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Constituent order in non-verbal representations: Describing events with pictures by speakers of Swedish and Kurdish

Anu Vastenius

Supervisor: Prof. Jordan Zlatev

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Abstract

In this thesis the question concerning possible influence of language on thinking was addressed by investigating constituent orders in non-verbal representations of motion events. Forty-nine participants, 25 native speakers of Swedish with the default order SVO (or Agent-Act-Patient), and Kurdish with SOV (Agent-Patient-Act) were recruited in Sweden and 24 in Iraqi Kurdistan to take part in an experiment. Reconstructions of motion events were elicited with video-clips and picture cards to investigate whether the constituent (word) order in one´s native language has an impact on the used order in pictorial sequencing. Evidence for the influence of language in the non-verbal representations could be detected in both language groups. In addition, the model of "thinking for speaking" suggested by Slobin (1996) was supported by the results, especially in the Swedish group.

Keywords: constituent order, word order, Swedish, Kurdish, non-verbal, motion event, thinking for speaking, experiment, elicitation

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1. Introduction

How do people represent events using non-verbal semiotic vehicles such as gestures or pictures? Could the basic constituent or word order in one´s native language influence the order of the constituents of the representation of an event when using pictures? More specifically: If in a language the unmarked, default constituent order is Subject-Verb-Object, does it affect the preferred order of constituents, i.e. Actor-Act-Patient, when representing an event by using pictures only? Or is there a different "natural" order, based on shared cognitive features of all human beings, that is applied in such tasks, regardless of language? These questions have been addressed in recent years in a number of empirical studies, but the results have not been unambiguous. Evidence for both the effect of language on thinking and for the opposite view has been found. With different study designs quite different results have been obtained (cf. McNeill 2000; Kita and Özyürek 2003; Casasanto 2008; Goldin-Meadow et al. 2008; Langus and Nespor 2010; Meir et al 2010; Schouwstra 2012; Christensen and Tylen 2013; Hall et al 2013).

Goldin-Meadow, Mylander, So and Özyürek (2008) conducted a well-known study in order to test how speakers of languages with different basic constituent orders represent events non-verbally both with pictures and gestures. Results suggested that the constituent order the speakers had in their native language did not affect the order of pictures or gestures used for reconstructing events. Rather, all groups predominantly used the order Actor-Patient-Act in their nonverbal representations. Based on this, Goldin-Meadow et al. (2008: 9167) proposed that "there appears to be a natural order that humans, regardless of the language they speak, use when asked to represent events non-verbally".

While Goldin-Meadow and associates used both gestures and pictures, similar experiments with gestures have been conducted in several studies and different results have been obtained (Langus and Nespor 2010; Meir et al 2010; Schouwstra 2012; Christensen and Tylen 2013; Hall et al 2013).

The picture task, however, has not gained as much attention. Furthermore, when looking closer at the pictorial task design used by Goldin-Meadow et al. (2008), methodological questions arise (cf. Section 2.2). One may wonder: What if the design is slightly changed? Would there still be a dominant language-independent pattern to be found in the order of pictorial non-verbal representations? The ambiguous results in gesture experiments certainly

motivate further investigation on how events are represented with pictures by using a different design.

In order to address these questions, an experiment was conducted with speakers of two languages: Kurdish, which is known to have Subject-Object-Verb (SOV) as the predominant constituent order, and Swedish, with Subject-Verb-Object (SVO) as the default constituent-order. To exclude the influence of the multilingual surrounding in Sweden where most immigrants with native SOV languages have at least basic knowledge of Swedish, the actual study with speakers of Kurdish was conducted in a location where it is the dominant language in the society, Iraqi Kurdistan.

In the following sections the experiment and the theoretical background to it will be presented. In Section 2, theories concerning the impact language on thinking, and their relevance for the topic of constituent order in different semiotic resources, will be reviewed. In Section 3 constituent-order as a typological feature in the world´s languages will be introduced and concrete examples of the two target languages addressed in this study, Kurdish and Swedish, will be given. Section 4 deals with the design of the study, explaining the methods and the procedure in detail. Section 5 presents the results obtained and the outcome of the study is discussed in Section 6. Finally, conclusions and suggestions for future research are given in Section 7.

2. Language, cognition and orders in non-verbal representations

2.1 Linguistic influence on thinking

Does our native language affect the way we think? This question has been addressed at least since Wilhelm von Humboldt claimed in the 19th century that thought and language are inseparable from each other, and that language is the formative organ of thought. According to Humboldt languages differ from one another so much as to lead different world views (Humboldt, [1836], 1988). Perhaps most famously Whorf (1956) introduced "the principle of linguistic relativity" in formulations such as the following:

> Users of markedly different grammars are pointed by their grammars towards different types of observations and different evaluations of externally similar acts of observation, and hence are not equivalent as observers but must arrive at somewhat different views of the world (ibid: 221).

> We cut nature up, organize it into concepts, and ascribe significances as we do, largely because we are parties to an agreement to organize it in this way-an agreement that holds throughout our speech community and is codified in the patterns of our language (ibid: 213-124).

In the last decades of the previous century such views fell under the attack of universalist and modularist theories in cognitive science (Fodor 1983; Pinker 1994), often to be completely dismissed:

> The famous Sapir-Whorf hypothesis of linguistic determinism, stating that people´s thoughts are determined by the categories made available by their language, and its weaker version, linguistic relativity, that differences among languages cause differences in thoughts of their speakers […] is wrong, all wrong. (Pinker 1994: 57)

Pinker (1994) argued that language and thought are separate from one another based on the existence of thinking with no language in deaf isolates, aphasics, and infants. However, claiming that not all thinking needs language as an instrument does not exclude the possibility that language may affect thinking in certain ways (Slobin 1996; Levinson 2003; Casasanto

2008). Research in linguistic typology has shown that linguistic structures and how the lexicon is constructed indeed differ substantially in the world´s languages (Givon 1979; Gell-Mann 2011; Dixon 2012; Dryer 2013). It is possible that the language-specific patterns that we use in communication could have at least some impact on the way we think (Zlatev and Blomberg, 2013).

A considerable amount of evidence for linguistic influence on thought has been found in recent years. Using spatial metaphors for conceptualizing time is more or less a universal phenomenon, but which spatial concepts correspond to which aspects of time varies. In European languages we talk about the future being in front of us, but in Aymara the future is conceptualized as the space behind us. These differences are also reflected in corresponding co-verbal gestures (Nunez and Sweetser 2006). In English, linear spatial expressions are used to describe time such as *long* vs. *short* time, but in Greek the expressions denote volume: *megálos* (‘large’) vs. *vs. mikrós* (‘small’) and *polí* vs. *lígo* (‘much’ vs. ‘little’). In an experiment with English and Greek speakers, the participants performed a non-linguistic task involving the estimation of duration differently, depending on their respective language, though the English group could be induced to behave like the Greek after a relatively brief period of exposure to volume-based metaphors for time (Casasanto 2008).

In an attempt to develop a more generally acceptable theory of linguistic relativity Slobin (1996) presented the idea of “thinking for speaking”, proposing that language has (at least) an impact on the kind of thinking that goes on when actually speaking.

> In my own formulation: the expression of experience in linguistic terms constitutes thinking for speaking – a special form of thought that is mobilized for communication. Whatever effects grammar may or may not have outside of the act of speaking, the sort of mental activity that goes on when formulating utterances, is not trivial or obvious, and deserves our attention. […] In the evanescent time frame of constructing utterances in a discourse, one fits one´s thought into available linguistic frames, and picks those characteristics of objects and events that (a) fit some conceptualization of the event, and (b) are readily encodable in the language. I propose that, in acquiring a native language, the child learns particular ways of thinking for speaking. (Slobin 1996: 76)

This hypothesis has the implication that "languages differ from one another not only in the presence or absence of a grammatical category, but also in the way in which they allocate grammatical resources to common semantic domains" (Slobin 1996: 83). For example, languages have been argued to differ in their preferred lexicalization patterns for expressing motion events. English and German are so-called *satellite-framed languages* (S-languages), while Spanish and Hebrew are *verb-framed languages* (Talmy 2000). When children of three, five and nine years of age, whose native languages were the ones mentioned, were asked to describe scenes in a children´s book, it was shown that in all three age groups the speakers of Spanish and Hebrew used significantly more descriptions that had no locative elaboration, and tended to use a bare verb when describing a downward motion. In contrast, the speakers of S-languages tended to encode the manner-of-motion more often, and in greater detail. As Slobin (1996) says:

> The language or the languages we learn in childhood are not neutral coding systems of an objective reality. Rather, each one is a subjective orientation to the world of human experience, and this orientation *affects the ways in which we think while we are speaking* (ibid: 91).

Other studies have shown that in different languages there are different strategies for specifying the spatial relationship between the landmark and the object to be located (Levinson 2003; Majid et al. 2004). Three different *frames of reference* (FoR) have been detected in the world´s languages for describing small-scale objects in a non-geographic space: Relative, Absolute and Intrinsic. In a language using predominantly the Relative FoR, the position of an object is described as being to the *left* or *right* of the landmark object. A speaker of a language where the Intrinsic FoR is widely employed would tend to describe the spatial relation between two objects without reference to any other system of coordinates, for instance, as *on top of* or *under*. Finally, in a language with an Absolute FoR, the position would be described as being *to the North of* or *to the South of* the reference object. In some languages, like in English, two FoR systems are combined: the Relative and the Intrinsic. In languages with Absolute FoR such as Tzeltal, Guugu Yimithirr, Balinese and Belhare, speakers have been shown to use this frame to describe everyday spatial relations. For instance, a speaker of Guugu Yimithirr would provide a spatial description such as *The fork is to the North of the spoon* (Majid et al 2004). Children in communities with a language using an Absolute FoR acquire the system not later than in languages with other FoRs, although one might think that keeping track on where cardinal points such as North and South are while

speaking would need much practise and advanced cognitive abilities. Importantly, studies have demonstrated performance in non-linguistic tasks in accordance with the dominant FoR of one's language. For example, Majid et al. (2004) conducted an experiment where participants were asked to place an object in the same position after rotation of 180°. Dutch participants, with the Relative FoR, used the same strategy for placing the objects as in their native language, and the speakers of Tzeltal the Absolute FoR.

These and other similar findings lead to the conclusion that the idea of linguistic influence on thinking does not imply that language and thought cannot be separated, as originally claimed by Humboldt. While linguistic determinism may be unfeasible, a degree of linguistic influence on thinking is possible, and even likely (Zlatev and Blomberg, 2013). The question then is: would this also be reflected in the orders that people use when combing non-linguistic semiotic vehicles such as pictures, in order to express a composite representation?

