Poster Session 1 – Tuesday, July 8th 12:00 pm – 2:00 pm

1

Speech-accompanying gestures of Saudi Arabic and British English monolingual speakers

Alsubhi

People from different cultural backgrounds gesture differently. Their gestures differ in terms of properties such as the degree of their complexity (Efron 1972, Kendon 2004), body parts involved in performing them (Efron, 1972), their size (Kendon, 2004), and referring to to-the-right and to-the-left relations (Kita, Danziger & Stolz 2001). According to previous studies, those differences may be caused by the ecological effect (Kendon, 2004), cognition of space (Kita, Danziger & Stolz, 2001), social norms (Kita and Essegbey 2001), and the semantic and grammatical structures of the spoken language (Kita and Özyürek 2003). However, Arabic speakers manual speech-accompanying gestures have not been examined in such cross-cultural studies, nor have those gesture features been investigated. Therefore, this paper aims to shed light on the cross-cultural differences between gestures accompanying speech produced by British monolingual speakers of English and Saudi monolingual speakers of Arabic in regards to features of gesture space, frequency of gestures within a clause, and types of gestures used. Thus, this study contributes to the existing literature on cross-cultural variations regarding speech-accompanying gestures. 3 British speakers of English and 4 Saudi speakers of Arabic were shown 10 small action event movie clips of Tomato Man and the Green Man (Özyürek, Allen, & Kita, 2001; Özyürek, 2007, Kita, 2008). After watching each clip, the participants were asked to describe the actions the characters performed. They also answered questions on 3 short stories of social dilemmas after silently reading them such as how they would react if they were in one of the characters situations (adapted from Chu, Meyers, Foulkes & Kita, 2013). Qualitative analysis of the data revealed the following results. I found that Saudi participants used significantly bigger gesture space when they gesture than the gesture space used by British participants. Saudi speakers of Arabic also used more representational gestures within a clause than those produced by British speakers of English who tended to use at most one representational gesture per clause. These properties are to an extent similar to Neapolitans speech-accompanying gestures (Kendon, 2004). Moreover, Saudi participants were likely to employ more than one type of gesture such as representational and beat gestures within a clause, whereas British speakers were more likely to employ not more than one gesture type within a clause (even when they have multiple gestures within a clause). Causes of such cross-cultural differences are discussed.

2

Multimodal constructions in children: Is the headshake part of language?

Andrén

Six Swedish childrens use of the headshake was analyzed on the basis of longitudinal recordings, each child recorded on average once a month as they interact with their parents at home, from 18 to 30 months. All children were found to use this conventionalized gesture more often with speech than without. When the children used it with speech, they tended to do so in strikingly restricted ways, across observations at different months, as if the headshake constituted an integral component of various recurrent multimodal expressions. Some of the patterns found were specific to individuals, and some were found across individuals: highlighting both individual and collective aspects of linguistic patterning. Importantly, there was a developmental progression from rote-learned coordination with speech to increasingly more flexible and productive coordination with speech.

To deal with these observations, I introduce the concept of multimodal constructions, as an extension of usage-based approaches to language learning and construction grammar to incorporate the kinetic domain as well. The concept of constructions, as employed in these theories, has the benefit that it offers a continuum from the holistic (lexical, rote-learned and formulaic) pole of linguistic structure to the analytic (structural, grammatical) pole, rather than a sharp divide between the two. The claim here is that some aspects of gesture development can be explained with reference to theories that are otherwise typically applied only to language development (e.g. Tomasello 2003), or, in other words, that the headshake can be seen as part of multimodal constructions that increase in analytic complexity and productivity as the children grow older.

This study has consequences for the (meta-)theoretical question of whether gesture can be said to be part of language or not. I suggest that some gestures that are frequently coordinated with speech, including the headshake, can be considered part of language, also in the traditional sense of language as a conventionalized system. In line with Langacker (2008) I argue that for gestures that are both (a) conventionalized in a speech community and (b) bearing a systematic relation to the expressions it occurs in, exclusion from the language would be arbitrary. The argumentation goes partly against McNeills (2005) view on co-speech gesture, which emphasize mainly the dynamic (improvised and non-conventional) aspect of gestures that are coordinated with speech. The aim here is certainly not to deny that there is a strong dynamic dimension to co-speech gesture, but rather to open up what one might call the static dimension of gesture for research as well (cf. Kendon 2008).

I will also argue that the results from this study are consistent with findings from research on the role of gesture in the transition from one-word speech to two-word speech, as well as other research on coordination of gesture and speech in children (and adults), but the application of usage-based approaches to language learning and theories of construction grammar constitutes a reinterpretation of that line of research, which throws it in new light.

3

Temporal order and co-speech gesture

Becker, Cienki, Stec

The concept time is thought to borrow at least some of its structure from space (Lakoff & Johnson, 1980). Recent work has shown that orientational metaphors of time and space in a mental timeline manifest themselves in co-speech gestures when speakers talk about the past or the future (Cooperrider & Núñez, 2012). To date, only one study has looked at the role of co-speech gestures in temporal order comprehension (Jamalian & Tversky, 2012). However, this study neglected to examine naturalistically produced gesture for communicating about linear order. Also, neither the use of the temporal order connectives before or after, nor their sentence positions, critical to meaning, was systematically controlled. We report on a procedure for eliciting co-speech gestures about temporal order statements, and some preliminary results which suggest that before statements elicit a left gesture, and after statements a right gesture. We compare these data to arguments used in political debates, and in particular to the strategy of labeling an opponent as a “flip flopper”. In addition, we discuss the possibility that perspective taking and individual differences in working memory may play a role in the way that temporal order is represented in the mind.

