereby a speaker manages his or her linguistic contributions to communicative interaction. Other terms that have been used for OCM are hesitation, planning, disfluency, (self) correction, editing and (self) repair (cf. Allwood, Nivre and Ahlsén 1990). OCM has also been described as “performance errors” (Chomsky) and “parole” (de Saussure). The term “disfluency” is here particularly noteworthy, since OCM, contrary to what this term suggests, often contributes to the fluency and flexibility of speech.

OCM has two main functions, i.e. “choice” and “change”. Choice mechanisms enable the speaker to gain time for processes having to do with the continuing choice (planning) of content and expression. Among other things, this involves prompting of memory, search of memory, hesitation, planning and keeping the floor. Change mechanisms enable the speaker, on the basis of various (internal and external) feedback processes, to change already-produced content and expressions. However, as we shall see, many cases of OCM are combinations of choice and change or of OCM with interactive communication management (ICM) and main message (MM) production. OCM is thus a central component in human spoken language interaction and a better understanding of how speech and body movements interact in OCM is a precondition for a theoretical account of spoken language. In addition, a better understanding of OCM will also have many practical applications, such as language teaching, speech therapy or computer based systems for speech and gesture recognition or speech and gesture synthesis.

## **2. Purpose, research questions and background**

Some of the questions we are trying to answer are the following:

- Question 1  
To what extent does OCM involve gestures?
- Question 2  
Is the distribution of OCM involving gestures (gestural OCM) different for OCM with choice as the main function and OCM with change as the main function

- Question 3  
Which kinds of gestures are used in OCM?
- what body parts?
- what types of movements?
- Question 4

What is the relation between vocal and gestural OCM?

The study will also address some of the current claims and hypotheses about gestures and semantic processes, especially in relation to word finding difficulties, e.g. the following:

1. Nouns and verbs (at least certain types of nouns and verbs) partly differ in activation areas in the brain and this is most likely related to different types of encoding, with association more related to areas for vision for nouns and motor areas (related to movement) for verbs (e.g. Pulvermüller 1999, Pecher et al. 2004). Can this, in turn, be related to differences in the types of gestures that are used together with nouns and verbs?
2. According to McNeill (2000), gestures and words are generated from a common growth point. An example of this can be seen in iconic illustrations, where words and gestures describing the same phenomenon are produced together. Does the role of iconic illustrations in OCM throw any light on this hypothesis? Related to this is the question of whether the analysis of different types of OCM gestures can give us better information about the semantic processing involved in speech planning. See, for example, the suggestions made by Kendon (1972), De Ruiter (2000) and Raucher, Kraus and Chen (2000).
3. Gestures help to activate and package information in a way that makes it easier to verbalize (Kita 2000). This has been seen in children doing cognitively complex tasks and in children with word finding problems. In the present study we investigate whether a similar tendency can be found in adults in spoken interaction.

Thus, the purpose of the study is to analyze what gestures occur in OCM. In order to study this, we first used a database consisting of a sample of 100 instances of speech based OCM from two video recordings of informal discussions. This sample is used as a basis for finding out how often speech OCM involves gestural OCM. It is also used to find out what proportion of speech OCM is used for choice and change (speech OCM).

In a second step, we have used a sample of 100 examples of OCM involving gestures (gestural OCM). The examples have been extracted from video recorded interviews and discussions in the GSLC (Göteborg Spoken Language Corpus) (Allwood et al. 2000). The two samples were then used for a further analysis of OCM to be reported below. On the basis of this analysis, we attempt to answer the questions stated above and discuss the three claims and hypotheses concerning differences in gesturing between noun and verb activation, gestures as clues to semantic planning and gestures as facilitating packaging of information.

### 3. Two examples of OCM with gestures

In order to give a better understanding of the nature of OCM, we start by considering two examples.