2.2 Research in constituent orders in gestures and pictures

Is there a certain basic order used in representing events that is common to all people or does the structure of one´s native language influence the way one conceptualizes events? If so, could the basic linguistic constituent-orders influence how one represents the same events with non-verbal semiotic vehicles, such as gestures or pictures? This question has been investigated in a handful of studies by asking participants to reconstruct events by means of non-verbal semantic vehicles such as gestures or pictures. Some of these experiments and their findings will be here briefly described.

As mentioned, Goldin-Meadow et al. (2008) conducted a study to research how speakers of different languages represent events non-verbally. The experiment was designed to investigate both communicative and non-communicative representation of events, for which both gestures without speech and reconstruction of an event with pictures were used. Forty adults, native speakers of four different languages (ten in each language group), were recruited. The participants were speakers of English and Spanish, both with the predominant constituent-order SVO, Turkish with SOV as the basic order, and Chinese with a mixed order. For the task the authors used vignettes (video-clips) displaying 36 different motion events that differed according to variables such as the number of participants, and the kind of motion involved. Some depicted interactions between people and real objects, and others were

animations. Since the present study employs the same set of clips,[1] these will be described in more details in Section 4.

In the first experiment the participants were asked to describe all the clips first in their native language. Then the clips were shown again, and after each the participants were told to describe the event in gesture only, with no accompanying speech. In the second experiment transparencies for creating a picture were used. Participants were asked to move the transparencies into one peg to form a complete picture of the event on a computer screen. The order in which the transparencies were picked did not affect the final product, i.e. the image would always end up the same. The order of constituents that was used in the gesture task, and the order of picking the transparencies was then coded. The participants were not found to display the orders of their spoken languages. Rather, the order of the constituents both in their gesturing, and in the transparency task was predominantly Actor-Patient-Act.

Based on the findings the authors hypothesized that there is a natural order for representing events: Actor-Patient-Act. Entities in events are cognitively more basic than actions and not as relational as them, which could cause the participants to choose Actor and Patient before the actions to highlight them instead of focusing in the action. In addition, there is a "particularly close cognitive tie between objects and actions, which would link P [patient] to A [act], resulting in an ArPA order" (Goldin-Meadow et al. 2008:9166). The authors speculated that this order "may reflect a natural disposition that humans exploit not only when asked to represent events nonverbally, but also when creating language anew" (Goldin-Meadow et al. 2008:9167).

It has been proposed independently in a number of studies that the Subject-Object-Verb order could be the original, "default" order in languages and that it has a cognitive bias. The direction of the syntactic change in the world´s languages has been observed to be mostly from SOV to SVO (Givon 1979; Gell-Mann and Ruhlen 2011). Proto-Indo-European has been hypothesized to have been an SOV-language, while the modern languages that have emerged from it most often have the SVO-order. Strategies that may facilitate preserving the original SOV-order such as case-systems may explain why many languages still have the original SOV order (Gell-Mann and Ruhlen 2011). In fact, most SOV languages do have a case system (Dryer 2013).

1 Thanks to the generosity of Prof. Goldin-Meadow and her colleagues.

Another piece of evidence that SOV serves as a "default order" is provided from spontaneously emerging languages, such as Al-Sayyid Bedouin Sign Language (Sandler 2010). Furthermore, so-called home-signers, i.e. individuals deaf from the birth, who have not had a possibility to learn a signed language, have developed a gesture-based system, that shows preferences for SOV constituent order (Goldin-Meadow et al. 2008). Can we therefore conclude that the "original" Actor-Patient-Act order is the cognitively basic order and therefore used as default when representing events non-verbally, quite independently of native language and type of semiotic resource (e.g. gestures or pictures)?

A number of different findings prevent us from drawing this conclusion. To begin with, in the original study of Goldin-Meadow et al. (2008), in half of the video-clips there was a spatial endpoint, or Landmark. In representing the clips with gestures, speakers of all four languages (Turkish, Chinese, Spanish and English) tended to place it at the end of the sequence. On the other hand, in the picture transparency experiment, there was a clear bias for placing the Landmark first in the picture task, (which in Turkish corresponds to the preferred pattern in speech).

Other recent studies have also questioned the general conclusion of Goldin-Meadow et al. (2008), and suggested alternative hypotheses regarding the factors influencing constituent order in non-verbal representation. Langus and Nespor (2010) proposed that the two most usual constituent orders SVO and SOV originate from two different cognitive systems. In improvised or simple communication with direct interaction between the sensory–motor and the conceptual system, SOV is the more basic and thus preferred order but in "the computational system of grammar", SVO is favoured. The authors suggested that the differences in grammar found in the world´s languages "emerge from the struggle between individual cognitive systems trying to impose their preferred structure on human language*"* (ibid: 291). The original SOV-order has changed into SVO for the sake of greater clarity. Support for this hypothesis is that Pidgin-languages generally have the constituent-order SOV, but when the languages are grammaticalized they often adopt the SVO-order. According to Langus and Nespor (2010) SVO is the preferred order in languages, because it has the advantage that the function of the adjacent nouns, i.e. subject and object can easier be recognized, since they are not placed beside one another. The authors performed four studies where these claims were investigated: a task with (a) gestural descriptions of simple scenarios, (b) gestural descriptions of complex scenarios, (c) gestural comprehension and (d) comprehension of flattened speech, i.e. artificially flattened prosodic strings. Speakers of two

languages, Italian and Turkish, were tested. In simple gestural tasks Actor-Patient-Act was the preferred order of constituents, but in the more complex ones, Actor-Act-Patient was the favoured order, which was found to support the hypotheses. In the gestural comprehension task, SOV elicited the fastest reaction times in both language groups. However, in the task with flattened speech both groups preferred the order of their respective native language (Langus and Nespor 2010).

In another recent study Hall, Mayberry and Ferreira (2013) suggested that SOV could be the optimal order for describing an event in which the Agent and the Patient can possibly be mixed up. They point out that case markings, which are usual in SOV-languages, can be especially important when describing *reversible* events, i.e. events where an animate object may as well be the subject. In many languages a differential object marking is in use, where objects with more subject-like properties are case marked. Animacy in many languages is a trigger for using case markings.

The authors used elicited gesture/pantomime tasks to investigate what constituent order the participants would use to describe (a) video clips with reversible events, i.e. events, where the patient was human, and (b) all the other clips which were classified as non-reversible. There were three designs of the experiment that were applied: (1) using only gestures for the descriptions, (2) combining gestures and verbal descriptions in English, and (3) changing the order of the stimuli, and testing whether displaying the non-reversible items first would result to higher amount of SOV strings. The results indicated that SOV was the most common order among non-reversible events, but among reversible events the most usual order was SVO in all designs. Participants were also found to use gestures that functioned as case markers, that is, did not have any referential content, but indicated what role the constituents had in the gesture strings. The case-markings were less usual in strings of reversible SVO-strings than was expected by chance, and this could be observed in all three experiments. The authors drew the conclusion that "semantic properties of the event are among the factors that determine which order is favoured" (Hall et al. 2013: 15).

In yet another study Meir et al. (2010) proposed the hypothesis that different kinds of clauses give rise to different communicative challenges. Transitive clauses can either be *canonical,* where the subject/actor is animate and the object/patient inanimate, and the clause can be understood on basis of semantics only, or *reversible,* where both arguments are animate, and a strategy is needed to mark which one is which. The authors conducted an experiment to test if

there was a difference in constituent order for each kind of clauses when representing the events by gestures. Thirty-three native speakers of Hebrew (a SVO language) were asked to convey by gestures the events presented in video clips. The results showed that in clauses with inanimate object, Agent-Patient-Verb was used in 65% of cases and Agent-Verb-Patient was detected in 31 %. A reverse pattern was found in clauses with human Patients, where Agent-Verb-Patient was found in 64 % of cases, and Agent-Patient-Verb in 31%. When two human objects were present, the participants invented additional devices, for instance showing initially two fingers to indicate that there were two people. The authors concluded that SOV might be the basic word order, and the others have developed later as a response to processing efficiency and communicative demands, in apparent agreement with Langus and Nespor (2010).

Likewise, Schouwstra (2012) hypothesised that different semantic properties give rise to different gesture orders. The author presented experimental data showing that SOV is not the only order that emerges, but that there is another category of events that elicitate SVO, what they called *intensional events*, such that are represented in the sentence in (a).

(1) a. The princess wants an apple.

b. The princess throws an apple.

The ontological status of the subject and the direct object in (1a) are not equal: *the princess* has to exist for the sentence to be true, while the desired object does not necessarily exist, or is not in the vicinity. Motion events such as the one expressed in (1b) on the other hand, are typically described with extensional verbs such as *throw*. To interpret extensional verbs, the direct object, i.e. the extension of the verb´s complement is important, but for the interpretation of an intensional verb (*wants* in 1a) it is less important. The marks of intensionality according to Forbes (2010) are: (a) substitution-resistance, (b) availability of unspecific readings, and (c) existence-neutrality. The verbs classified as intensional, or that at least have an "intensional flavour" and were used in the experiments conducted by Schouwstra (2012) were classical intensional verbs *(search*), psych verbs (*dream of, think of),* perception verbs *(hear, see),* and creation verbs *(build, draw, knit, sculpt).*

The study consisted of two experiments. In the first one the authors tested if a difference could be detected between the gestural representations of the two kinds of verbs. Sixteen speakers of Dutch, a SVO-language, were shown pictures of 20 motion events and 20

intensional events. Each motion event had a corresponding intensional event, where the subject and the (inanimate) object were the same, but the action was changed. Participants were asked to communicate the meaning of a picture to the experimenter by using gestures only until they thought the meaning had been conveyed. The results showed that there was a significant correlation between the picture type and the order of constituents: in motion events the participants predominantly used SOV-order, but in intensional events the most usual order was SVO.

In the second (pilot) experiment a series of ambiguous gesturing sequences was set up in two orders: SOV and SVO. The prediction was that the SOV strings will be interpreted as motion events, and the SVO strings as intensional events. Short movie clips were created where an actor gestured simple events so that the events could be interpreted either as motion events or intensional events. An example of a pair of such events is demonstrated in (2a) and (2b).

(2) a. A witch climbs a house.

b. A witch builds a house.

Both events were gestured in exactly the same way, but the order of the action and the object was switched. The participants were shown the videos on a laptop screen, and they were asked after each clip to choose the picture that best described the event shown on the clip. Two pictures were shown after each video as the two answer possibilities: corresponding to an intensional and a motion event, respectively. The results suggested that for a motion event, SOV order was chosen more often, and for an intensional event SVO. This supported the hypothesis that the distinction in gesture production between SVO and SOV order has a communicative function (Schouwstra 2012).

