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The Natural Order of Events: speakers of Polish do not follow the pattern

Abstract. Research on constituent order is informative about language development and change, since constituent order is one of the earliest properties of language learned by children, and it displays a systematic variation across the languages of the world (Goldin-Meadow et al., 2008), including sign languages (Napoli & Sutton-Spence, 2014). Nonverbal communication in language evolution studies is currently in focus due to the gestural primacy hypothesis, which posits that language could have first emerged as a gestural/pantomimic system and subsequently evolved into primarily vocal communication (Żywiczyński & Wacewicz, 2015; Żywiczyński, 2018). In this paper, we review our earlier work on constituent order in pantomimic production, and complement it with two studies which investigated the influence of constituent order on comprehension. We conclude that constituent order has no influence on comprehension of pantomime.

Keywords: natural order of events; language evolution; nonverbal communication; linear order; syntax; pantomime.

Natural Order of Events

The natural order of events hypothesis states that, despite the existence of six possible methods of arranging the prototypical affirmative sentence,

there is an innate preference for humans to represent events in a fixed manner, using SOV order (Goldin-Meadow et al., 2008; Newmeyer, 2000; Shun-Chiu, 1982). The hypothesis rests on evidence from historical and comparative linguistics, emerging sign languages, theories of language evolution, as well as observations from language systems without full grammar.

To begin with, Givon (1979) and Dryer (2013) observe that most languages use the SOV order, with SVO being close second, and the other patterns constituting a minority in the distribution. In Givon's (1979) view, it is possible that language originally followed the SOV pattern and only at a later stage did it develop other sentence patterns, a process which may be reproduced via historical reconstruction. Similarly, Newmeyer claims that "[t]he earliest human language had rigid [...] SOV word order" (2000: 372). Additionally, Gell-Mann and Ruhlen (2011), resting on evidence from archaeology, linguistics and genetics, speculate that early behaviourally modern humans could speak a single language. With the use of a putative phylogenetic tree, Gell-Mann and Ruhlen (2011) arrive at the conclusion that the ancestral language was an SOV one, and only later diverged into a number of other patterns.

That there is a certain cognitively-motivated preference for the SOV order is also attested by data from emerging sign languages. Newly spontaneously emerging sign languages, such as the Al-Sayyid Bedouin Sign Language (ABSL) or the Nicaraguan Sign Language (NSL) manifest a verb-final pattern. Observations from these two sign languages are significant because the sign languages emerged without an external intervention: NSL developed in a community of congenitally deaf children with no prior contact with any sign language (Goldin-Meadow & Mylander, 1984, 1998; Senghas & Coppola, 2001). ABSL, similarly, developed as a means of communication between people who lost their sense of hearing at a pre-linguistic stage (Sandler et al., 2005).

Finally, owing to the analyses of pidgin languages, which typically lack an advanced grammar, Bickerton (1990) and Jackendoff (2002) make conjectures regarding the nature of *protolanguage*, i.e. a system of communication used at a stage before a fully-fledged modern language emerged (Żywiczyński & Waciewicz, 2015). Whereas Bickerton proposes that elements of protolanguage were put like beads on a string, without any rules restricting the order of elements, and with pragmatic inference serving to comprehend a message, Jackendoff proposes the notion of *linear grammar* (Jackendoff, 2002; Jackendoff & Wittenberg, 2017). That grammar, Jackendoff and Wittenberg (2017) argue, specified that the subject should appear first. However, similarly to Bickerton, they posit that the meaning of

an utterance was primarily interpreted from the context. The conjecture about linear grammar is based on pidgins, basic varieties of language acquired by immigrants, and child speech, as well as certain structures in contemporary languages, such as compound nouns (for a broader discussion, see Jackendoff, 2002: 246–249).