#### *Example 1. Choice OCM*

Speaker: *å där så de e som en e // sportspår där som vi springer*

(and there so it is like a eh // sportstrack where we run)

A closer look at what gestures co-occur with the phrase *en e // sportspår* (a eh // sports track) is presented below, in Table 1.

Table 1. Choice OCM

Speech	en	e	//	sportspår
Type	Article	OCM word	pause	Noun
Gesture	hand circling, illustrating track	turns away head and gaze		head and gaze back

If we start by examining the temporal relation between the vocal-verbal and gestural production, we see that an illustrating gesture occurs before the OCM word *e* and pause which, in turn, precede the possible target word (*sportspår*). Since an indefinite article, *en*, is produced, that, however, is of the wrong gender for the noun actually produced later, we interpret this as indicating that the speaker has a problem in choosing and producing the right noun and that this is reflected in the production of the OCM word *e* and a pause. Additional evidence that there is a word finding problem is provided by the fact that the illustrating

gesture occurs when the article preceding the OCM is produced. This means that the gesture is probably not an illustrating iconic gesture, which could have occurred even if the speaker had no need for support in finding the word. Rather, it probably has a self-activating word finding function for the speaker, while at the same time keeping the floor and giving a clue about the meaning of the coming noun to the listeners.

In accordance with the “common growth point” hypothesis, McNeill (2000) claims that the peak of an iconic (i.e. based on similarity) gesture co-occurs with the stress of the iconically illustrated word, thus indicating a close semantic and articulatory relationship between speech and gesture production. Since the gesture here, however, precedes the corresponding noun, it probably therefore rather has a facilitating function (cf. Kita 2000).

Simultaneously with the OCM word *e* and pause, the speaker turns his head and gaze away from the interlocutors, perhaps indicating memory search and turnkeeping. When he produces the noun he moves his head back facing the interlocutors.

Thus, the example indicates that OCM contains a number of elements, vocal-verbal (OCM word *e* + pause) as well as gestural, and that the temporal relation between the modalities is not simple. The example is in this way fairly typical of the complex relation between OCM, speech and gesture.

Let us now consider a second example that illustrates how choice related OCM is related to change related OCM and how OCM is related to ICM and MM.

### *Example 2. Multifunctional OCM*

Speaker: *jo fö+ för att inte: eh //eh för att hålla en del grödor vid liv*

(yes fö+ for (in order)no:t eh // eh for (in order) to keep some crops alive)

This instance of OCM involves a complex combination of choice and change related OCM. Below, we first summarize the choice related parts in Table 2.

Table 2. Choice OCM

Speech	fö+ för att	inte:	eh	//	eh
Type	self repetition	vowel lengthening	OCM word	pause	OCM word
Gesture and function	turntake	two hands, turntake ICM, emphasis MM, activation OCM	head turn away-down, gaze away-down		

It also involves an instance of change related OCM (see Table 3). The speaker changes her mind from saying *in order not to (for not to)* to saying *in order to keep (for to keep)*.

Table 3. Change OCM

Speech	för att inte: eh // eh för att hålla	en del grödor vid liv
Type	substitution	
Gesture	head turn back, gaze back (eye contact), hand ICM	head nod affirmation elicit understanding

As she makes the substitution *för att hålla*, she turns her head and gaze back towards the listener, establishes brief eye contact and makes an offering gesture with her hand. The fact that the occurrence of this gesture is more or less simultaneous with the verbal utterance *hålla* indicates that no time is needed for activation or memory search, rather the hand gesture pinpoints the delivery of the substitution.

The example also shows how OCM functions often are integrated with ICM and MM functions. The use of the word *jo*, combined with self repetition and vowel lengthening of *inte:*, helps the speaker to take the turn and maintain it. Her main message (MM), at this point *inte:*, is strengthened by the lengthening, which gives emphasis. In a similar way, her hand gesture, in carrying out the substitution, functions as a contact maintaining aid to the listener (ICM) and her closing head nod functions to affirm her statement as well as to elicit understanding and possible agreement from the listener (ICM).