Additionally 19 speakers of Turkish, a SOV-language, participated in the experiment conducted by Schouwstra and de Swart (2014) with the design used in the first experiment of Schouwstra described earlier. Similar results were obtained: just like the speakers of Dutch, the speakers of Turkish used predominantly SOV for motion events, and for intensional events SVO, while there was no significant difference between the language groups. In their article they conclude that:

> […] our experimental results show that in improvised communication, the fine-grained semantic properties of the message influence sequencing of information, and that this is a dynamic process that happens ‘on the fly’. This

> sheds a novel light on the possible mechanisms at work in emerging languages. There is no pre-set basic word order, but a range of possible linearization options, and choices are driven by different factors (ibid: 435).

In another study a similar approach was adapted, though using a different terminology. Christensen and Tylen (2013) hypothesized a different order in gesturing based on the difference between *object manipulation events*, and *construction events*. (3a) is an example of a representation of a manipulation event, and (3b) a representation of a construction event.

(3) a. A ballerina is throwing a paper plane.

b. A ballerina is painting a paper plane (on canvas).

To test the hypothesis the authors designed a game where pairs of participants communicated the two kinds of transitive events in gestures. Fifty native speakers of Danish participated in the experiment. Two sets of pictures were created, one for each condition in a combinatory manner so that the actions were minimal pairs, i.e. each agent and object appeared in both manipulation and construction events, which forced participants to disambiguate the elements, and to include them all. The results followed the predictions that had been made: in manipulation events the dominant order turned out to be SOV, and in construction events SVO. Christensen and Tylen (2013) argued that motivational sources can be revealed in conceptualization of events by gestures, and that the gesture strings "iconically reflect the inherent logical and sequential structure of the perceived events" (ibid: 1). According to the authors the conceptual structure in gesture is influenced by external, real-world factors, and thereby is not restricted to the cognitive domain. We can note that the two categories of events used by the authors can be categorized as sub-types within the event types of Schouwstra (2012): motion events, and intensional events, respectively. In "manipulation events" objects exist prior to the action, but in "construction events" objects are the consequence of the actions, and thus have a different sequential and logical structure.

While the studies reviewed above qualified the proposed universal "natural" order of Goldin-Meadow et al. (2008), they did not focus on a possible role of the native language. Such influence on gesturing was rather explored in another domain of language than word-order: semantic structure in verb clauses. Kita and Özyurek (2003) investigated how clausal packaging or semantic structure in one´s native language affects spontaneous gesturing. They carried out an experiment where animated cartoons were used to elicit gestural narratives. The

authors detected that gestural representations show cross-linguistic variation based on how the features are encoded in the language. Speakers of English, Turkish and Japanese represented Manner and Trajectory in gestures in different ways depending on whether both these categories were encoded within a processing unit in the native language of a participant, or if two units would be required to convey the same meaning. The speakers of English expressed a movement with one gesture, while speakers of Japanese and Turkish performed two gestures for the same movement. A possible explanation the authors gave was that the memory of a native speaker is shaped by the language he speaks.

> If language specific spatial representation is repeatedly generated for speaking, then it can become part of habitual non-linguistic thought about space, that is, the default way of thinking about space even outside the context of speaking (ibid: 27).

The authors argued that the results of the study support the *Interface Hypothesis*, a view according to which "gestures originate from an interface representation between speaking and spatial thinking" (ibid: 17).

The same questions had been addressed already earlier by McNeill (2000), who used the same method with animated cartoons to elicit gesturing. He studied speakers of English and Spanish, and obtained similar results as those reported by Kita and Özyurek (2003): that the satellite- and verb-framed structures in the languages elicited corresponding differences in gesturing.

To summarize, in the studies described in this section, in addition to differences in native language, ease of processing and event structure seemed to play an important role for which order was chosen for the non-verbal representation of events. Several factors in the events affecting the orders have been proposed:

I. Reversibility (animate vs. inanimate Patient)
II. Ontological status of the Patient (intensional vs. extensional event, manipulation vs. construction event)
III. Complexity of the communication mode (simple vs. complex)
IV. Structure in native language

An effect of native language was not found in the study of Goldin-Meadow et al. (2008), and the order Actor-Patient-Act was argued to be natural and universal. However, the other studies reviewed in this section question this hypothetical universality, indicating that there may be other factors that influence the order of non-verbal representations.

Pictorial representations of events have not been used in as many studies as gestural representations, and obviously more research is needed in this respect. In the original study of Goldin-Meadow et al. (2008) the pictures used in the experiment were transparencies, and the order in which the participants chose to move the single constituents into one image did not affect the final product. What if the same constituent pictures were arranged into a line to reconstruct the event as it is usually done, for instance, in comic books, where the action is represented in a chronological order? Would the placement of the arrow, corresponding to the Act, still tend to be in the end, or would it obtain a more relational role in the string and be positioned more centrally?

Furthermore, in the original study all events were verbally described by participants once before performing the gesture task. This did not have an impact on the results, as mentioned. However, the authors did not test what the outcome would be if the participants were asked to give verbal descriptions for the picture task directly after viewing each clip prior to ordering the pictures? Could it be that in that situation there is a "thinking for speaking"-effect to be found, and that the native languages influence the picture order?

In addition to these unanswered questions, another motivation for using pictures instead of gestures in this study is that arranging pictorial representations in a sequence can be argued to be a task that resembles language less than gesturing, with the two even forming a "unified systems" according to some scholars (McNeil 2005). Using pictorial representation is therefore possibly more appropriate for researching the impact of language on thought.

Having studied deaf children who have independently from their hearing parents developed a gesture-based communicative system, Goldin-Meadow (2006) argues that

> When gesture assumes the full burden of communication, acting on its own without speech, it takes on language-like form […] But when gesture shares with speech the burden of communication, it loses its language-structure and assumes instead a holistic form (ibid:38).

An experiment made by means of gestures gives an outcome that reminds on the process of an evolving new language. Using images for the same task could come somewhat closer to a deeper non-linguistic use of cognitive resources. As Casasanto (2008) claims:

> Patterns in language can serve as a source of hypotheses about cognitive differences between members of different language communities, but some sort of extra-linguistic data are needed to test these hypotheses: Otherwise the only evidence that people who talk differently also think differently is that they talk differently. (ibid: 67)

Even arranging pictures for retelling an event can of course be argued to have some correspondence to language production, especially if it is used in a communicative situation, but so is any kind of utilization of semantic means.

Hence, the present study poses the following research questions:

1) Does the basic constituent-order in one´s native language have an impact on which order of constituents is used for a pictorial reconstruction of a motion event?
2) Is there a "thinking for speaking"-effect i.e. difference in the outcome if a description of an event is given in one´s native language prior to describing it with a non-verbal semiotic vehicle?
3) Does the way of using images of the constituents in events influence the outcome?

3. Constituent-orders, Swedish and Kurdish

In this section, we need to consider some basic aspects of constituent orders in language, the alignment between grammatical functions and role, and describe how Swedish and Kurdish differ in this respect. According to current estimates, SOV (proposed as the natural or original order, cf. Section 2) is also the most usual basic constituent or word order, as shown in Table 1 (Dryer 2013). The second most common is SVO, and languages with no dominant word order follow. In many languages more than one order is in use, but there is in most cases a dominant, unmarked order, which can be changed under certain circumstances (Gell-Mann and Ruhlen 2011).

Table 1. Order of subject, object and verb in world´s languages (cf. WALS Dryer 2013)

Dominant order	SOV	SVO	No dominant order	VSO	VOS	OVS	OSV	Total
Number of languages	565	488	189	95	25	11	4	1377

Constituent order in language can be formulated in two ways: by using (a) grammatical functions and (b) semantic roles. Grammatical functions such as *subject, direct object* and *indirect object* signify the grammatical role played by noun-phrases in a clause. In intransitive sentences there is only a subject. In mono-transitive sentences there is additionally an object, and in di-transitive both a direct and an indirect object.

Semantic roles are rather the types of arguments in the predication expressed by the clause, such as Agent, Patient, Recipient and Goal (cf. Saeed 2009). There is no definitive consensus in the field on what the roles are or how they should be distinguished. In this thesis three semantic roles have been utilised: Agent (A), Patient (P), understood as prototype-based (see below) and Landmark (LM) in addition to the main predicate (V). There is a general pattern of alignment, although with exceptions, between the semantic roles and the grammatical functions (Givon 1990). In an *accusative* language such as English, the Agent is often the grammatical subject, the Patient is the direct object, and a Goal or Recipient (here called Landmark) are usually expressed by the indirect object. Since there are no grammatical functions in non-verbal representations, semantic roles will be of greater importance in discussing the orders in pictorial representations, and their possible similarity with the constituent orders of sentences.

Dowty (1991) has suggested a solution to certain problems with thematic roles. Since the boundaries between the roles are unclear, and in many cases arguments lack some typical entailments, he proposes that only two kinds of roles are needed for linking: Proto(typical)-Agent and Proto(typical)-Patient. In this thesis the categorization of the arguments follows Dowty´s proposal, and Agent and Patient are under understood as prototype-based concepts, defined by clusters of properties (entailments). Not all typical entailments need to be present (volition, intention, animacy etc.) for something to be Agent. The central feature of Agent is taken to be *causal force*, where the Patient is *affected* by this force. To these two proto-roles, we can add Landmark, also as a prototype based role, with *place of motion-endpoint* as central feature. This classification was found to be most relevant for answering the research questions.

The basic word order in most Indo-European languages is Agent-Verb-Patient, corresponding to SVO, as it is the case in English (4).

(4)	I	ate	an apple.	
	S	V	O	(functions)
	A	V	P	(roles)

The default word order in Swedish[2] is as in English, as shown in (5).

(5)	Jag	äter	ett	äpple.
	I	eat.PRES	DET.INDEF	apple
	A	V	P	
	"I am eating an apple."			

When there is an indirect object in the clause, with the semantic role of Landmark (Goal), it is placed after the verb, as in (6).

(6)	Vi	går	till	centrum.
	We	go.PRES	to	centre
	A	V		LM
	"We are going to the centre."			

The Landmark (when also serving the role of Recipient) may either precede or follow the Patient, as shown in (7a) and (7b), similar to English.

[2] Swedish belongs to the Germanic branch of the Indo-European language family, and it is spoken by approximately 8 million people in Sweden and Finland (Ethnologue.com).

(7a)	Han gav		en	blomma	till flicka-n.
	He give. PAST		DET.INDEF	flower	to girl-DEF
	A	V	P		LM
	"He gave a flower to the girl."				

(7b)	Han	gav	flicka-n	en	blomma.
	He	give.PAST	girl-DEF	DET.INDEF	flower
	A	V	LM	P	
	"He gave the girl a flower."				

If there is an adverbial, an adverbial clause or a dependent clause in the beginning of the sentence, the constituent order changes, so that the subject (Agent) follows the verb, i.e. Swedish is a so-called "V2 language" (Josefsson 2004).

(8)	Ofta	gav	han	en	blomma	till flickan.
	Often	give.PAST	he	DET.INDEF	flower	to girl-DEF
		V	A		P	LM
	"Often he gave a flower to the girl."					