We began by analyzing American presidential debates from 2000 to 2012, seeking out examples of before or after statements. We found several examples of rightward co-speech gestures while producing a sentence-middle before utterance.

Next, we conducted a pilot study to elicit spontaneous co-speech gestures while speakers retold 4-step procedures. We asked 10 participants (5 pairs) to retell 4-step procedures adapted from Glenberg and Langston (1992). For example, a speaker would memorize the procedure for writing a story in the following steps:

1. Write the first draft
2. Consider the structure
3. Address the audience
4. Proof the paper

The speakers were then asked to retell the procedure to the listener using either Before or After in the sentence-initial position. In the sentence initial position, Before cues the listener that the temporal order does not match the word order of the utterance, whereas for After, both temporal order and word order match.

We found that even with only 10 participants, we were able to elicit a pattern of co-speech gestures in at least one participant that fit our prediction of a leftward gesture for a Before utterance, and a rightward gesture for an After utterance.

We show in both a qualitative analysis and a procedure for eliciting co-speech gestures that temporal order is represented along a left-right mental timeline, at least for English and Dutch speakers. These findings suggest that abstract experiences such as temporal order are represented in the mind as embodied and situated thought. We propose that the concept time can be thought of in terms of spatial orientation, including communication about temporal order.

4

Teacher’s use of gesture and stereotype threat in classrooms

Begolli, Frausel, Richland

This project investigates how a teacher’s use of linking gestures during a mathematics lesson interacts with amount of anxiety-enhancing pressure on children. Drawing connections and comparing multiple representations is central to mathematical thinking and generalizable learning (National Mathematics Panel, 2008). However, these strategies are often underutilized in U.S. classrooms. Previous research has found that gesture might be one mechanism through which teachers facilitate students’ connected thinking, by reducing processing demands and drawing attention to key relationships (Richland, Zur & Holyoak, 2007). In particular, comparative gestures that move back and forth between items, linking gestures, are thought to draw learners’ attention to relevant connections (Alibali & Nathan, 2007). Teachers’ gestures during instruction can enhance student learning, draw attention to key objects, and convey strategy information (see Flevarez & Perry, 2001; Goldin-Meadow, 2003; Roth, 2001; Singer & Goldin-Meadow, 2005).

Children in mathematics classrooms are placed under great cognitive demands related to task demands and content knowledge. In addition, children might be threatened by negative stereotypes regarding mathematics ability. Stereotype threat refers to the idea that one’s negative beliefs about one’s group can influence future behavior and learning (Steele & Aronson, 1995). In a well-replicated paradigm, these authors found that African-American students performed more poorly on standardized tests than white students when race was emphasized, but performed equally well when race was not. In particular, stereotype threat has been theorized to engage working memory resources (e.g. Beilock, Rydell, & McConnell, 2007). Because gestures have been hypothesized to reduce working memory demands, linking gestures may increase students' learning when under threat.

This project experimentally manipulated gesture and stereotype threat during 5th grade students' instruction of a lesson on ratio comparing a misconception with an accurate solution. Four conditions (Gesture-Threat, Gesture-No Threat, No Gesture-Threat, No Gesture-No Threat) were created via video-editing of a single classroom lesson. This approach maintains the ecological validity of a classroom environment, while enabling manipulation of experimental variables. In the gesture conditions, linking gestures were visible during key comparative moments; in the no gesture conditions, linking gestures were not visible but the audio stream was the same. In the threat conditions, students reported their race before learning, while students in the no threat condition reported the date. Participants were 89 5th graders in a low-income, majority-African-American community.

Students completed a pretest the week before the intervention, a posttest immediately after intervention and a posttest one-week later. The assessments gauged student's procedural flexibility and conceptual understanding of the ratio concepts from the lesson.

Data are collected and being analyzed. We hypothesize that students who view linking gestures will demonstrate improved flexibility and understanding, particularly after a delay. We also hypothesize that induction of stereotype threat will negatively influence the performance of children who come from minority backgrounds; however, gesture might reduce the effect of negative stereotypes.

This research has important implications for teaching strategies and reduction of stereotype threat's impact on student learning. Gesture could support student's development of comparative thinking, and could be easily integrated into a teacher's existing practice.

5

Two-handedness in gesture and sign: Comparing the non-verbal gestures of hearing non-signers with the signs of sign language

Börstell, Belsitzman, Lepic

Two-handed signs are not randomly distributed across sign languages, but rather are preferentially used to represent spatial or interactive relationships between whole or parts of entities (Lepic et al. 2013). Though studies have investigated the iconic motivations for gestures (cf. Poggi 2008; Streeck 2008), the function of one vs. two hands has not been explicitly studied. Thus, this study investigates whether hearing non-signers use the two hands in the same way signers do. Using data from three sign languages: American SL, Israeli SL, Swedish SL, and non-signers' non-verbal gestures, we examine which aspects of manual representation are shared across signers and non-signers, and which are exclusive to sign language.