After having considered two examples of OCM, we will now turn to a finer classification of OCM and a consideration of what the data in our two samples reveal about OCM and gestures, especially in relation to the research questions listed above.

#### 4. Expressive features of OCM

If we look at OCM units produced in spoken interaction, we can classify them into different types, depending on their expressive features (cf. Allwood, Nivre and Ahlsén 1990). Our first classification separates units with single OCM features from units with several combined OCM features. There are two main types of unit with single OCM features, i.e. Basic OCM expressions and other units influenced by Basic OCM operations:

Basic OCM expressions:

- A. Pauses
- B. Simple OCM expressions, for example hesitation words, like *eh*, *uh* or *m*
- C. Explicit OCM phrases, like *what's it called*
- D. Other OCM sounds, like sighing, smacking or hissing

Basic OCM operations:

- A. Lengthening of continuants
- B. Self interruptions
- C. Self repetitions

The difference between the two kinds of units is that the first kind “basic OCM expressions” have as their type meaning an OCM function, while the second kind can have any type meaning, but are given an OCM function through the OCM operation, e.g. lengthening *inte*: (no:t) or self interruption + repetition *fö+ för* (fo+ for) in example 2 above.

The second main class consists of OCM units which involve combinations of basic OCM expressions and operations. An overview is given in Figure 2 below. For a more detailed explanation, see Allwood, Nivre and Ahlsén (1990).