Pantomime

David McNeill defines pantomime as a “dumb-show of gestures” without speech (1992: 37). Yet, it is crucial that pantomime is not composed of manual gestures alone, but is rather a whole-body creation. Zlatev (2014) argues that pantomime is whole-body mimetic communication. Yet, the most detailed definition was proposed by Żywiczyński et al. (2018), who characterise pantomime as “communication mode that is mimetic (volitional and representational); non-conventional and motivated; multimodal but primarily visual improvised; using the whole body and the surrounding space rather than exclusively manual and stationary; holistic and non-segmental; communicatively complex and self-sufficient; semantically complex; displaced, open-ended and universal” (Żywiczyński et al., 2018: 308). Because of its universal presence in human cultures, pantomime makes a useful tool for investigating the possible effects of linear ordering of constituents and natural order of events. Its form enables us to elicit event order without any direct interference from the performer’s mother tongue and look at how successive elements of a narrative emerge.

As we discussed earlier, studies in newly emerging sign languages, as well as nonverbal research, suggest that there is a particular order of events that is preferred over others in nonverbal communication, the Subject–Object–Verb order, in which the action is the last information given (Goldin-Meadow et al., 2008; Schouwstra et al., 2020). We hence argue that pantomime should be a medium preferred in the natural order of events research exactly because it is omnipresent across cultures and is independent of spoken language. Another argument in support is that pantomime could have been the original system of communication in humans (Żywiczyński & Waciewicz, 2015; Zlatev et al., 2020).

Investigating the order of events can bring us closer to understanding the way we process information, and whether this processing is sensitive in relation to the semiotic system used for communication. As studies we describe below show, linear organisation for gestural, pictorial and verbal representation may vary even within the same language. The element we

find crucial for the study, following Meir et al.'s design from 2010, is the presence of two types of events in the material, *reversible* (in which both the agent and patient have the capacity to be the doer of the action), and *non-reversible* (in which only the agent has the capacity to be the doer of the action).

Experimental work

In this section, we present an overview of research on event order in nonverbal communication conducted prior to our experiments. Our hypotheses were greatly influenced by the results of the studies presented below and our methodology follows the designs shown below.

Goldin-Meadow et al. (2008)

In one of her pioneering experiments in event order, Susan Goldin-Meadow and her team (2008) tested whether the word order of one's spoken language influences event order in nonverbal task performance. To test that, a group of speakers of four different languages: English, Turkish, Spanish and Chinese was invited to the lab where they performed two types of nonverbal tasks: a communicative one and a noncommunicative one. In the former task, 40 participants (10 for each language) were asked to describe pictures displayed on a computer screen. There were 36 different events chosen based on early language production in children, such as *woman-twists-knob* or *girl-gives-flower-to man*. To determine the predominant speech order of the participants, they were asked to first describe what they see in speech, and only then to describe it in gesture. Another 40 participants (10 for each language) were given a set of transparent pictures with elements they have seen in the vignettes beforehand and were asked to stack them to retell the events. The tasks were designed to see if the participants would transfer their spoken word order patterns onto gestural representation and transparencies stacking task.

Both the first and the second task results proved that the participants used different word orders for different types of tasks. And so, in verbal descriptions of events, they followed: English and Spanish – SVO, Turkish – SOV, and Chinese – SVO for static and SOV for motion events. The enquiry into the natural order of events of the group of languages under investigation was concluded with one major finding: the predominant gesture order,

regardless of the type of the task performed and the spoken language of the participants, was SOV.

Meir et al. (2010)

The study conducted by Goldin-Meadow and colleagues was repeated by Meir et al. (2010), however, with an important change in the design. The group conducted experiments with actors performing two types of events, which later were termed reversible and non-reversible. The former involves two animate participants, both of whom can assume the role of the agent of the action, whereas in the latter type of events, one of the participants is animate and the other inanimate, rendering the interpretation more straightforward. An additional change in the design involved the type of re-enactment the actors were requested to perform. In contrast to Goldin-Meadow et al. study, instead of gesture, Meir and colleagues asked the participants to perform transitive events using pantomime. The participants were native speakers of Turkish (an SOV language) and Hebrew (SVO). The results of the experiment showed that although participants still tended to re-enact non-reversible events as SOV, they changed the order of representation to SVO in the case of reversible events, notwithstanding the native language of the participants. Meir et al. (2010) stated that the actors avoided arranging two animate participants without any case marking in direct adjacency in order to avoid the possibility for the misinterpretation of the event, which is a comprehension-oriented interpretation.