Using the ECHO project concept list (Woll et al. 2010), we first removed the concepts that are idiosyncratic to Deaf culture ("cochlear implant", "deaf club", "fingerspelling", etc.) and then pseudo-randomized and divided the remaining 245 concepts into three lists of written English words, and asked 11 English speakers to express each concept using their hands and body instead of their voice (thus producing "silent" rather than co-speech gestures). The responses were directed toward an experimenter, who videotaped the session. Responses were then glossed and coded for handedness. Each gesture was coded as one-, two-, or no-handed (meaning that the gesture had no manual component). The two-handed responses were divided into categories based on whether the hands are (1) performing one two-handed gesture where the hands do the same thing or (2) performing one two-handed gesture where the hands do different things, for example with one hand acting as a base. If a participant produced more than one gesture or provided no response, this was coded as such.

We observe that some of the concepts are preferentially represented with a single two-handed gesture. "Book", "cold", "dance", "fat", "house", "narrow", "sleep", "smile", and "thin" for example, were expressed with one two-handed gesture by all participants who saw them. Additionally, "afraid", "alive", "big", "car", "drive", "happy", "light", "love", "many", "snow", "spring", and "tree" were represented with a two-handed gesture by all but one of the participants who saw them. Interestingly, of the 31 concepts that are preferentially paired with a two-handed gesture, more than half (n=17) are also found to be preferentially two-handed in sign languages. However, of the 69 concepts that are preferentially two-handed in sign languages, only 17 are preferentially paired with a two-handed gesture.

There appears to be one main difference in the use of two hands in signers vs. gesturers, namely that the similarity in two-handed form distribution seems to be monodirectional: when gesturers agree on a two-handed concept pairing, so do signers; when signers agree in the same respect, gesturers show more diversity. Thus, handedness in gesture can to some extent predict handedness in sign languages, but handedness in sign language cannot predict handedness in gesture. This would suggest that sign languages share some basic form-meaning mapping strategies with gesture, but that they must also have additional strategies that are shared across sign languages but not with hearing gesturers.

6

Beyond representation: Gesture as a learning tool in mathematics

Brookes, Colletta, Davis, Ovendale

Studies show that learners' and teachers' gestures are an important part of communication and learning (Goldin-Meadow and Singer 2003; Richland et al. 2007). Teachers' gestures appear to serve several functions such as guiding learners attention (Alibali et al. 2011) and establishing understanding when communication breaks down (Alibali et al. 2013). Teachers' gestures are also a semiotic resource that helps learners' conceptual development in areas such as mathematics learning (Arzarello et al.2009). Certain types of gestures and the way they are used may enhance learning more than others. Mittelberg (2008) has looked at the formal aspects of representational gestures and their analogical properties in the field of grammar teaching. In mathematics teaching, representational gestures may help representing numbers as well as operations. However, representing a number or an operation in gesture does not necessarily make gesture a positive learning tool for children. What strategies do teachers use to establish the foundations for acquiring new mathematical knowledge. This study focuses on how teachers' gestures work to build the mathematical concept of halving in four first grade mathematics classes. Four teachers were filmed teaching 20 minute lessons on halving discrete entities. Both speech and gesture were transcribed on ELAN, as well as the mathematical sequences (one sequence runs on one question or problem to solve that the teacher imports in the course of the lesson). Several indicators (mean length of episodes, rewordings of questions and percentage of correct answers) show that learners experienced less confusion in two out the four classes. A qualitative analysis of the teachers' gestures, the informational content of speech and the relation between gesture and speech led us to identify four effective gestural strategies used by one of the four teachers: the use of Polysign Gestures (Calbris, 2011), i.e. gestures that provide multiple layers of information that embody and spatially represent the target concept; the division of informational load between gesture and speech: the use of Mathematical Gesture Schemes, i.e. repeated gesture phrases compounding several strokes that symbolize an invariant operation on variable numbers; and mimesis: the simultaneous use of gesture by learners with the teacher and as an assessment feedback tool during the learning process. From a mathematical perspective, the gestures used by the teachers can be understood as attempts at making available computational criteria that enable the learner to realise the process of halving natural numbers. To that end, the teachers' gestures implicitly represent attempts at preserving the structure of division over the natural numbers (and at times, over the rational numbers) in gesture. However, by focusing on the outcome of division by 2 rather than on the nature of the operation itself, teachers sometimes generated gestures that were not structurally compatible with division by 2, making it difficult for some children to produce the required computations. We conclude that gesture is a crucial tool for mediating the transition from concrete and personal symbolic processes to the abstract mathematical concept and discuss the implications for gesture research as well as for education.

7

Cognitive load indicates simultaneous activation of two language systems for bilinguals: Alternative explanations