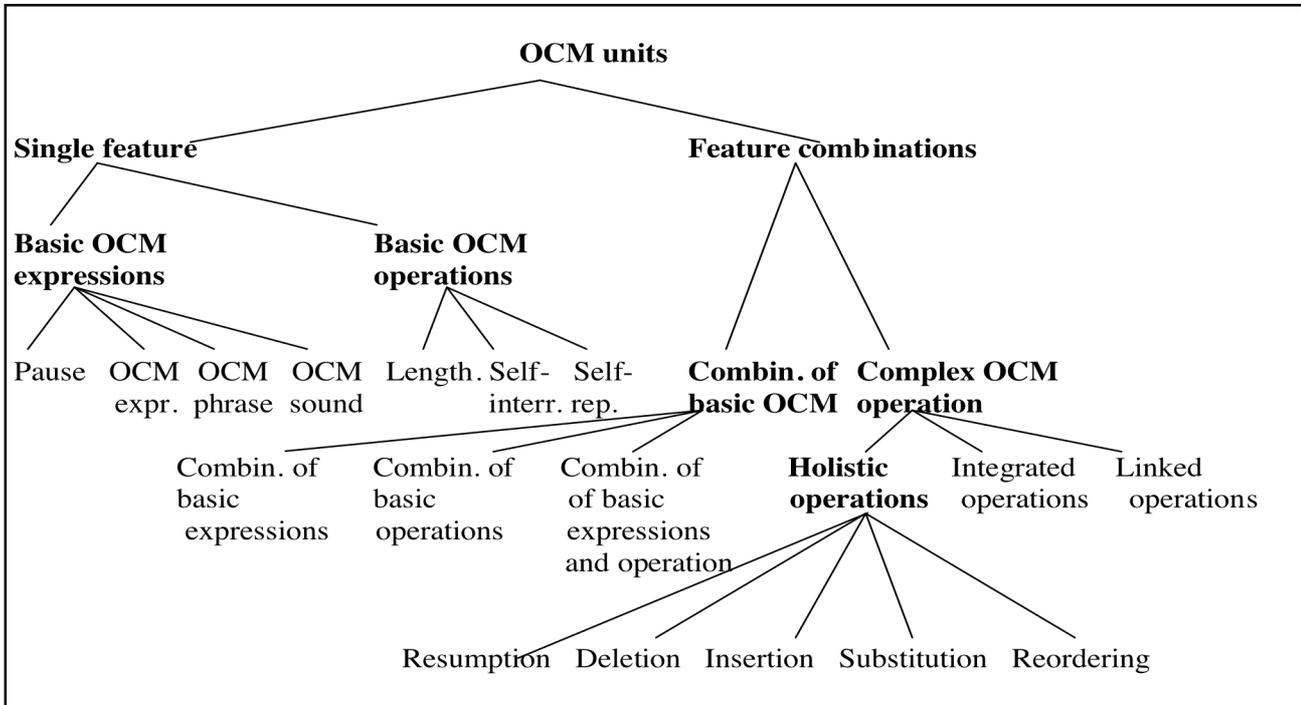


Figure 2. Taxonomy of OCM features

## 5. Functions of gestures in OCM

### 5.1. Choice, change and gesture

If we start by examining functions for speech based OCM in general, we find that 90% of the examples in the first sample have choice as their main function, whereas only 10% have change as their main function. As expected, the two functions very often cooccur. The distribution of functions is the same if we look at the second sample of OCM, involving gestures (89% vs. 11%). Choice is thus, by far, the most common OCM function. For a summary, see Table 4 below.

Table 4. Distribution of choice and change functions in two samples of OCM

Function	Speech based OCM		OCM involving gestures
	Sample 1	Sample 2	
Choice	90%	89%	
Change	10%	11%	

If we continue by examining to what extent gestures occur in connection with speech based OCM in Sample 1 and what features, in accordance with the taxonomy in Figure 1 above, occur in the sample, we get the following results, summarized in tables 5a and 5b, below .

Table 5a. Gesture involvement in speech based OCM

Gesture involvement	
Gesture involvement	55%
Only OCM related gestures	45%

Table 5b. Types of OCM involving gestures.

Types of OCM	
Basic OCM expression	39%
Combination of basic OCM features	47%

Table 5a shows that in Sample 1 (100 speech based OCM units), 55% of all instances of OCM involve gestures. If gestures that are not clearly related to OCM functions are removed, we find that 45% of the speech based OCM instances involve an OCM related gesture, while 10% involve gestures not clearly related. A gesture is not clearly related to OCM if it has some other identifiable main function, such as waving to a friend or drinking coffee etc. There are also gestures, like scratching the head or touching the face that can be related to both OCM and ICM, but these have not been counted as clearly

related. We can, thus, conclude that about half of the instances of speech-based OCM include gestures. In Table 5b, we see that in the 100 cases of speech based OCM, the most popular OCM speech features to combine with gestures are Single basic OCM expression (39%) and Combination of basic OCM (47%).

So in answer to the first question posed in section 2 above, i.e. to what extent OCM includes gestures, we found that in the sample of speech OCM approximately 50% of OCM instances include gestures, where hand and head gestures are the most popular. Considering the main functions of choice and change, about 90% of OCM is choice related, while only about 10% is change related. This holds in both the sample of speech based OCM and the sample of gestural OCM.

In Table 6, we present how gesture involvement is distributed between OCM with change and choice function.

Table 6. Gesture involvement in speech based OCM

	<i>Speech based OCM</i> - choice function	<i>Speech based OCM</i> - change function
Gesture occurrence	55	45
OCM related gesture	40	15

Out of the instances of speech based OCM with a choice function, 55% involve a gesture (of these, 15% are unrelated). For speech based OCM with a change function, 45% involve gesture (of these 30% are unrelated): For speech based OCM, it thus holds for both change and choice functions, that they are more common without related gestures. (60% of choice related OCM and 85% of change related OCM do not involve directly related gestures.)

### ***5.2 Types of gestures involved in choice and change***

If we look at the types of gestures occurring in OCM with choice function, the most frequent ones (more than 5%) are, in order of frequency:

Table 7. Proportions of different gesture types in OCM with mainly choice function.