Gibson et al. (2013)

Yet another study in this paradigm was carried out by Gibson et al. (2013), who introduced a similar manipulation in the transitive events as above. Gibson and colleagues invited three groups of native speakers of different languages: English (SVO), Japanese and Korean (both SOV). They found that native speakers of English followed the behaviour outlined above, i.e. they used SOV for non-reversible and SVO for reversible events. However, the Japanese and Korean groups consistently used SOV event order, which signifies a potential influence of their native languages. Additionally, this study involved one more stage, in which the speakers of Korean and Japanese were asked to pantomimically describe more complex events, for instance *The man says that a woman pushes a boy*. As a result of the manipulation, the

two groups switched from SOV to SVO. Similarly to the findings reported above, Gibson et al. (2013) arrive at a comprehension-oriented interpretation. They assume that communication occurs within a noisy channel, in which the intended message can be obscured due to such factors as “errors on the side of the producer, external noise, or errors on the side of the listener” (Gibson et al., 2013: 1080). In order to minimise information loss, communicators attempt to express their intentions as accurately as possible, and listeners use the partially obscured message in order to reconstruct the intended message. Within the context of the experiment, SVO is less likely to be misinterpreted than SOV for reversible events. Even if information loss occurs, Gibson et al. (2013) argue, the message can be even partially reconstructed, i.e. either someone pushes another person or someone is being pushed. With SOV order and this type of information loss, the “listener” would only receive information about the parties engaged in the action.

Hall et al. (2013)

Finally, a study conducted by Hall and colleagues (2013), used the silent gesture paradigm in order to investigate the problem of event order shift in reversible events. Similarly to the experiments reported above, participants of Hall et al.’s study were asked to re-enact with gesture, but without using language, simple transitive events. All participants of the experiment were native speakers of English. In general, the results can be said to be consistent with the previous studies, meaning that SOV was used for non-reversible events and SVO for reversible ones. However, Hall and colleagues argue that since such orders as OSV, SOSV and SOSVO were attested, neither the noisy channel nor the confusability hypothesis explains the shift sufficiently. They argue that OSV and SOV are equally difficult to understand and are equally prone to be corrupted while communicating over a noisy channel. Consequently, Hall and colleagues (2013) propose that the avoidance of the SOV order, or in fact any ordering where V comes directly after O, stems from role conflict, adding that the confusability and noisy channel hypotheses are also important. Role conflict occurs when “the producer detects a potential mismatch between the intended agent of the action [...] and the most recently adopted role” (Hall et al., 2013: 13).

The research on natural order of events in the Polish language

The results from these experiments, and the fact that various language groups were taken into consideration, served as a basis for our research programme. To our knowledge, no other research on natural order of events with native speakers of Polish had been conducted prior to our first experiment. Polish, unlike English, is a highly inflected language in which the word order does not determine either syntactic or semantic roles (Karolak, 1995); however, it is SVO that is considered canonical (Huszcza, 1980; Siewierska, 1993). Nevertheless, the same message can be communicated in two ways that are of interest in this study: SVO and SOV (e.g. *Janek kopnął Bartka* and *Janek Bartka kopnął*, respectively: Janek-NOM kicked Bartek-GEN and Janek-NOM Bartek-GEN kicked).

Since so many different forms are possible, we evaluated Goldin-Meadow et al.'s 2008 finding in four different experiments we describe in detail below, in which we ask the following research questions: i) What is the “default” order of pantomimic re-enactments of transitive events if actors are given no instructions? ii) Is the linearisation strategy of an actor different for reversible and non-reversible events? iii) Does the order of re-enactments influence decoding the message? The hypotheses we set posit, accordingly, that: a) The order of events we observe in pantomime will reflect the supposed natural order of events, i.e. S–O–V; b) The linearisation strategy will be different for the two different kinds of events; and c) Regardless of reversibility, it will be easier to understand SOV-types of pantomime, as predicted by the natural order of events hypothesis.