Kurdish belongs to the Indo-Iranian branch of Indo-European languages, and more precisely to the West-Iranian group. It is spoken by approximately 30 million speakers in Turkey, Iraq, Iran and Syria (Ethnologue.com).The two main dialects are Kurmanji, spoken in the northern regions, and Sorani in the southern ones. The dialects are not entirely mutually intelligible and there are differences both at the structural level and in vocabulary (Thackston 2006). The participants in the experiment described in the following section were speakers of the Sorani dialect spoken in Suleymania-region in northern Iraq.

In Kurdish the basic word order is SOV, or Agent-Patient-Act, and the Patient needs to precede the Verb, as demonstrated in (9).[3]

(9)	(a)	Mn	seu	dakhom.
		I	apple	eat.PRES
		A	P	V
		"I am eating an apple."		
	(b)	*Mn	dakhom	seu.

[3] When no reference is provided, the example has been provided by a Swedish-speaking native speaker of Sorani-dialect in Malmö in January 2014.

While the Patient precedes the verb, the Landmark usually comes after the verb (Haig 2002), though in some cases it can also precede the verb, see (13) below. Unlike most SOV-languages, Sorani Kurdish has prepositions and circumpositions which are used to mark the boundaries of a prepositional phrase (Thackston 2006).

As shown in the example (10) the Landmark can either follow the verb as in English and Swedish, or it can be placed between the A and V, or even in an initial position.

(10) (a)

Ema	da-rroi-in	bo	nau shaar.
We	PRES go 1.PL	to	centre
A	V		LM

"We are going to the center."

(b) Ema bo nau shaar darroiin.

(c) Bo nau shaar ema darroiin.

As seen in example (11), Kurdish, is a so called pro-drop language, i.e. the verb is conjugated according to person, and due to this feature the Agent is often omitted. If the personal pronoun is omitted, it is even possible for the prepositional phrase (Landmark) to be in an initial position, as in (12).

(11)

(Ema)	Da-rroi-in	bo	nau shaar.
(We)	PRES go 1.PL	to	centre
(A)	V		LM

"We are going to the center".

(12)

Bo nau shaar	darroiin.
LM	V

The position of the animate Landmark (Goal) in Kurdish is typically final (13c), as in English (13a) and Swedish (13b), although the verb comes after the Patient.

(13) (a)

I	gave	the book	to	Sara.	
A	V	P		LM	

(b)

Jag	gav	bok-en	till	Sara.
I	give. PAST	book.DEF	to	Sara
A	V	P		LM

"I gave a book to Sara".

(c)	Mn	ktaab-eka-m	daa	ba	Sara.
	I	book.DEF.1.SG	give.PAST	to	Sara
	A	P	V	LM	

"I gave the book to Sara".

In (13c) the congruence of A in past tense is realized on the P as a suffix. While in other tenses the person-number marker is attached to the verb, in the simple past it attaches itself in the direct object or another preverbal matter. As seen in example (13c), instead of using the personal suffix in the verb, in past tense it is added in the object, while the verb *daa* ('give') does not change. In Sorani dialect this is a relic of the former ergative construction, which still exists in northern dialects (Bynon 1979; Thackston 2006). It does not affect constituent order, and therefore the ergative features of Kurdish will not be taken in consideration in coding the constituents.

The generalized proto-roles A (Agent), P (Patient), and LM (Landmark) only will be the ones of interest, expressed in constructions such as those shown in (13) and (14).

(14) Aw saga aw gul-ei berd bo aw kulana.
That dog that flower.3SG take.PAST to that house
A P V LM
"That dog took that flower to that house."

4. Method

The target languages and countries were selected to be Swedish (as spoken in Sweden) and Kurdish (as spoken in the autonomous region of Kurdistan in Iraq), due to the existence of both differences and similarities in constituent order, as described in Section 3. To remind, the differences concern above all the placement of Patient (after the verb in Kurdish, and before in Swedish) while the placement of Landmark was similar.

4.1 Materials

The materials used in the experiments were adapted from those used by the well-known study in the field, that of Goldin-Meadow et al. (2008). This was done for the sake of attempting to replicate the original study, but with one parameter changed: how the pictures to be ordered were presented (see below). The same short video clips were used as stimuli: some were animations using toy figures such as those shown in Figure 1, while others showed live footage of people and animals. The constituents appearing in the video-clips are specified in Table 2. Again, these are the same classifications used by Goldin-Meadow et al. (2008), though here they are consistently described using full sentences, and with the three generalized semantic roles Agent, Patient and Landmark.

Figure 1. The start screen of one of the animated video-clips (# 27 in Table 2)

Table 2. Video-clips and constituents analysed in terms of the three semantic roles.

#	Description	Agent	Patient	Landmark
1	A chicken moves to a captain.	chicken		captain
2	A garbage man pushes a garbage can to a cross man.	garbage man	can	cross man
3	A bike moves to a woman.	bike		woman
4	A girl topples over.	girl		
5	A man moves to a motorcycle.	man		motorcycle
6	A boy stirs a spoon in a bowl.	boy	spoon	bowl
7	A baby crawls to a chicken.	baby		chicken
8	A man bends over.	man		
9	A boy moves to a girl.	boy		girl
10	A man carries a chicken to a scaffolding.	man	chicken	scaffolding
11	A man crawls to a cat.	man		cat
12	A captain swings a pail.	captain	pail	
13	A gate hits a woman.	gate	woman	
14	A girl waves.	girl		
15	A man gives a tool box to a captain.	man	box	captain
16	A girl puts down a basket.	girl	basket	
17	A girl puts on a hat.	girl	hat	
18	A basket moves to a washer woman.	basket		woman
19	A duck moves to a wheelbarrow.	duck		wheelbarrow
20	A chicken moves in a circle.	chicken		
21	A man picks up a baby.	man	baby	
22	A bike with a cart carries a girl to a giraffe.	bike	girl	giraffe
23	A dog moves to a van.	dog		van
24	A boy tilts a glass.	boy	drink glass	
25	A washer woman pets a dog.	woman	dog	
26	A tool box moves on a school bus.	box		bus
27	A girl gives a flower to a man.	girl	flower	man
28	A bike moves to a dog.	bike		dog
29	A gate moves to/closes a fence.	gate		fence
30	A van drives to a man.	van		man
31	A man throws a ball to a basket.	man	ball	basket
32	A bicycle bends.	bicycle		
33	A man plays a guitar.	man	guitar	
34	A dog carries a flower to a doghouse.	dog	flower	doghouse
35	A train moves into a fenced area.	train		fenced area
36	A woman twists a music box.	woman	music box	

The main difference in the design compared to the original study was in the way the pictures to be ordered by the participants were constructed. First of all, these were actual physical artefacts rather than virtual objects on the screen. Each transparency (cf. Section 2) was printed on a white picture card (10 x 10 cm) using only black colour. Pictures displaying

persons were approximately of 4-5cm x 2cm; pictures of objects 1.5cm x 1.5cm and pictures, or symbols of actions (expressed by arrows, as in the original study) were 2-7cm x 5cm. See Figure 2. Secondly, since the pictures were not transparent, they had to be placed in a given order so as to produce a representation of an event. Thus, the task required a strategy, unlike using transparencies, which in the study of Goldin-Meadow et al (2008) would always result the same final product regardless of the order the transparencies were stuck in.

The task was performed on a transversal plane with a sagittal directionality, i.e. participants were instructed to place the pictures in a row, from the slot furthest away from them, to the slot closest to them. The bottom side of each picture was marked with a dark black line, so as to help the participants in interpreting the rather schematic pictures, especially the arrows. Finally, all pictures when laminated, made the size of a single picture card to be ~13 x 13cm.

A white cardboard of size 13 x 52 cm was used for arranging the pictures, so that participants would be constrained in placing the pictures, and less likely to be influenced by the direction of motion in the clips. For example, if an arrow points to the right (as in Figure 3), a participant might choose to place the Agent on the left and the Patient/Landmark on the right side of the arrow, and thus produce an *iconic* representation of the event. The risk for this would be even higher if there was a Landmark in the direction to which the Agent moved. Using a vertical order was presumed to prevent, or at least to minimize this kind of a tendency.

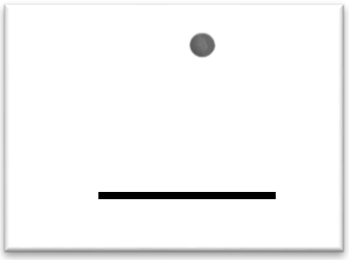
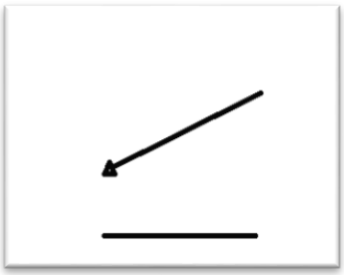
	**Agent**
	**Patient**
	**Act**
	**Landmark**

Figure 2. Picture cards, used for representing the event "A man throws a ball into a basket"

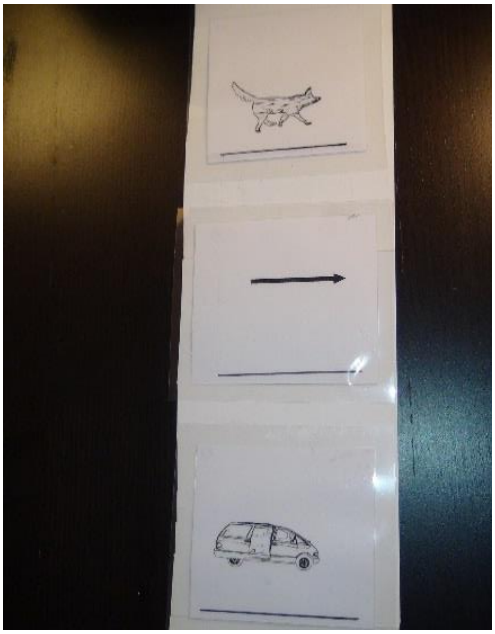


Figure 3. Pictures on the cardboard

The video clips were arranged in three different random orders, of which each was used equally many times. A laptop with a screen of 15.6 inches was used for showing the video-clips to the participants. Two extra video-clips were recorded to use as practice trials, i.e. to help the participants understand the task. Photos of the actors and the objects appearing in the clips were taken and printed, and picture cards were prepared of them in an identical way as the ones used for the actual test.

4.2 Participants

Two groups of participants were recruited for the task. Twenty-six participants (12 male) from Suleymania in the Kurdish region of Iraq were recruited by the author and a Kurdish-speaking assistant. The participants had their origin in the governorates of Suleymania, Kirkuk and Hawler, and at the time of the study were residing in the cities of Suleymania and Chamchamal. The participants were contacted by the assistant, and a preliminary selection was made according to their foreign language skills and gender in order to be able to balance the test groups as much as possible. Only monolingual participants in Kurdish were chosen, since mastering other than an SOV-language might have an impact on the outcome.[4] The ages of the participants were between 16 and 48, with the mean 28.58. Eight had finished elementary school and 13 secondary. Five were illiterate or with very poor literacy skills.