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Hand gesture	55%
Gaze down	21%
Head shake	12.5%
Gaze up	7%
Gaze to side	6%
Head nod	5%

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*(The table sums to more than 100%, since some gestures occur simultaneously as a complex unit, but all the features have been counted separately here. Only numbers over 5% are included.)*

The most frequent choice related gestures are hand gestures, followed by gaze changes and head movements.

The most frequent (more than 5%) gestures occurring in OCM with change function are, in order of frequency:

Table 8. Proportions of different gesture types in OCM with mainly change function

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Hand gesture	65%
Gaze down	5%
Gaze to side	5%
Gestures types that occur less than 5%	25%

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Again, we can see that hand gestures of different types are the most frequent, followed by gaze down and gaze to the side. Combining both table 7 (choice) and table 8 (change), the most popular OCM gestures involve hand movement (56%), followed by gaze (31%) and head movement (15%).

**5.3 Gaze Aversion**

As tables 7 and 8 show, gaze aversion is more related to choice than to change. This could point to a difference in the need for memory activation, where gazing away from the interlocutor indicates a greater degree of memory activation.

#### 5.4 Functions co-occurring with choice and change

In table 9, below, we give an overview of some of the other functions we have found correlated with choice and change functions in OCM.

Table 9. Functions that correlate with choice and change functions in OCM

<b>Gesture functions accompanying Choice OCM</b>		<b>Gesture function accompanying Change OCM</b>	
Illustrating the content of a sought after concept by iconic gesture	25%	Illustrating the content of what is changed	21%
Activation inducing gesture, moving hands to mobilize energy	61%	Activation - often with both hands	71%
Less clearly OCM related function, like scratching or supporting head	14%	Less clearly OCM-related function	8%

The table shows that the related function types are fairly similar for choice and change. If we combine the results for choice and change, we find that 24.6% of all OCM related gestures also have an illustrative function which, however, often also has an activating role in word finding, 62% have an activation function that is not illustrative and 13.4% have a function that is less clearly relatable to OCM.

## 6. More about functions of gestural OCM

### 6.1 Iconic illustration and general activation

The kinds of gestures we find with OCM include gaze, head and hand gestures. For types of gaze we find (in order of frequency of occurrence) gaze down, up or to the side. We find head nods, head shakes and head movements to the side. Often choice or change function are combined with other functions. For hands, we find both illustrative OCM related hand gestures and non-illustrative but OCM related gestures, as well as gestures that are less clearly related to OCM, with the hand close to the face. The distribution of hand gestures concerning these functions is shown in Table 10.

Table 10. Distribution of illustrative gestures, related but non-illustrative gestures and less clearly related hand gestures in a sample of 100 instances of gestural OCM.

Type of hand gesture	N 100	
Hand lifted/waving (non-illustrative)	One hand	41
	Both hands	15
Illustrating hand gesture	One hand	13
	Both hands	8
Less clearly related gestures		23

Over and above choice and change, table 10 probably reflects two other main functions of gestural OCM. The first is “general activation”, which probably is also related to interactive communication management functions, such as turn keeping and attention holding. This function is more frequent and is in most cases accomplished using one hand. The other function is probably related to content activation and/or illustration. This function is less frequent but we can see that compared to activation gestures, it is relatively speaking more often made with both hands.

## 6.2 *Hands, gaze, nouns and verbs*

We also find a difference in activation of nouns and verbs in that OCM for choice related to verbs is more often accompanied by gestures requiring both hands. OCM for choice related to nouns is, on the other hand, often related to gazing down, something that does not occur in our database with verb related OCM (see Table 11).

Table 11. Gestures with choice OCM: noun and verb related

	Gaze	One hand	Both hands	Illustrating	Head
Choice of N/NP	9	17	6	7	1
Choice of V/VP/predicate	2	9	12	5	1

Possible explanations for these differences could be that nouns are more visually encoded and that this encoding is activated by a downward gaze trying to retrieve a visual image, whereas verbs are encoded more in relation to physical action, sometimes involving both hands, the movement of which activates the encoding. This would be in accordance with the findings by Pulvermüller 1999 and others who have claimed that gestural differences of the type discussed exist between noun and verb activation.