Previous studies in pantomimic re-enactments

In our previous study (Boruta & Placiński, 2017), we investigated the constituent order of pantomimic re-enactments of reversible-only events in spontaneous, non-instructed pantomime. We hypothesised that the order of events in the pantomimes will reflect the trend found by Goldin-Meadow et al. from their 2008 research – a presumed natural order of events (SOV). To that end, we used the data from Zlatev et al. (2017). The material comprised videos in which actors performed pantomimic representations of reversible transitive events (Fig. 1 below). The whole material comprised 80 5–20 s. videos of 5 Polish amateur actors, who re-enacted via pantomimic performance simple reversible events presented as a matrix of cartoon-like drawings, for example “a woman slaps a girl”. What is important, and

ultimately different from Goldin-Meadow et al.'s design, is that the actors were asked to use full-body pantomime and not gesture alone to represent the events. In another study (Placiński & Boruta-Żywiczyńska, 2019), we investigated the ordering strategy the actors adopt for reversible and non-reversible events. Our aim was to see whether the strategy is sensitive to the type of event. Following Goldin-Meadow et al. (2008), we hypothesised that the SOV strategy will be dominant, in spite of the canonical word order in Polish (SVO). Based on our previous findings (Boruta & Placiński, 2017), we created a novel matrix of hand-drawn pictures, in which characters perform reversible and non-reversible events. As a whole, the matrix showed 10 types of simple events – *kick, wave, throw, walk, look, hold, shout, push, twist, pull* – in two conditions: as reversible ($n=10$) and non-reversible events ($n = 10$).



Figure. 1. Stimulus material in the Placiński & Boruta-Żywiczyńska (2019) study: the example of non-reversible (left) and reversible (right) kicking

In both of the studies, we found that SVO is the dominant word order in both reversible and non-reversible events. In fact, SOV was only marginally represented in each corpus. We observed no differences between reversible and non-reversible groups – neither of the patterns was prevalent in the qualitative test. Interestingly, we found cases of gender marking – two male participants indicated that they were acting a female role by gesturing long hair; and case marking – two actors indicated that they were performing the subject or the object role signalling that by the use of an erected index finger (first person) or two erected fingers (second person).

Comprehension in pantomime

Building on the studies presented in 4.1, here we present the result of our next step, which was to investigate the role of the event order in comprehension. The change was motivated by the fact that Gibson et al. (2013) and Meir et al. (2010) hypothesised that an event-type shift in constituent order can be motivated by the concern that the addressee may misinterpret the information. Yet, the hypothesis was not empirically tested. Therefore, to fill in this gap, we designed an experiment in which participants were asked to guess reversible and non-reversible events in two conditions. Based on previous research, we assumed that it would be easier to guess SVO-type of pantomime for reversible and SOV for non-reversible events, following the intuitions mentioned above. To achieve this aim, we designed Experiment One.

Experiment One

We presented a matrix of hand-drawn pictures (Placiński & Boruta-Żywiczyńska, 2019) to one female actor who knew the purpose of the experiment, and was instructed specifically to pantomimically re-enact all of the events in two linear patterns: SVO ($N = 20$) and SOV ($N = 20$) in the reversible and non-reversible condition (10/10 per order). The actor was also instructed not to change the features of her performance between conditions. The actor had 10 seconds to perform each scene. The task of the participants ($n = 25$, age range: 19–21) was to match the scene they were watching with the correct image on the paper-matrix. The scenes were displayed on a computer screen to each of the participants, with a break of 5 seconds between scenes. Thereby, we obtained 25 sheets with answers, 20 scenes each, totalling 1000 answers, 500 per event order condition.

Results

The experiment showed that event order does not determine whether a message can be easily decoded. In terms of correct answers, the participants provided 406 correct answers in the SVO (81 %) and 382 (76 %) in the SOV condition, a difference that was not statistically significant ($p = .731$). We hypothesised that the effect of ordering might have been nullified by the qualitative aspect of the pantomime: in a qualitative post-study analysis,

we found that the pantomime was rich in detail, i.e. the actor provided information about hair length, hairstyle, gender, specific clothing items and so forth. Therefore, Experiment Two was designed.