[4] By "monolingual" it is here meant that a speaker may know some words or expressions in another language than his/her native tongue, but is not able to communicate in it.

In Sweden twenty-seven participants (13 male) in Lund and in Malmö with Swedish as their native language were recruited.[5] The participants were between 16 and 67 years, with mean age 31.48. Five had finished elementary school, seventeen had finished secondary school and five had a higher education. All were literate. The Swedish-speaking participants were not monolingual as the Kurdish, but it was ensured that they did not have skills in a language in which the predominant constituent-order is not SVO.

The data of four participants, two in each language group, were disqualified later due to technical problems or because participants were not able to complete the task in a satisfactory manner. One Kurdish participant was not consequent in arranging the pictures in a top-to-down order, and another used the same order every time as the pictures had when taking them out from the envelope without thinking further. The data of the two Swedish participants was not possible to use because of a failure in video-taping.

4.3 Procedure

Prior to the testing, forms of informed consent in Kurdish and Swedish were given to the participants. Both language-groups were randomly divided in two groups, and assigned to each of two sub-conditions: in the first group they were asked to first describe the video-clips verbally, and then to arrange the pictures to represent the event (*With verbalization*), and in the second group only to use pictures (*No verbalization*). Participants were then interviewed regarding their age, level of education, native language and skills in other languages. Instructions were given both verbally and in writing for how to perform the task. The participants were told that they would be shown 36 short video clips, and for those in the verbalization condition, that after each clip they were supposed to tell shortly in one sentence in their native language what happened in the clip. Both groups were told that they would be expected to represent the video clip with a set of pictures, by arranging the pictures on the white cardboard in a top-to-down order, with the base line in each picture at the bottom. Before starting the actual test, participants were given the two training clips, and corresponding pictures. After performing with these, they were asked if they had understood what was expected from them when doing the experiment. If they had questions about the procedure, they were informed without revealing the underlying aim of the experiment.

[5] The Kurdish and the Swedish groups were not balanced when it comes to level of education, but efforts were taken to select Swedish participants with lower levels of education. It was impossible to find academically educated participants who also were monolingual to perform the task in Kurdistan, so the mono-linguicism was chosen to be the preferred criterion.

Each session was video-taped with a Sony HDR-CX360 Handycam, so that only the stimulus pictures and the hands of the participants were recorded. When instructions had been given, and the two test trials had been done, video-taping was started. Video clips were shown one by one. If belonging to the *with verbalization* condition, the participants gave a description of the event verbally, and then received the pictures of the constituents in an envelope, where they were in a random order, pulled them all out at once, and were then allowed to order them on the cardboard in any order preferred. When this was done, the pictures were collected, placed back in the envelope, and the next clip was showed.

At the end there was a debriefing session. The video camera was stopped and participants were asked (a) how they understood the arrow on the pictures, (b) if they had any strategy for using a particular order, and (c) if they could discern what the point of the experiment was. Participants were further given the possibility to be informed of the purpose of the experiment after finishing the task.

In Sweden the experiments were conducted in a room at the Humanities Laboratory in Lund University with only the participant and the experimenter (the author of this thesis) present. Participants, who were not able to travel to Lund University, were tested (a) at the home of the author (4 cases), (b) in another educational institution (6 cases) and (c) at home of a participant (one case). In all situations the participants were alone in the room with the experimenter/author. The participant and the author sat at a table beside one another. On the table there was a 15.6´ laptop, which was used for showing the video-clips by means of a MS PowerPoint presentation, one by one. Beside the laptop there was the cardboard for arranging the pictures, and in addition there was the video camera on a camera support.

In Kurdistan the experiments were performed in two houses belonging to the assistant´s relatives and in one case the testing was done in the house of a participant. For the first three experiments a table and a chair were obtained. However, since it transpired that participants preferred to do the task on the floor, the rest of the tests were performed so that the participant sat on the floor and had the computer and the cardboard in front of him, as shown in Figure 4.[6] The participant then got instructions from the assistant in Kurdish how to perform the task. The assistant showed the video-clips on a computer, and the second assistant, also a native speaker of Kurdish, handed the pictures after each clip in an envelope, and collected them

[6] Most people in Kurdistan do all their daily tasks sitting on the floor. They eat, prepare food, drink tea with guests and watch TV while sitting on the floor.

from the cardboard. To both assistants exact instructions were given and they performed consistently. Sometimes, when required due to external reasons the places between the second assistant and the author were changed. Due to the home environment, the participant, author and two assistants were occasionally not the only people in the room.

Figure 4. Experiment session in Kurdistan, with the participant in the middle, the main assistant to the right, showing the clips on the computer, and the second assistant to the left, handing the picture cards in envelopes.

4.4 Analysis of the data

The collected data was analysed as follows. The information for each participant was anonymised and saved in a data base. The order of pictures used for representing each event was noted by the experimenter by using the codes: (A) Agent, (V) Act, (P) Patient and (LM) Landmark. The noted orders where later checked against the video-recordings and if necessary corrected. The software ELAN (tla.mpi.nl/tools/tla-tools/elan/) was used for transcribing the speech of the participants. In the case of Kurdish, transcription was performed by the Kurdish assistant who was present at the experiments, using a Romanized script developed by the author.[7] The transcription of the Swedish data was performed by the author. The utterances were then analysed and glossed in English by the Kurdish assistant and the author, respectively. The sentence constituents were coded in the same way as for the non-verbal task, using the semantic codes A, P, V and LM, as shown in examples (9)-(15), and in

[7] There is no standardized Roman script to be used for Sorani Kurdish, which is written with modified Arabic alphabet.

Figure 5. The constituent order information was then exported in an Excel-file, for the purpose of quantitative analysis of preferred constituent orders (a) in all representations, (b) in verbal representations, (c) in non-verbal representations, and (d) whether the order in non-verbal representations correlated with the preceding verbal descriptions.

In both languages the default constituent-orders, SVO and SOV characterize active voice, non-topicalized sentences, but sometimes participants used passive constructions and topicalizations. This was another motivation for comparing the actual utterances and the pictorial representations.

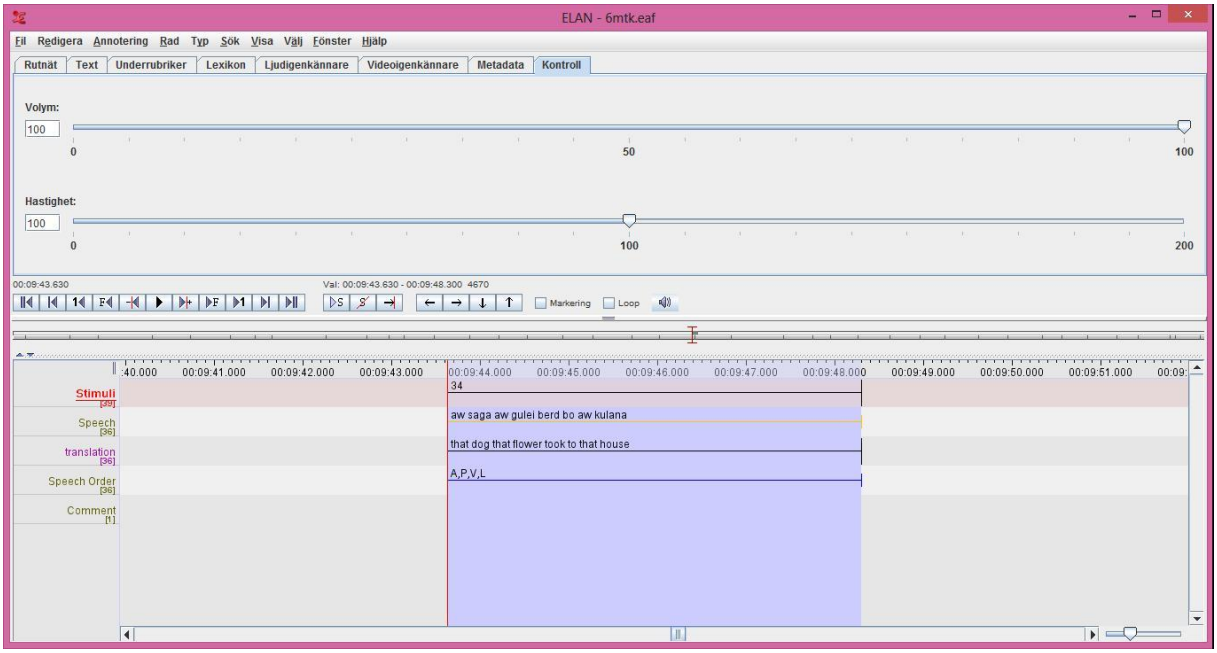


Figure 5. A screen picture from ELAN

4.5 Predictions and hypotheses

Despite that Goldin-Meadow et al. (2008) did not find an effect of the dominant constituent order of the native languages of participants on the order of placing the "transparencies", results from other studies investigating the order of gestural representations were less clear in this respect (Section 2.2). Furthermore, the review of research on linguistic influence of language on thought (Section 2.1) showed support for at least a degree of such influence, especially in a "thinking for speaking" context. Given the similarities and differences between Swedish and Kurdish constituent order described in Section 3, it was expected that the two

language groups would differ in their "picture orders" with respect to the relative placement of Patient (P) and Act (V), but not in the relative position of Agent and V, since in both languages the order is A > V, nor with respect to V and Landmark (LM), since in both languages the dominant order is V > LM. Furthermore, it was expected that this effect would be more pronounced in the case where participants had to describe the video-clip prior to representing it with the pictures.

These general predictions were spelled out at the following hypotheses:

H1. The Swedish group will tend to have V > P order more than P > V, while the reverse will be the case for the Kurdish group: more P > V than V > P

H2. The tendency to follow the language pattern (V > P for Swedish, P > V for Kurdish) would be stronger in the *With Verbalization* condition than in the *No Verbalization* condition.

H3. There will be correlations between the relative order of V and P in speech and in the picture task for both groups in the *With Verbalization* condition (i.e. if a participant verbalized V > P, they would tend to order the pictures V > P as well, and vice versa).

H4. There will be no difference between the two language groups in the relative picture order of V and LM.

H5. The tendency to order V > LM will be stronger in the *With Verbalization* condition than in the *No Verbalization* condition for both language groups.

H6. There will be correlations between the relative order of V and LM in speech and in the picture task for both groups in the *With Verbalization* condition, but this will be the same in both cases, with V > LM clearly dominating.