Brown, Church, Quiros, Koumoutsakis, Mahootian

There is an abundance of literature that examines cognitive processing in bilinguals (i.e., Bialystok, 2001; Adesope et al., 2010). Bilingual studies seem to suggest that bilinguals may be activating two language systems simultaneously when speaking. Behavioral evidence for this has included code-switching and stuttering (Mahootian, 2006; Matras, 2000; Karniol, 1992). In some cases experimental studies have illustrated that this bi-language system activation makes bilinguals particularly good at cognitive control and selective attention (Bialystok, 2001). However, no experimental study has been used to generate evidence that bilinguals in fact hold two languages in mind simultaneously. The cognitive load paradigm has been used to show activation of simultaneous representations (Goldin-Meadow, S., Nusbaum, H., Garber, P., & Church, R. B., 1993) and is an experimental technique that can address this question. There is an abundance of literature that examines cognitive processing in bilinguals (i.e., Bialystok, 2001; Adesope et al., 2010). Bilingual studies seem to suggest that bilinguals may be activating two language systems simultaneously when speaking. Behavioral evidence for this has included code-switching and stuttering (Mahootian, 2006; Matras, 2000; Karniol, 1992). In some cases experimental studies have illustrated that this bi-language system activation makes bilinguals particularly good at cognitive control and selective attention (Bialystok, 2001). However, no experimental study has been used to generate evidence that bilinguals in fact hold two languages in mind simultaneously. The cognitive load paradigm has been used to show activation of simultaneous representations (Goldin-Meadow, S., Nusbaum, H., Garber, P., & Church, R. B., 1993) and is an experimental technique that can address this question.

This study compared 12 bilingual individuals who acquired two languages early in development with 14 English and 24 Spanish monolinguals on a cognitive load task to determine whether bilingual individuals activate both of their available language systems simultaneously while speaking. A cognitive load paradigm (having subjects perform two tasks at the same time) was used to measure working memory in bilinguals compared to monolinguals. Monolingual English, monolingual Spanish and Spanish-English bilingual individuals were asked to recall a list of numbers (task 1) while narrating a cartoon story (task 2). The fewer numbers remembered, the greater the cognitive load inferred. We found that bilinguals were significantly more compromised in their ability to remember numbers, demonstrating that they were under greater cognitive load than monolinguals. This evidence suggests that bilinguals are activating two language systems simultaneously while speaking. This study examined bilingual individuals who acquired two languages early in development to determine whether they activate both of their available language systems simultaneously while speaking. A cognitive load paradigm (having subjects perform two tasks at the same time) was used to measure working memory in bilinguals compared to monolinguals. Monolingual English, monolingual Spanish and Spanish-English bilingual individuals were asked to recall a list of numbers (task 1) while narrating a cartoon story (task 2). The fewer numbers remembered, the greater the cognitive load inferred. We found that bilinguals were significantly more compromised in their ability to remember numbers, demonstrating that they were under greater cognitive load than monolinguals. This evidence suggests that bilinguals are activating two language systems simultaneously while speaking.

We also examined participants' narrations for evidence of simultaneous activation of two language systems by their use of language-specific linguistic patterns in speech and gesture. Though monolinguals tended to express motion events using only one language system; path-focused (focusing on the trajectory of movement; e.g., "He went up.") for Spanish monolinguals and manner-focused (focusing on the manner in which motion occurred; e.g., "He climbed on the ladder.") for English monolinguals; bilinguals failed to show any preference for one system or another when they expressed motion events. We interpret these findings as suggestive that when performing a language task (like story narration) bilinguals activate multiple language systems simultaneously, significantly reducing the cognitive resources available for performing other tasks. We examine and rule out alternative explanations for the correlation between cognitive load and bilingualism such as: (1) bilinguals tell longer stories than monolinguals (2) bilinguals have more speech disfluency than monolinguals and (3) bilinguals give more elaborate and detailed narrations than monolinguals. We discuss how reduction in cognitive load promotes other cognitive skills such as cognitive control and selective attention. We also examined participants narrations for evidence of simultaneous activation of two language systems by their use of language-specific linguistic patterns in speech and gesture. Though monolinguals tended to express motion events using only one language system; path-focused for Spanish monolinguals and manner-focused for English monolinguals; bilinguals failed to show any preference for one system or another when they expressed motion events. We interpret these findings as suggestive that when performing a language task (like story narration) bilinguals activate multiple language systems simultaneously, significantly reducing the cognitive resources available for performing other tasks. We examine and rule out alternative explanations for the correlation between cognitive load and bilingualism such as: (1) bilinguals tell longer stories than monolinguals (2) bilinguals have more speech disfluency than monolinguals and (3) bilinguals give more elaborate and detailed narrations than monolinguals. We discuss how reduction in cognitive load promotes other cognitive skills such as cognitive control and selective attention.

8

The interplay of culture and communicative intention in shaping the production of iconic gestures

Campisi, Özyürek

One of the most common contexts of human interaction is the transfer of new knowledge to other people (Tomasello, 1999; Csibra & Gergely, 2009). This setting, called demonstration (Clark & Gerrig, 1990), often involves children and requires a specific "child-directed" register. We have evidence for variation both in speech (Fernald et al., 1989) and gesture (Iverson et al., 1999; zäliskan & Goldin-Meadow, 2011) when they are directed to young children (1-3yrs) in spontaneous interactions. However, almost nothing is known about child-directed communication with older children (Guttmann & Turnure, 1979; Campisi & Özyürek, 2013) and in comparison with adults. Furthermore, studies on child-directed gesture usually concern demonstrations with objects (Clark & Estigarribia, 2011; ONeill et al., 2005) and very little is known about contexts where speakers can rely only on the help of speech and gesture without the objects and in different cultures.

To test the influence of culture on gesture production for children and adults, we asked 16 Dutch and 16 Italian adults to solve the Tower of Hanoi and then to explain it to another adult and to a child in a counterbalanced order. We found that gesture rate didn't change between conditions. However, both Italian and Dutch used less hand-shapes for the child than for the adult. Furthermore, Italian participants used more two-hand gestures for the child and Dutch participants changed the perspective of their description for the child, depicting the object from the addressee's point of view. Concerning the comparison between cultures, we found that Italians produced more iconic gestures than Dutch.