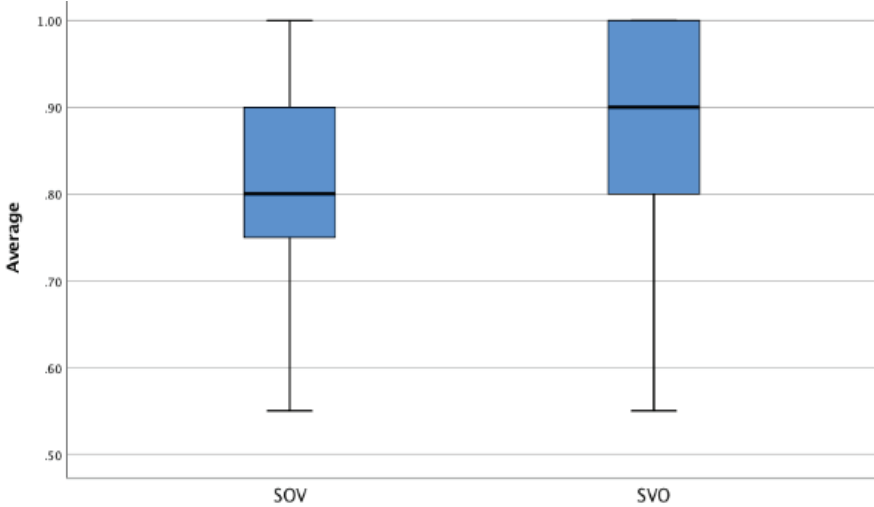


Figure. 2. Correct answers for SOV and SVO order (difference not significant), pantomime rich in detail

Due to the aspects mentioned above, we hypothesised that informationally rich re-enactments might have outweighed any influence exerted by the linear ordering of events on comprehension. To address this problem, we designed another experiment.

Experiment Two

Similarly to Experiment One, one female actor, who knew the purpose of the experiment, and was instructed to act in a particular way, re-enacted all of the scenes from the matrix described above. This time, however, the actor was informed that she should avoid providing too much detail in the pantomime and show only the gender of the characters. We obtained the same number of scenes and 400 answers in total from 20 undergraduate students participants ($n = 20$, age range: 19–21).

Results

We analysed all of the data in spreadsheet software, counted the number of correct and incorrect answers for the SVO and SOV conditions in each group, and we calculated percentage results per each group. The number of correct answers for SVO condition was 313 out of 400 (78%); and the number of correct answers for SOV condition was 303 out of 400 (75%); again, the difference was not significant ($p = .748$).

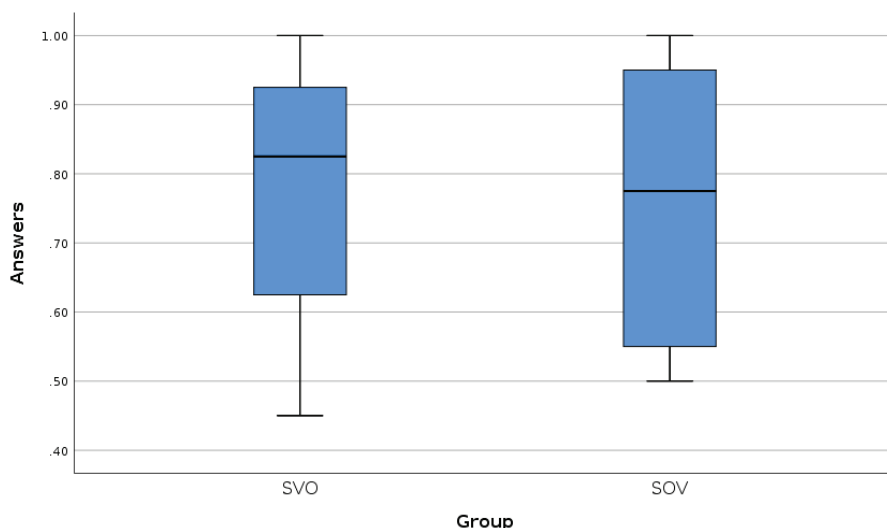


Figure. 3. Correct answers for SOV and SVO conditions (no significant difference), pantomime devoid of detail

Post-study analyses

Originally, we relied only on between-groups comparison of averages. However, they did not capture the possible interactions between the type of event and the score. The statistical analyses concerned the interactions between the event type, order of events, and the score. The figure below displays the results of ANOVA test for Experiment One. Again, similarly to the original results, neither the order nor interactions between the order and event type were significant. The results we obtained for order were: $[F = 1.23, p = .28]$; for reversibility: $[F = .034, p = .85]$; for order and reversibility combined: $[F = .034, p = .85]$.