5. Results

After coding 2664 strings of constituents, of which 1764 where strings of pictures, and 900 were spoken utterances, the data were imported in MS Excel, where they were statistically analysed. The main statistic test used was a mixed-model logistic regression analyses (Fox & Weisberg 2011). The values that are reported in the following are the values of the regression coefficient, the standard error, the z-values, the associated p-values and r-values. The presented values are estimations. Did the data support the six hypotheses presented at the end of Section 4?

5.1 Act (V) and Patient (P) in general

The participants in the Swedish group placed the picture representing the Act before that of the Patient (V > P) 208 times, and vice versa (P > V) 219 times. Thus, the prediction that Act picture would precede the Patient, as in the dominant word-order in Swedish, was not supported. On the other hand, the order between Act and Patient pictures for the Kurdish group was as predicted: 144 (V > P) and 265 (P > V). Figure 6 shows the ratios between the two orders for the two groups. While H1 was not supported exactly as stated, the effect of the language on the order was significant (B = -0.969, SE = 0.478, z = -2.028, p = 0.043, r=0.14).

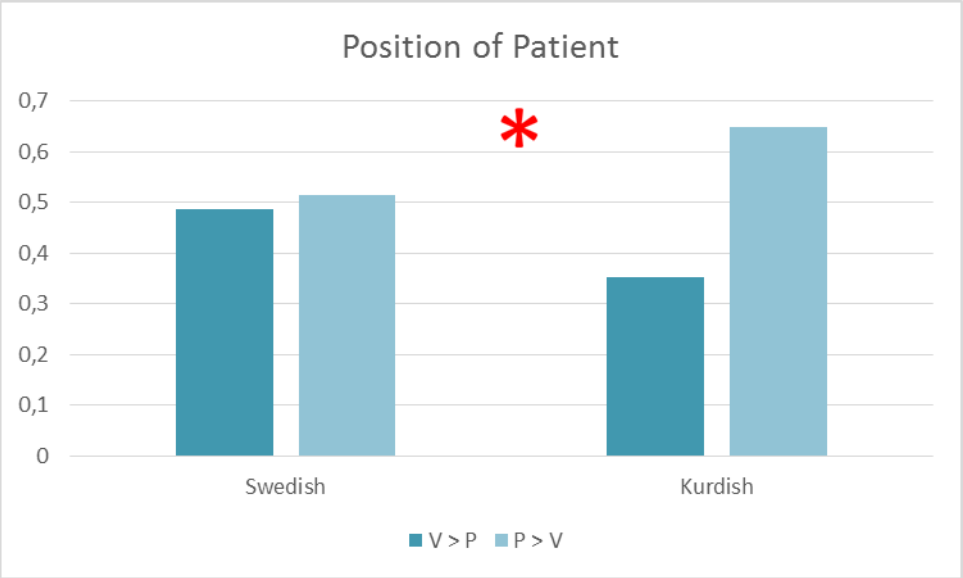


Figure 6. Ratios of placing the Act picture before Patient picture (V > P) and vice versa (P > V) in the two language groups (Swedish: 0.49, 0.51; Kurdish: 0.35, 0.65)

5.2 Act (V) and Patient (P): thinking-for-speaking

Were the differences between the two language groups reported above stronger in the *With verbalization* condition, as predicted in Hypothesis 2? As can be seen in Table 3 and Figure 7, there seemed to be a thinking-for-speaking effect for the Swedish group, but not for the Kurdish group. The tendency to place V > P (as in the constituent-order of the language) was stronger in the *With Verbalization* condition than in the *No Verbalization* condition in the Swedish group, and it was marginally significant (B = -0.934, SE = 0.498, z = -1.876, p = 0.061, r= 0.15). The Kurdish group however tended to place the Act picture in the end in both conditions (actually even more often in the No Verbalization condition) and no evidence for the thinking-for-speaking effect was detected (B = -.0946, SE = 0.864, z = -1.096, p = 0.273, r = 0.10).

Table 3. Position of the Patient picture (P) with respect to the Act picture (V) in the two conditions in both language groups

Group	Swedish		Kurdish	
Position of Patient	V>P	P>V	V>P	P>V
With verbalization condition	**125 (.60)**	98 (.45)	82 (.57)	124 (.47)
No verbalization condition	83 (.40)	**121 (.55)**	62 (.43)	141 (.53)
Total	208	219	144	265

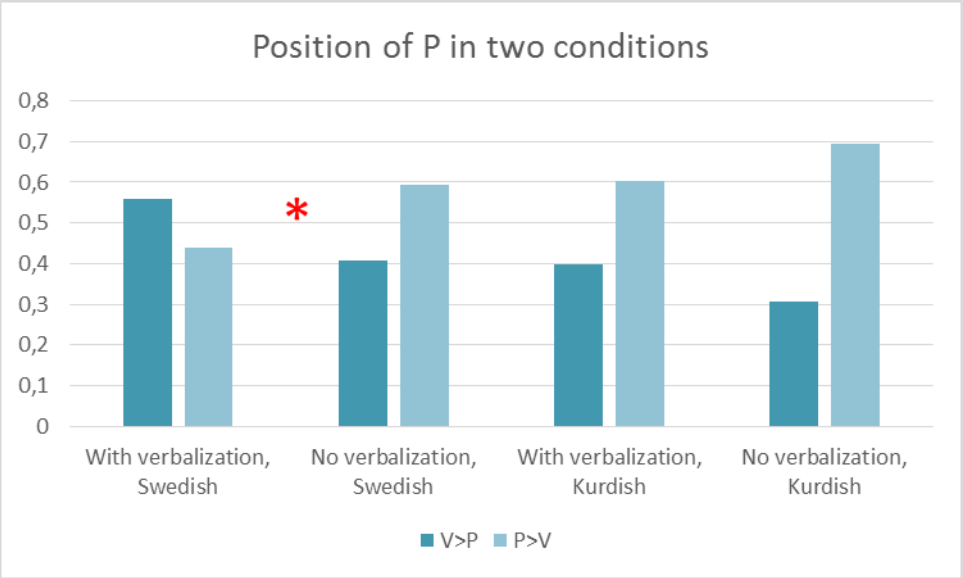


Figure 7. Position of the P in the two conditions in both language groups (ratios in Swedish: 0.56, 0.44, 0.41, 0.59; Kurdish: 0.40, 0.60, 0.31, 0.69)

5.3. Correlations of V/P orders in picture tasks and verbal descriptions

Table 4 shows the orders of V and P for the Swedish and Kurdish participants who performed the task in *With verbalization* condition. As can be seen, support for the Hypothesis 3 was found for the Swedish participants, who predominantly use the V > P order both in their verbal descriptions and in their picture orders. When they used the order P > V (in topicalizations and passive constructions), there was also the tendency to use this order in the pictures. In other words, the Swedish participants tended to use the same order of representing the events in their pictorial representations as the one they had just used in speech, (B = 4.372, SE = 1.371, z = 3.189, p = 0.001, r=0.19). For the Kurdish group there was no such correlation (B = 0.009, SE = 1.020, z = 0.009, p = 0.993, r=0.01).

Table 4. The order used in speech in *With verbalization condition* compared to the order in pictures in the same condition

	Swedish VERBAL DESCRIPTION		Kurdish VERBAL DESCRIPTION	
	V>P	P>V	V>P	P>V
PICTURES V>P	**116 (.97)**	3 (.03)	3 (.04)	66 (.96)
PICTURES P>V	65 (.88)	**9 (.12)**	5 (.05)	101 (.95)

5.4 Act (V) and Landmark (P) in general

Unlike the different placements of V and P in Swedish and Kurdish, the speakers of both languages tended to place the Landmark at the end of the sentence, as shown in Section 3. Hence, Hypothesis 4 predicted there will be no difference between the two language groups in the picture orders in this respect. As Figure 8 (representing proportions) shows, this hypothesis was clearly not supported. While the Swedish participants placed the LM after the V as predicted (456 times V > LM, 89 times LM > V), the Kurdish group did not follow this pattern, and rather tended to place LM before V (V > LM 209 times, LM > V 317). The effect of language was significant (B = -3.962, SE = 0.786, z = -5.038, p = 0.000, r= 0.45), meaning that contrary to H4, there was significant difference between the two groups.

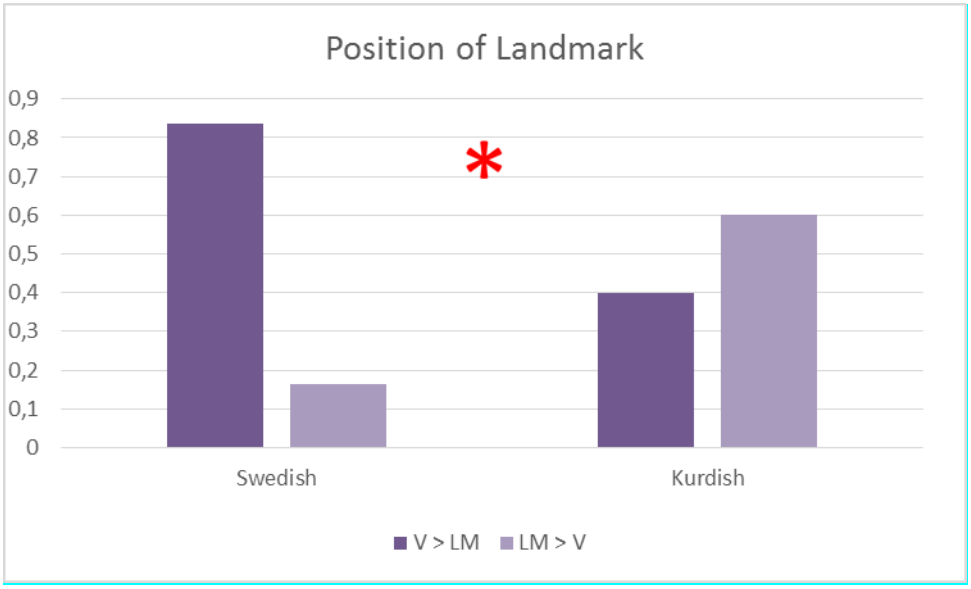


Figure 8. Ratios of placing the Act picture before Landmark picture (V > LM) and vice versa (LM > V) in the two language groups (Swedish: 0.84, 0.16, Kurdish: 0.40, 0.60)

5.5 Act (V) and Landmark (LM): thinking-for-speaking

As with Hypothesis 2, there was evidence for a thinking-for-speaking effect in the Swedish group: where the effect of the condition Verbalization was significant (B = -2.808, SE = .901, z = -3.116, p = 0.002, r = 0.29). For the Kurdish group, the effect went in the expected direction: a stronger preference for V > LM (as in the language) in *With verbalization* condition, rather than with *No verbalization* condition LM>V. However the effect of the

condition was not found to be significant (B = -1.662, SE = 1.159, z = -1.434, p = 0.152, r = 0.22). This is shown in number of responses in Table 5, and in ratios in Figure 9.