Overall, the results show that people with no experience with children have some implicit knowledge about how to design demonstrations, both in speech and gesture, even for older children. The strategies they use are highly dependent on the culture of the participants and some of them seem specifically designed for older but not for younger children."

9

The effect of manner-incidental and manner-inherent stimuli on coverbal gestures in English and Italian

Cavicchio, Kita

Since Kita and Özyürek (2003), many studies have investigated how manner and path are expressed in speech and manual gestures. Satellite-framed verbs, such as rolls up in English are usually accompanied by gestures conflating manner and path in one gesture. In contrast, two-clause structures such as ascends as it rolls, typical of Japanese and Turkish, are accompanied by two gestures depicting manner and path. Here we focus on the effects that manner inherent to path (manner causes location change) vs manner incidental to path (non-causal location change) have on verbal and gestural expression in English and Italian (Kita et al., 2007; Allen et al., 2007). Italian is considered a verb framed language (Talmy, 1985). Despite that, satellite framed constructions such as "rotola giśu" (rolls down/up) are used by native speakers.

We tested these effects with Allen et al.'s (2001) stimuli, where two characters, Tomato and Triangle, performed actions involving manner and path, such as rolling down a slope. Half of the stimuli depicted motion events in which manner was inherent to path. The remaining half depicted events in which manner was incidental to path. Allen et al's stimuli can be described with a satellite framed form (e.g. rolls down) or a verb framed form (e.g. descends as it rolls). 40 participants (20 native Italian speakers, 20 English) saw the 10 videos. They were asked to describe each of them to a listener.

Mixed effect logistic regression with structural tightness as dependent variable (one vs two-clause) and fixed effects for language (English vs Italian), event-type (manner-inherent vs manner-incidental), random intercepts for subjects and items and random slopes for event-type by subjects showed Italian native speakers prefer two-clause over one-clause verbs (Est=3.4, SE=0.9, $p < 0.001$) to describe the experimental action. Nevertheless, Italian and English speakers are more likely to produce one-clause verbs with manner-inherent events (Est=1.8, SE=0.6, $p < 0.001$). A second mixed effect model with gesture (conflate vs manner and path) as dependent variable, structural tightness, event-type and language as fixed effects and the same random intercepts and slopes structure of the first model, showed that conflated gestures are more likely to be produced with one-clause verbs (Est=3.3, SE=0.7, $p < 0.001$), with no effect of language (Est=0.7, SE= 1.5, p=0.6). Speakers were more likely to produce conflated gestures with manner-inherent events (Est=0.9, SE=0.4, $p < 0.03$).

As in Kita et al. (2007) for English, the event-type manipulation successfully elicited both one-clause and two-clause descriptions of manner and path in Italian speakers, with one-clause descriptions more common for manner-inherent events. More crucially, in both Italian and English, one-clause descriptions elicited conflated gestures, even when the effect of event-type is controlled for in the analysis. The information packaging in speech is mirrored by the information packaging in gesture. We thus extended Kita et al.'s finding for English to a verb-framed language, Italian. These findings support the hypotheses that representational gestures arise from the interface between spatio/motoric events and language and that conceptual message representations and syntactic representations are generated interactively during speaking (Kita & Özyürek, 2003).

10

Tongue protrusion in Taiwan sign language conversation

Chen

Tongue protrusion is either in the form of protruding the tongue between the lips or in the form of protruding the tongue with mouth open. It is attested in various unrelated sign languages and is treated as adverbial morpheme (Liddell 1980) or mouth gesture with a variety of meanings (Lewin & Schembri 2011). This study aims to investigate the form, the meaning, and the spreading behavior of tongue protrusion in Taiwan Sign Language (TSL) conversation.

The data analyzed in this study are drawn from two dyadic conversations (about 1.5 hours). The data were annotated using ELAN annotation software. There were 120 tokens were identified. The preliminary results show that tongue protrusion in TSL is manifested in terms of various forms: tongue protrudes between the teeth or with open mouth, tongue protrudes with the arched upper lip, and tongue flapping. Results suggest that the intensity of tongue protrusion (i.e., how much of the tongue shows beyond the boundary of the teeth) varies.

The majority of tongue protrusion co-occurs with only a single manual sign, such as clause negator (i.e. NOT) or semantically negative sign (i.e. KNOW-NOTHING-ABOUT). In accordance with previous studies, tongue protrusion is found to occur more frequently with only one manual sign. It spreads to only one additional sign if the spreading occurs. With respect to the direction of spreading, it spreads either in backward direction or forward direction from the source signs. The source signs include negators, verbs, or adjectives.

This study proposes that tongue protrusion is paralleled to co-speech gestures, rather than being adverbial as suggested in previous studies. Tongue flapping is considered as emblem because it has a standard form and can be used as substitutes for sign NOT-HAVE. Other kinds of tongue protrusion are considered as co-sign gestures because the presence of sign language is obligatory. The meaning is specified in terms of the corresponding manual signs.