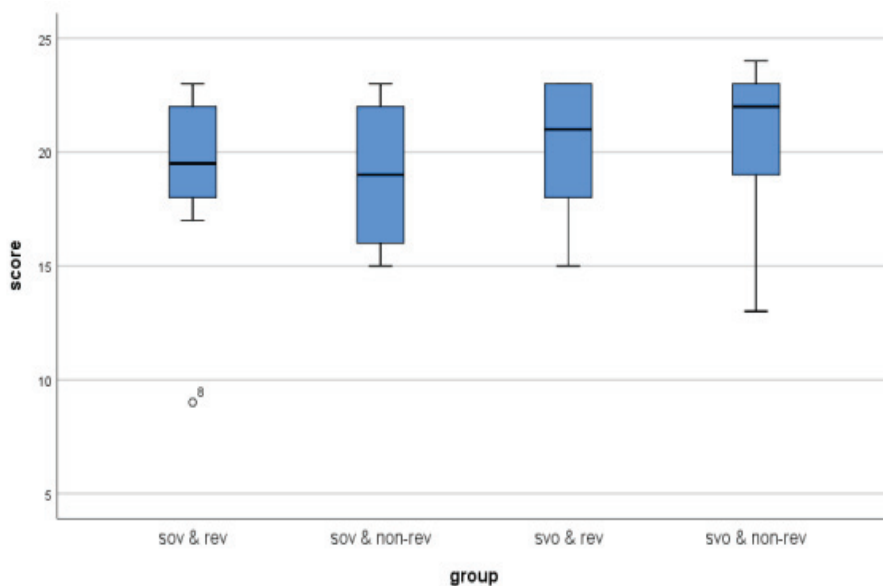


Figure 4. Experiment One: Correctness of answers for SVO/SOV condition and their interaction with reversibility

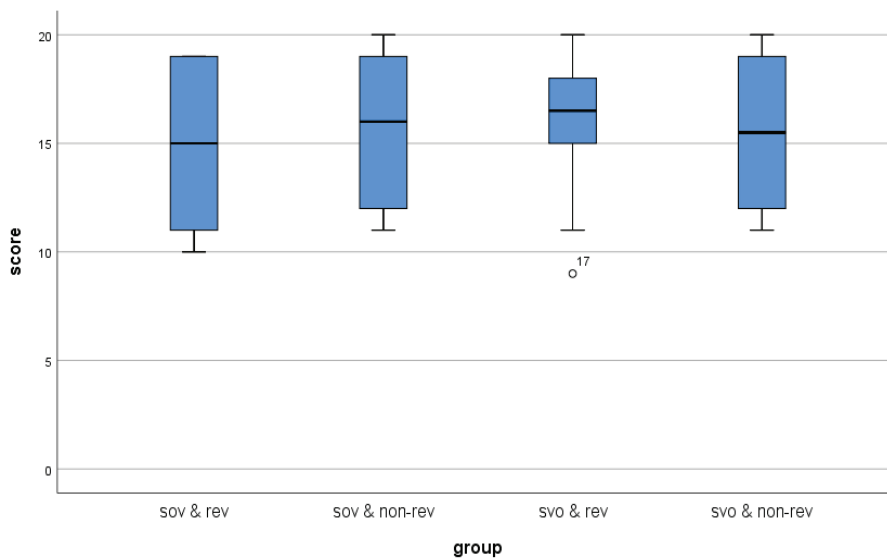


Figure 5. Experiment Two: Correctness of answers for SVO/SOV condition and their interactions with reversibility

We applied the same model for Experiment Two, in which only grammatically-relevant information was coded in pantomime (e.g. gender). However, neither the interactions across event orderings nor between event types and event orderings proved significant. The results we obtained for order were: $[F = .192, p = .66]$; for reversibility: $[F = .192, p = .66]$; for order and reversibility combined: $[F = .28, p = .60]$.