Table 5. Position of the Landmark picture (LM) with respect to the Act picture (V) in the two conditions in both language groups

Group	Swedish		Kurdish	
Position of Landmark	V>LM	LM>V	V>LM	LM>V
With verbalization condition	265 (.58)	17 (.19)	132 (.63)	129 (.41)
No verbalization condition	191 (.42)	72 (.81)	77 (.37)	188 (.59)
Total	456	89	209	317

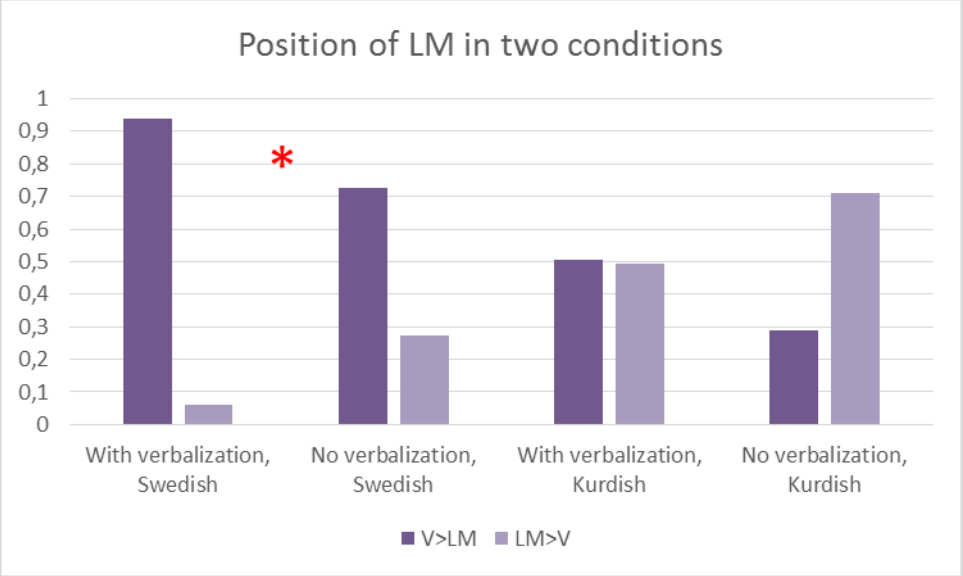


Figure 9. Position of the LM in the two conditions in both language groups (Swedish: 0.94, 0.06, 0.73, 0.27; Kurdish: 0.51, 0.49, 0.29, 0.71)

5.6. Correlations of V/LM orders in picture tasks and verbal descriptions

The effect of linguistic constituent order ("word order") on picture order for V and LM was further supported by analysing the correlations between these orders in the two media for the groups who produced verbal descriptions before performing the pictorial task (*With verbalization* condition).

Hypothesis 6 was supported since positive correlations between the relative order of V and LM in speech and in the picture task for both language groups were found. As predicted, the most usual outcome turned out to be the same in both cases, with V > LM being the dominant order in this condition. For the Swedish group the correlation between constituent order in the verbal descriptions and the picture sequences was significant (B = 4.642, SE = 1.217, z = 3.815, p = 0.000, r = 0.46) and for the Kurdish group as well (B = 1.909, SE = 0.672, z = 2.842, p = 0.004, r = 0.14), as shown in Table 6.

Table 6. The orders used in speech in *With verbalization condition* compared to the order in pictures in the same condition

	Swedish VERBAL DESCRIPTION			Kurdish VERBAL DESCRIPTION	
PICTURES		LM>V	V>LM	LM>V	V>LM
	LM>V	**3 (.3)**	7 (.7)	**19 (.21)**	73 (.79)
	V>LM	1 (.00)	**242 (1.00)**	11 (.11)	**93 (.89)**

6. Discussion

As reported in the previous section, the hypotheses of the study were largely, though not completely, supported by the results. The main expectation of differences in the preferred "picture orders" between the two language groups was confirmed. Still, the Kurdish participants seemed to be less influenced by the orders of their verbal description than the Swedish group. Why was this so? The answers the participants gave in the debriefing will be considered here and factors influencing orders in non-verbal representations discussed in Section 2 will have to be taken into account, as well as more general cultural factors.

6.1 Interpreting the results

The prediction regarding the placement of the Patient in the pictorial sequences was confirmed for the Kurdish test group: the dominant constituent order P > V in language was preferred in the pictorial representations as well. However, this was also the placement predicted by a cognitive bias for placing the Act finally, such as that of Goldin-Meadow et al. (2008), so the Kurdish results cannot be used to distinguish between these factors.

The Swedish test group used both orders almost equally with a slightly higher (not significantly different) score in P>V (see 5.1). Since this does not correspond to the dominant constituent order in Swedish sentences, this pattern cannot be explained solely as an effect of language. Thus, on the one hand Swedish results can be seen as supporting a bias for placing the Act finally, at least when representing motion events, rather than "intensional" events (cf. Section 2.2). But on the other hand, the significant difference between the two language groups shows that this preference is exactly a bias, interacting with other factors, linguistic constituent order being one of them.

The effect of "thinking for speaking" for placing the Patient was tested by conducting the experiment with two conditions: the *With Verbalization* and the *No Verbalization* condition. The results supported the hypothesis marginally for the Swedish, but not for the Kurdish group, who had the tendency to follow the P>V pattern by placing the Verb in the end in both conditions. When first providing verbal descriptions, the pictorial orders of the Swedish participants tended to follow the P>V orders in these descriptions, but it was not the case for the Kurdish group. The overall results for the experiment concerning the position of the Patient suggested that the Kurdish test group was more consistent in using the P>V order

regardless of the condition, and that the Swedish group was more sensitive to the influence of speaking in the *With verbalization* condition. This supports the interpretation that the P>V order was in a sense default, and perhaps because of it, the Kurdish speakers did not display an apparent influence from language, at the same time as an effect of language for the Swedish group was detected.

The fact that LM is most often placed at the end of clauses in both languages was an important indication to test where linguistic order would have a similar effect on both groups. In the Swedish group LM indeed was placed in the end in most picture sequences, but in the Kurdish group LM>V was in general the preferred order. Was the Kurdish group more influenced with the cognitive factor biasing for placing the representation of Act at the end of the sequence?

To help answer this question, the position of the Agent with respect to Verb was analysed as well, since the A> V order is predicted both by the cognitive factor, and possible linguistic influence, since Agent precedes Verb in both languages. As expected, the Agent was found in the pictorial representations most often in the initial position, thus it mostly appeared before the Act. However, there was a difference between the languages: the Swedish group had Agent before Act more often than the Kurds, as shown in Figure 10, and the difference was found to be significant (B = 1.950, SE = 0.673, z = 2.897, p = 0.00377). These results support the interpretation that there is indeed a cognitive bias for placing Act at the end of a sequence, and the Kurdish group was more influenced by this bias, possibly due to less familiarity with written language (see 6.3).

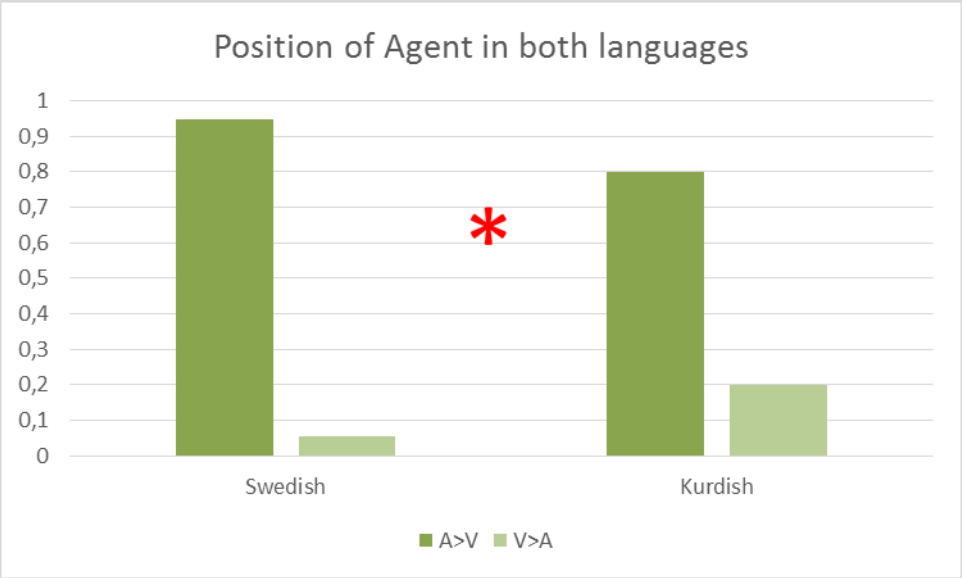


Figure 10. Position of Agent in relation to Act in both languages (Swedish 0.95, 0.05; Kurdish 0.80, 0.20)

Another factor may also have contributed to the difference between the language groups with respect to V/LM order. In Kurdish LM may appear before V more often than in Swedish, and it actually was detected in speech strings in 30 out of 196 utterances, while in Swedish it only appeared in 4 occasions out of 253. If the V>LM is not clearly the default order in language, as it is in Swedish, it might have had an impact on LM>V strings being more usual in the pictorial representations as well. Another possibility would be, that in *No verbalization* condition the Kurds experienced the picture of LM as a Patient, and placed it before the Act, as it is in language.

In sum, the Kurdish group showed a strong tendency to place the Act picture in the end of the pictorial strings. Two possible reasons could explain the outcome: (a) effect of the language in which a verb is often at the end of a clause, and (b) a language-independent cognitive bias (Goldin-Meadow et al. 2008), perhaps due to iconicity (Christiansen and Tylen 2013). The Swedish groups showed more clearly an effect of linguistic constituent order, but also a "pull" toward placing the Act finally that could not be counteracted by language fully. Together, the findings strongly suggest a composite effect of both language and cognitive bias.

While ordering P and LM, the Swedish participants were more inclined to follow the order in speech in the pictorial representations while speaking than the Kurdish group, who nevertheless showed some evidence for being influenced by the language due to the positive correlations between verbal and pictorial orders (cf. 5.6) and the fact the LM>V preference

was neutralized in the *With verbalization* condition (see 5.5 and Figure 9). In the Swedish group the difference was more outspoken: considerably less LM>V strings were found in the *With verbalization* condition, strongly suggesting that the effect of "thinking for speaking" was discovered. Importantly, there were correlations between the orders of the verbal descriptions and the pictorial representations in both language groups.

Thus, the findings provide support for the impact of linguistic order on the order of non-verbal tasks, but this impact was stronger for the Swedish than the Kurdish group. What could have caused the differences between the two groups? Was there something in the test situation that could have influenced? Or is there a cognitive, linguistic or cultural factor that might have been behind the differences? Some possible explanations for the differences in findings will be discussed in 6.3.