11

The use of hand gestures to communicate about objects in space among children with autism spectrum disorders

Choi, Kwong, Amy, So

Autistic children have strong visual-spatial skills. Previous research has shown that autistic children outperform in the abstract spatial reasoning tasks, such as the Block Design subtest in the intelligence test batteries and the Raven's Progressive Matrices. Given their outstanding spatial skills, are they able to perceive spatial locations represented in gestures.

Gestures are spontaneous hand movements. They are produced in space, and thus are inherently spatial. The spatial locations of gestures represent referents in an abstract manner (Gullberg, 1998; 2003; So, Coppola, Licciardello & Goldin-Meadow, 2005). For example, a speaker says, “There is a table (hands draw a circle in the left) and a cabinet (hands draw a rectangle in the right).” The left location is associated with the table while the right is associated with the cabinet.

In the present study, we examined whether autistic children could perceive spatial locations represented in gestures and make use of the corresponding locations for demonstration. In this task, an experimenter told autistic children to demonstrate four different activities in four trials (e.g., making a sandwich). In each trial, an experimenter introduced children with four objects (“Imagine this is a piece of bread (index finger draws a rectangle in the top left); this is a fried egg (index finger draws a rectangle in the center); this is ham (index finger draws a rectangle in the top right); and this is a plate (index finger draws a rectangle at the bottom)”. Then children demonstrated and described how to make a sandwich based on the experimenter’s description. A child could get one point if he/she made use of the correct spatial location for the corresponding referent in each trial (e.g., I take the bread (right hand moves to the top left)). A gesture identifies a referent if it is produced in the same location that has previously been established. Maximally he/she could get sixteen points in this task.

Seventeen Chinese-speaking autistic children (two females, ranging from 7.42 to 12;15 years) and 13 aged- and IQ-matched typically-developing children (six females, ranging from 6.63 to 11.58 years) participated. Standard observation using Autistic Diagnostic Observation Schedule-2 confirmed their diagnoses. All autistic children were high-functioning (IQ ranging from 75 to 124 according to the Wechsler Intelligence Scale for Children Fourth Edition [Hong Kong]). The Raven’s Colored Progressive Matrices (RCPM), (WISC-IV[HK]), The Hong Kong List Learning Test (for verbal learning and retention) (HKLLT), The Rey Complex Figure Test (RCFT), and the Hong Kong Cantonese Oral Language Assessment Scale were also administered.

Children with ASD gestured at the specified locations less often than TD children. Verbal and spatial memory were positively correlated to the ability to produce referent-identifying gestures for all children. There was a positive correlation between Raven’s Children Progressive Matrices (RCPM) and gesture production ability in children with ASD but not in TD children, suggesting that the RCPM task and gesture production may require common cognitive mechanisms in children with ASD.

12

Are the hands intelligent? Hand movements and type of intelligence

Dvoretska, Lausberg

There is some empirical evidence that the gesture production is related to the level of intelligence. People with high logical abilities produce more gestures that express the semantic content (Wartenburger et al., 2010). As compared to individuals with average fluid intelligence, individuals with superior fluid intelligence perform more pantomime and kinetographic gestures, and they express more rotations in their kinetograph gestures (Sassenberg et al., 2011). However, no differences concerning crystallized intelligence were found, suggesting that the gesture production is related not only to the level but also to the type of intelligence. The present study investigated whether verbal intelligence (Verbal IQ) and nonverbal intelligence (Performance IQ) are related to different patterns of hand movement behavior.

Eleven right-handed participants were videotaped in two experimental settings: (i) a standardized interview employing questions of an intelligence test, to challenge competences corresponding to Verbal IQ, and (ii) a narration of the animated cartoon “Die Maus”, to challenge competences corresponding to Performance IQ. The participants’ verbal (VIQ) and Performance intelligence (PIQ) was investigated with WAIS-R. Two independent certified raters, blind to the hypothesis of the study, analyzed the participants’ hand movements with NEUROGES-ELAN (Lausberg & Sloetjes, 2009), a coding system suitable for assessing the level of cognitive complexity.

The results revealed different movement patterns for each type of intelligence. High PIQ was positively correlated to high frequency of phasic and repetitive left hand movements and lower frequency of irregular left hand movements. Furthermore, the PIQ correlated positively with the frequency and the proportion of time spent with left hand dominance and asymmetrical movements. High VIQ was associated with greater proportion of time spent with emphasis gestures, specifically bimanual batons and superimposed, and right hand back-tosses. The VIQ correlated negatively with the proportion of time spent with left hand and right hand spatial relation presentation gestures.

The findings confirm our hypothesis about a relationship between the type of intelligence and the hand movement behavior. A high Performance IQ was associated with a high frequency of left hand movements that reflect complex conceptual processes (phasic, repetitive, asymmetrical). The left hand preference in the right-handed participants strongly suggests a right hemispheric generation of these hand movements. The finding is in line with attribution of Performance Intelligence to right hemisphere functions. In contrast, a high Verbal IQ was associated with emphasis gestures, which set accents on speech, indicating that people with a high Verbal IQ have a high competence to express themselves verbally and they use gestures rather as a means to support speech than to present per se concepts.