General discussion

Our two previous studies (Boruta & Placiński, 2017; Placiński & Boruta-Żywiczyńska, 2019) provided results inconsistent with the studies mentioned in the theoretical part of the paper. First of all, we found no preference for the SOV ordering in non-reversible events. In fact, across all the event types, SVO was dominant. Our results contradict the previous findings (Goldin-Meadow et al., 2008) due to the fact that there were no major differences between the event order in pantomime and in spoken language. Such a discrepancy may result from the nature of the Polish word order, which is relatively free and which is a null-subject language due to verbal inflections (Embick, 1995; Szczegielniak, 2001). The preference for the SVO order may be due to the influence of the native language of the actors in the experiment – although no such influence was found in previous studies. As mentioned earlier, Polish is a language with a relatively free word order, but SVO is the canonical one. Perhaps this is precisely why actors tended to re-enact the events in this fashion.

Secondly, our results are, to a degree, consistent with the role conflict hypothesis. Actors generally preferred to embody the agentive role notwithstanding event type, which conforms with the role conflict hypothesis when both the subject and the object are animate, but not when the object is inanimate. In the re-enacting studies, actors never separated the agentive role from the action, but they always used their body to simultaneously represent both the subject and the verb. Again, there is a similarity to emerging sign languages, which typically first develop verbs whose subject is realised through the signer's body, and only at a later stage do they accumulate verbs which do not use this strategy (Meir et al. 2007). Moreover, observations show that it would simply be difficult to separate the action from the agent, as it is most often an animate subject performing the action.

One may argue that second language proficiency affects pantomimic re-enactments of events. However, at least for co-speech gesturing, studies in Second Language Development show that although L2 speakers can

acquire gestural patterns of a foreign language, it is their native language, and not the foreign one, that affects speech-accompanying gestures (for an overview, see Gullberg et al., 2008; Kellerman & Hoof, 2003). What is crucial to our research is that the participants produced pantomimic reenactments of events or gestures without speech; therefore, any direct L1 or L2 interference in terms of gesture or bodily movements was removed from the design of the study.

Concerning the second pair of experiments, which were comprehension-oriented, no preference effects have been found, either. Admittedly, a certain limitation of our design was that the stimulus recordings were provided by a single actor, which was however partly compensated for by the detailed instructions given to the actor. Generally, there was no significance for ordering of events in comprehension notwithstanding the event type. Additionally, the ANOVA model showed that the interactions between event type, event ordering, and score are also non-significant. This is evidence against the hypotheses formulated by Meir et al. (2010) and Gibson et al. (2013), since the score was not affected (or was in fact marginally affected) by either event type or event order. A likely explanation for our results lies either in the role conflict, as proposed by Hall et al. (2013), or in the argument we propose below.

If a language follows strict rules of word order, we intuitively expect the users of this language to use word ordering rules appropriate for their language if asked to represent events nonverbally, for instance, as pictures or gestures. However, word order is not fixed for all languages, as some of them allow syntactic variation to express the same proposition, a rule that is related to languages inflection/deflection, that is, the more deflection there is, the more rigorous the word order to compensate the inflectional details that have been lost. We suggest that the results we obtained previously in the experiments reported in 4.1, concerning production in pantomime, are caused by the influence of the actors' native language, Polish. As mentioned earlier in the text, languages can be located at either of two sides of the word order continuum, i.e. fixed or free, which is determined by the inflectional morphology of a given language. Polish is characterised by a relatively free word order and a high degree of inflection (Szczeżeliński, 2001), which puts it at the "free" extreme of the axis.

Conclusions

In a series of studies, we looked at pantomimic re-enactments of actors whose native language is a highly inflected language – Polish. In sum, we have not reproduced the results of Goldin-Meadow et al.’s studies on natural order of events in nonverbal reconstruction; further, we have not found a difference in actors’ syntactic realisation of reversible and non-reversible events; and finally, we have not observed that syntax and reversibility of an event influence its comprehension, nor have we found a difference in comprehension of rich and information-deprived pantomime. This leads us to the conclusion that pantomimic re-enactments and comprehension, rather than being cognitively driven by a natural order of events, may be influenced by the performers’ and comprehenders’ native language.

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