### ***6.3 Hand gestures - the main functions related to choice and change***

The main hand gesture functions related to choice OCM are: illustrating the content of a sought after concept by iconic gesture (25%), activation gesture, moving hands to mobilize energy (61%) and possibly non-OCM related function, like scratching or supporting head (14%). If we turn to change OCM, the main gesture functions are: illustrating the content of what is changed (21%), activation, often with both hands (71%) and possibly non-OCM-related function (8%). We can, thus, conclude that the distribution of gesture functions is fairly similar for choice and change OCM. Both of these functions can be related to two further, partly different cognitive functions, i.e. activation and illustration. A closer analysis of illustrating OCM gestures could very well reveal that many of them also have a more specific information packaging or activating function, as claimed by Kita (2000).

One reason for the assumption that illustrating gestures in an OCM context also can serve an activating and possibly information packaging function, is that in a number of examples, illustrating gestures relating to the sought for “target word” preceded the target word and co-occurred with OCM. Sometimes, as in Example 1 above, an illustrating gesture even precedes the verbal-vocal OCM and can be seen as the first part of the OCM. In this context, we may also consider the following example, where a man describes a toy museum with windows to protect the toys from the children.

### Example 3

Speaker: *de e alltså / de e fantastiskt å se just lek+ / +saxsmuseum som skyddas / ö: från barnen med f+ // från med med fönster / glasade fönster*

(it is then / it is fantastic to see precisely to+ / +ymuseum that is protected / uh from the children with f+ // from with with windows / glass windows)

In Table 12 below, we give an analysis of the utterance, in terms of the function of the vocal verbal, as well as the gestural expressions.

Table 12. Analysis of function, vocal verbal and gestural aspects of an OCM sequence.

Function	Vocal verbal (Swedish)	Vocal verbal (English translation)	Gestural expression/function
<b>Change (substitution)</b>	de e alltså...de e fantastiskt	it is then ... it is fantastic	ICM elicitation/ affirmation nod
<b>MM (emphasis)</b>			MM hands together focus
<b>Choice + MM (emphasis) + ICM (contact)</b>	lek+ / +saxsmuseum	to+ / +y museum	Gaze - eye contact
<b>Choice</b>	/ ö:	/uh	Head/gaze turn back-down
<b>Choice</b>	f+ //	f+//	Hand gesture up & down, illustrating window
<b>Aborted resumption</b>	från	from	Quicker hand movement up and down
<b>Choice/change (deletion)</b>	med med fönster	with with windows	Head nod Gaze downwards ICM gaze turn to listener 3 Hands in resting position
<b>Change (insertion) MM (emphasis)</b>	fönster / glasade fönster	windows / glazed windows	Turn back to listeners 1 & 2

(/ = short pause, // = medium pause, + = self interruption)

We can see that the temporal relation vocal verbal – gestural is often simultaneity, but that the illustrating gesture for window comes well before the word *window*.

Although the timing of the gestural OCM and speech based OCM, ICM and MM deserves a more comprehensive and detailed analysis than has been possible in this study, we can see in our examples that gestural OCM, when it is used, can precede both vocal OCM words and the vocal related main message words. This opens up the perspective that OCM gestures, even elaborated ones with a more specific semantic content, are, at least sometimes, more easily and spontaneously produced than verbal-vocal OCM or MM output. This provides additional support for OCM gestures as an interesting object of study when trying to understand the speech planning and processes of speech production.