13

Visual exploration of co-speech gestures in aphasic patients: An eyetracking study

Eggenberger, Preisig, Zito, Nyffeler, Gutbrod, Müri

Background: Aphasia is a major language disorder typically occurring after left-hemispheric brain damage. Since patients suffering from aphasia are restricted in their verbal abilities, they may compensate their shortcomings by using gestures. Previous studies have shown that some patients could use gestures as compensatory strategies (Herrmann et al., 1988), while others did not (Cicone et al., 1979). In contrast to previous research which focused mainly on gesture production, the present study investigated co-speech gesture and face perception of aphasic patients while they were following dyadic conversations. We expected that aphasia will influence gaze behavior in patients and that altered gaze patterns would be associated with content-related comprehension.

Methods: Sixteen aphasic patients and 23 healthy control subjects participated in the study. Gaze data was collected by means of a contact-free infra-red eye tracker while subjects were watching videos of dyadic conversations.

Results: In line with Gullberg and Holmqvist (1999), we found that subjects rather gazed at the face of the speaking interlocutor than at the co-speech gestures. Aphasic patients fixated less the face region compared with healthy controls but showed no differences exploring the gesturing hand. Interestingly, we found a significant co-speech gesture x ROI interaction, indicating that the presence of a co-speech gesture encouraged subjects to look at the speaker.

Conclusion: Aphasic patients fixate less the face probably to avoid interference between the visual and the auditory speech signal. Co-speech gestures guide the observer's attention towards the speaker, the source of semantic input.

14

Gestures: Bringing life to calculus problems

Engelke Infante

This study focuses on the role of gestures during first semester calculus students' problem solving activities. Calculus is a natural place to examine gesture as it is the study of motion; there are several problem types that require students to visualize/imagine situations involving rates of change. Visualization and representation are dynamic in nature and are an important part of being able to solve such problems (Alibali, Bassok, Solomon, Syc, & Goldin-Meadow, 1999; Alibali, Spencer, Know, & Kita, 2011; Booth & Thomas, 2000; Cifarelli, 1998; Greer, 1997; Hegarty & Kozhevnikov, 1999; Lucangeli, Tressoldi, & Cendron, 1998; Silver & Marshall, 1989; Simon, 1996; Vergnaud, 1998). Diagrams and graphs are one means of visualization that may facilitate the understanding of many concepts and problems in calculus, and there is evidence that producing gestures may assist in constructing such representations (de Freitas & Sinclair, 2011; Keene, Rasmussen, & Stephan, 2012; Marrongelle, 2007; Sinclair & Tabaghi, 2010).

The participants were first semester calculus students enrolled in a peer mentoring workshop in which cooperative problem solving was emphasized. The sessions, in which related rates and optimization were covered, were video recorded and watched, specifically attending to students making hand gestures and the diagrams they drew while working in groups of three. Each video was made into small clips capturing gesture episodes. Coding these video clips using the techniques described by Erickson (2006) and Scherr (2008, 2009), we identified two broad categories of gesture dynamic and static that facilitated the problem solving process. There was a strong relationship between diagram construction/interpretation and these movements.

Dynamic gestures consist of moving the hands to describe action that occurs in the problem or movements made to represent mathematical concepts. We further identified two subcategories: dynamic gestures related to the problem (DRP) and dynamic gestures not related to the problem (DNRP). DRP gestures are iconic gestures as defined by McNeill (1992) while DNRP may be iconic, metaphoric, or deictic gestures. Dynamic gestures are used to facilitate understanding of the changing quantities in the problem, to aid in diagram interpretation, and to illustrate concepts.

Static gestures are made to illustrate either a fixed value (length, radius, volume, etc.) or geometric object. This definition was further sub-categorized into static gestures related to a fixed value (SRF) and static gestures related to the shape of an object (SRS). Both SRF and SRS are primarily iconic gestures but may be metaphoric. Static gestures are primarily used to facilitate diagram construction.

When students were struggling to construct a diagram, they gestured more while reasoning about the part on which they were confused. Gestures arose as students were trying to understand how the diagram corresponded to geometric terms in the problem and to bring life to the diagram by enacting/coordinating rates of change. The more challenging the problems, the more the students gestured. However, students gestured less when they encountered subsequent similar problems. Some gestures were influenced by prior gestures; students quickly adopted and adapted gestures made by their peers.

15

Intentional gesturing at encoding facilitates retrieval, but not as much as mental imagery: Implications for representation of gestured information

Foraker, Kuhl

To investigate the relationship between internal mental imagery and externally produced gestures, we investigated how effective gesturing is as an intentional memorization strategy. Previous research shows that imagery is superior to repetition, and that both spontaneous and instructed gesturing are more effective than speech alone. However, the three strategies have not been directly compared. Our main hypothesis tested whether gesturing would aid learning of new information more than imagery. Gesturing could fare better: recent literature proposes that gesturing facilitates or entails activation of mental imagery and spatial representations, which would provide an additional representational format, facilitating memory retrieval. However, imagery may be a more distinctive and flexible representational format, faring better than gesturing on demand.

Participants memorized unassociated word pairs (grass-spoon) by repeating the words, imagining the words in a relationship, or gesturing to create a relationship between the words. Immediately after and two days later, participants completed a cued recall test (grass -_____). In Experiment 1, we found for both immediate and delayed tests that repetition had the lowest accuracy, gesturing was better, and imagery was marginally better than gesturing. In Experiment 2, participants were assigned to either imagery or gesturing instructions, and two possible modulators were also investigated. One was independently measured spontaneous gesture rate, as those who gesture more may produce more effective gestures on demand. The second was fluid intelligence, which is positively associated with producing movement gestures [9, 10], and so may underlie more effective gesture use. Linear mixed effects regression indicated that imagery produced significantly higher memory accuracy than gesturing overall. Higher gesture rates did increase accuracy, but only for the immediate test, and this effect was not specific to the gesturing group. Higher fluid intelligence also increased accuracy, for both immediate and delayed tests, although again, this effect was not specific to the gesturing group.