While conducting the experiments some questions emerged related to the method: Was the design optimal for researching non-verbal representations or was there something that could have been done better? In debriefing some issues regarding the interpretation of the stimuli were detected. Also, participants were not found to follow only the model in their native language, but other strategies were detected as well.

6.2 Indications from debriefing

As stated in Section 3, the participants were debriefed after performing the task, focusing on the questions: (a) how they understood the arrow in the pictures, (b) if they had any strategy for using a particular order, and (c) if they could discern what the point of the experiment was.

The most usual answers to (a) were that the arrow was understood as representing motion, action or direction. When asked to label this in language, participants responded with verbs (e.g. take), sometimes to a preposition (e.g. to) or a directional adverb (e.g. there). The other two questions showed to be more difficult. Most of the participants said they did not know. Only few in both language groups could detect the aim of the experiment.

A few gave a detailed explanation of how they were thinking while arranging the pictures, such as the following.

> "I understood the arrow as a symbol for motion. If the actor had a direct contact with the thing [object], I would place the thing immediately after him. Otherwise I´d put the arrow between them." (Swedish, female, with verbalization)

> "Sometimes I´d think this way: "A man pushes a wagon to another man", and I would use the order *man-arrow-wagon-other man*. Other times I thought: "A man has a wagon and he takes it to another man", and the order would be: *man-wagon-arrow-other man.*" (Swedish, female, no verbalization).

> "I´d put first the thing that was stable and standing in one place, and after the moving things" (Swedish, female, no verbalization)

In Kurdistan the answers to debriefing were roughly the same as in Sweden, although the metalinguistic knowledge was somewhat weaker, and the participants often did not know what to reply when asked to explain their interpretation to what the linguistic connection to the images was. The following response was unusual.

> "If there was something wrong with the event in the clip, I would put the arrow last, but if the event was "normal", I´d place the arrow in the beginning" (Kurdish, female, no verbalization)

By "wrong" or "anomalous" event she referred to video-clips where, for example, a basket moved to a woman without an obvious force causing it. However, when coding the pictorial representations, no consistent system for categorizing was found in her results. Did she just make up the explanation in the moment, or did she actually use the strategy in an inconsistent way stays unknown.

An unusual case among Swedish participants was a young male. He placed the pictures almost exclusively in Agent-Patient-Act order.

> "I used to read a lot of Japanese comics [in English/Swedish] and I was thinking of making a comic of the pictures in the task. I placed them as they would appear in a comic book. I rarely said the actual sentence in my head. I think it was the case when I saw the clip "a boy goes to a girl" (Swedish, male, no verbalization)

The participant had taken a first level course in Japanese, and he had only little knowledge of it.[8] However, it would be ungrounded to think that the scarce knowledge of Japanese could have influenced the order, yet one could speculate about the indirect effect of Japanese through the comics created by Japanese authors. Is there a certain conventionalized order in them in which events are represented? Analysis of comics would be required to answer this question.

In sum, the responses obtained in debriefing demonstrated that many participants used the linguistic descriptions as a model for arranging the pictures, but some used other strategies for representing the events.

6.3 Cultural factors

The Swedish and Kurdish participants had very different cultural backgrounds. In Kurdistan life circles around big families and visiting relatives and friends, and less time is spent alone. It is possible, that the average time used for reading is less than in Sweden, if looking at the whole population. Could the frequency of seeing language in written form have an impact on non-verbal representations? Are people more conscious of the constituent order in their language if they not only hear it, but even see it daily? Five Kurdish participants were overtly illiterate, and some others did not have very good reading and writing skills. Previous studies have indicated that literacy has an impact on cognition both in case of language processing, and in non-linguistic tasks (Castro Caldas 1998; Dehaene et al 2010). Literate subjects have been found to perform better than the illiterate in neuropsychological tasks that require coding, decoding and producing of 2D pictures of objects (Petersson 2001). In the experiments there was a notable difference between the language groups in one more sense: the Kurds described the animated people in video-clips as if they were real: a doll representing a man was described as "a man", but the Swedes often denoted the same animated character as "a doll" (*docka*), a "Duplo-doll" *(Duplo-docka*), a "toy" (*leksak*) or a "toy hubby" (*leksaksgubbe*).

Other differences in generalization ability from pictures to real objects between members of cultures where people are not exposed to pictures compared to individuals who have grown up in Western cultures have been detected (Walker 2012). However, in Kurdistan,

[8] This was the only one of the Swedish participants who had had any contact with an SOV-language.

Suleymania, the way of life is relatively urban and people have access to TV, Internet and mobile phones, thus especially the young generations have been exposed to pictorial representations. The older (over 50 years) however have probably less experience in interpreting 2D images than an average Swedish person of same age. The interpretation of live-action video-clips tended to be more uniform and predictable than the interpretations of the animated clips, but no statistical analysis was done to measure if there was a significant difference between the groups. If this factor could possibly effect the order in pictorial representations however should be tested in a separate study. The difference in interpretations could of course even depend on that among Kurds the concept of toy might be less present than among speakers of Swedish simply because of a shorter history of supplying children with industrially produced objects for playing.

Some tendencies between the language groups could be detected in performing the task: Swedish participants performed the task more slowly compared to the Kurdish, suggesting that the Swedish speakers were more focused on the task. Furthermore, many of the Swedes performed the task in a laboratory setting. In addition, the groups were not balanced regarding education, as explained in section 3. The Swedish group was in average more highly educated that the Kurdish.

6.4 Methodological issues

The following issues could have contributed for some of the uncertainty in the interpretations given in the previous sub-sections.

Placement of pictures. The pictures were arranged on the white cardboard as explained earlier. The motivation for this was to avoid any directional bias, i.e. the direction where the arrows pointed at were not supposed to affect the order. However, Act pictures in which the arrow pointed slightly down- or upwards, could in some cases cause that a participant placed the Landmark at a position where the arrow pointed at, although in other situations, where the arrow was round or in a horizontal position, the same participant would put the Landmark in the opposite end of the string.

How did the participants understand the semiotic content of the pictures they used for the representations? During the debriefing the participants sometimes pointed at the pictures one

by one and referred to the corresponding linguistic constituent, which made it possible to see concretely how each constituent was interpreted. In the debriefing there was not much variation in the answers concerning the entities depicting Agent, Patient or Landmark, but varying responses were obtained for the Act-pictures. The arrows were interpreted as motions, actions, directions, and labelled with verbs (takes, moves), prepositions (to, towards) or directional adverb (there). The schematic nature of the image of the arrow seemed to allow multiple readings unlike the pictures of the other constituents that were more transparent in their meaning. Since the placement of verbs and other form classes differs in both Swedish and Kurdish, such ambiguity could have masked an even closer correspondence between linguistic and pictorial order than what was found. A possible solution in future research is to utilize images with the same grade of transparency for the Act pictures as for the arguments. For instance images of a hand with a movement depicted with a tiny round arrow (twist) or a picture of legs in movement (walk), or, alternatively to separate the constituents Act/Verb and Direction/Preposition on detached cards.

Semantic roles. The Swedish sentence in (15) was an example of one the "alternative" P > V orders found.

(15) En hund med en blomma i mun-nen går mot en hundkoja.
A dog with a flower in mouth.DEF go.PRES towards a doghouse.
A P V LM

"A dog with a flower in its mouth goes towards a doghouse."

Although not being a Patient in a strict sense in this clause, the flower was coded to be one according the coding schema for pictures. The same phenomenon was detected in other utterances, too, which may have influenced the overall score. It is possible that the coding of (Proto-) Patient was too general, and a future study would need to distinguish sub-types. The animacy of the Patient was another factor that could cause the Agent and the Patient to switch position, as proposed by Meir et al (2010) and Hall et al (2013). For instance "a woman" in "a gate hit a woman" was often topicalized in verbal descriptions, and a passive construction was used both in Swedish and Kurdish. The same was done in pictorial representations, i.e. the woman was placed first in the string. Signs of a hierarchy between two animate constituents, a human being and an animal, could be traced too, although in case of "a dog runs to a woman"

another influencing factor could be spotted as well: stability. Certain participants opted to put a Landmark in the beginning, because it was stable, and the Agent was moving towards it.

Other factors. The stimuli did not include events where the Patient was changing, which would test the hypothesis of Schouwstra (2012) and Christensen and Tylen (2013) concerning the effect of the ontological status of the Patient. Another factor that could not be controlled for was the size of Agent, Patient or Landmark. If the Agent was tiny (a mosquito), and the Patient big (elephant), would the Agent still be placed first? New stimuli should be created with which the different factors could be controlled and analysed separately.

7. Summary and conclusions

In this thesis the question concerning possible influence of language on thinking was addressed by investigating constituent orders in non-verbal representations. Reconstructions of motion events were elicited with video-clips and picture cards, which were the same as in the well-known study conducted by Goldin-Meadow et al (2008). Unlike in the original study, which did not find an effect of the constituent order of different languages, the present study used separate picture cards rather than transparencies. These were to be arranged in a top-down order in representing the event seen in the video clips, rather than stacking the transparencies on top of each other. This design change made a profound difference. The Swedish participants in the study were clearly influenced by the dominant word order of their language, and preferred to place the Patient picture after the Act picture. This effect was increased after describing the stimuli in language, supporting a Slobin-style thinking-for-speaking hypothesis. The order in the Kurdish group was significantly different from that of the Swedish group, preferring Act after Patient both with and without verbalization.

Several factors may explain this difference. It is possible that the Kurdish group was less influenced than the Swedish group by language due to less familiarity with written language, and other cultural factors. However, there were correlations between the orders of the Act and Landmark order between verbal and pictorial sequences also for the Kurdish group, which shows that they were not immune to linguistic influence.

More likely, the findings support *a joint effect of at least two different factors*: the order of the native language of the participant and a (universal) bias for Agent-Patient-Act order, found in other studies when the events represented are *extensional*, i.e. motion events. The fact that the Swedish participants used this order significantly despite the opposite order in their language supports this.

In sum, a number of different factors impact on the orders of arguments such as Agent, Patient, Landmark and Act, in non-verbal representations. In combination with the factors found in earlier studies, a more complete picture was obtained by adding language on the list of contributing factors. The major conclusions can be stated shortly: neither general cognition nor native language determines the orders used in non-verbal representations, but rather their interaction. This is admittedly a more complex explanation than either-or, but the only one

that is fully consistent with the findings. Future studies will need to elaborate this empirically and theoretically.

To be able to find even stronger evidence to either support or to refute the premise that the language we use actually has an impact on other cognitive processes, much more research is needed to be done. There are many factors that need to be taken in consideration when designing an experiment for investigating linguistic influence on non-verbal behaviour. Each new study in the field provides new knowledge for answering the question: Does language shape the way we think and if so: how?

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