#### ***6.4 Head shakes, choice and change***

The function of head shakes in choice and change OCM differs. Choice-related headshakes seem to indicate uncertainty, searching for words or that the situation is perceived as strange. Change-related head shakes, on the other hand, indicate the rejection of one expression in favor of another. Typical cases are when *eller* (or) or *nä* (no) is uttered with a headshake in a change context.

#### ***6.5 Choice and change of words vs choice and change of clauses***

If we turn to the second question in section 2 above, concerning the role of gestural OCM in speech planning, we find that 65% of the choice related and 75% of the change related OCM occur before choice or change of a word, whereas only 35% of the choice related and 25% of the change related occur before the choice or change of a clause. Words, thus, perhaps are a more basic units in planning than clauses.

### **7. Summary and conclusions**

Perhaps the main observation of this study is that many gestures are multifunctional, they can simultaneously support the main message (MM), e.g. by iconic illustration, while at the same time managing the interaction (ICM) by keeping the floor, maintaining contact and attention, and thirdly facilitating the speaker's own communication (OCM) by activating his/her memory and providing time for planning.

Some of the main findings, answering the initial questions posed in section 2 above are:

- (i) Roughly 50% of all speech based OCM co-occurs with gestures (Question 1).
- (ii) Roughly 90% of both vocal verbal and gestural OCM is choice directed, whereas about 10% is change directed (Question 2).
- (iii) Roughly 40% of all speech based choice related OCM involves gestures. The corresponding share for speech based change related OCM is 15% (Question 2).
- (iv) In choice OCM, gestures can illustrate the content of a sought after word by iconic gesture (25%), but they can also more generally induce activation by moving some part of the body to mobilize energy (61%). Finally, they can signal to the interlocutor that the speaker needs time for planning by scratching or supporting the head (14%) (Question 2).
- (v) In change OCM, gestures also illustrate the content of what is sought after in order to make a change (21%). In this way, choice is often integrated in change, as one of the means whereby change is achieved. The gestures can also be used to mobilize energy (71%) or be used for some unrelated function (8%) (Question 2).
- (vi) Hand movements, gaze change and head gestures are the most popular types of gesture involved in OCM (Question 3).
- (vii) Concerning the relation between vocal and gestural OCM, we have noted that gestural OCM either precedes or occurs simultaneously with vocal OCM. We have also noted that gestural OCM can be multifunctional and have an iconic illustrative MM function connected with the OCM function (Question 4).

Thus, in answering our initial questions, we have found a number of possible functions for OCM gestures. In addition to choice and change, we have found hand gestures that are more generally activating and hand gestures that are illustrating the content of a word the speaker wants to express. It is important to note that these functions need not be distinct, rather they generally reinforce each other. Thus, an illustrating type of hand gesture might also serve an activating and information packaging function. We have also found more gaze aversion in choice OCM than in change OCM and suggested that this might be related to a need for memory search. Finally, we found that head shakes were used with different functions for choice and change and that words more often than clauses seem to be the units that are subject to gestural (as well as vocal-verbal) OCM.

As regards the three hypotheses and claims also mentioned in section 2, we have found that there was a difference in OCM gestures used when searching for nouns and verbs (gaze downwards only for nouns and more gestures with both hands for verbs) (Hypothesis 1, Pulvermüller 1999, Pecher et al. 2004). As regards hypothesis 2, that gestures and words are generated from a common growth point (McNeill, 2000), our observations show that this is not always the case, since iconic gestures referring to some phenomenon sometimes precede the vocal word referring to the same phenomenon. In fact, this, instead supports Hypothesis 3, i.e. that gestures help to activate and package information (Kita 2000).

We have, thus, described some of the features of gestures in Own Communication Management. We believe that giving detailed information on human multimodal communication, including gestural as well as vocal-verbal communication is both an empirical and a theoretical challenge, affecting how we describe, understand and explain the structure of spoken language. We also believe that such descriptions will be exploitable in practical applications based on speech and gesture; both in systems for production and generation/synthesis and in systems speech/gesture recognition and understanding.

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