Our results show that producing gestures intentionally is a helpful memory mnemonic, but they also indicate that it is more difficult to execute effectively than mental imagery even for those who gesture relatively often, and for those with high fluid intelligence. We discuss how gesturing may be less flexible, detailed, and practiced, and produce greater cognitive load than mental imagery, with implications for the mental representations and cognitive functions of gestured information.

16

A cognitive sonata for four hands: Automated analysis of hand configurations in one on one math tutoring

Forster, Sathyanarayana, Reilly, Salamanca, Carini, Lee

Automated approaches to behavioral analysis attempt to replicate reliability of manual coding schemes Beyond the pragmatics of avoiding time consuming data processing and analysis, machine learning approaches provide opportunities to revisit well established investigative traditions and reframe overlooked questions. Automated gesture recognition has followed this typical trajectory. The potential for discovering useful automated analytic approaches is especially rich where datasets are collected in naturalistic settings with deliberate design for both detailed annotation and machine perception capabilities. A soon-to-be released dataset of 1:1 math tutoring sessions demonstrates such potential. 20 sessions were recorded, then richly annotated with multiple coding schemes for speech functions, gaze, gestures, and FACS. Each session was flanked by a pre- and post-test and an additional coding tier captured the onset and completion of problem segments The sessions were recorded by four different cameras - two cameras captured head-on facial expression of each tutor and student. A third camera situated further away captured the context of the side-by-side tutor pair, and an overhead webcam recorded the view of the working space. The workspace view was first divided into separate “zones”. Each of these zones is checked for the presence or absence of hands, and the number of hands in them by employing computer vision techniques. In order to achieve detection of hands, a wide range of image descriptors such as skin color, motion, HOG, modified HOG, GIST etc. are explored. After having detected the number of hands in each zone, we then generate a continuous trace of (i) the total number of hands in the workspace and (ii) the number of hands in each zone, which in turn gives us the relative positioning of the hands. Further, the various combinations of “hands’ and “no-hands” in each zone result in a set of 1-, 2-, 3- or 4-hand configurations in each image. These configurations can be generated by combining the hand detection output from the various zones and analyzing the patterns that emerge. In addition to the static configurations that can be derived from a single image, the transitions from “hand” to “no-hand” or “no-hand” to “hand” can be studied across image frames by checking the presence or absence of hands within each zone. This throws light on the dynamic shifts that transpire during the tutoring session. This analysis of the hand ensemble constitutes a parallel perspective on each tutoring session, a backdrop against which a refreshing set of issues can be addressed This group (Saythyanarayana et al. 2013) recently demonstrated automatic gesture recognition of the most common gestures in tutoring behavior. Now one may ask whether the four-hand ensemble predict individual gestures Another set of questions revolve around the multi-modal multi-agent nature of this dataset. Does behavior get organized across modalities within each agent first (e.g, speech and gesture), or do certain modalities get coordinated between and across individuals independently or at least asynchronously with other modalities. Behavioral organization questions lead to other cognitive and learning oriented queries, that can be addressed given the richly annotated dataset - do the dynamic shifts in hand configuration correlate with learning outcomes? what is the relation between the different hand positions and behavioral function, e.g., components of problem segments that represent functional behavioral categories.

17

Speaking and gesturing in German and English: An investigation of syntactic packaging and co-speech gestures

Fritz

Previous cross-linguistic studies have shown that co-speech gestures are shaped by syntactic encoding possibilities (cf. Kita & Özyürek 2003, Kita in press). Hence, gestural representation of an event is assumed to be similar to its linguistic encoding.

To investigate the influence of syntax on co-speech gesture production, we focussed on the effect of word order on gestures depicting motion events in German and English. Both are satellite-framed languages, meaning that path in a motion event is encoded in a so-called satellite, a verb particle or a preposition outside the root verb (Talmy 2000). But unlike in English, in German roots and satellites do not necessarily co-occur in main clauses (cf. German "verbal bracket"), only in subordinate clauses (e.g. durchfahren "to throughdrive"). Furthermore the order of verb and satellite differs depending on clause type (main/subordinate).

In an exploratory study four German-English bilinguals were asked to retell two different movie scenes and describe what they would do if they could spend one day in New York and London. Based on previous research the gestures' stroke was expected to co-occur either with the satellite expressing path (cf. McNeill 2009) or with the root and the satellite expressing both manner and path (cf. Duncan 2005)- regardless of the sentence structure.

Notably, the German data showed that stroke placement might be influenced by word order. The stroke tended to align with whatever part of the verb came first in the clause. Furthermore the data suggests that the so-called "double-framing" (cf. Croft et al 2010 for this structure) might play a role in German gesture placement. Thereby path is marked twice within a clause: once by the satellite and additionally by a preposition which is semantically very similar/identical to the satellite (durch etwas durchfahren "through something throughdrive"). In English only one stroke co-occurred exclusively with the satellite, 8 with the verb and 5 with both elements. Since the participants were bilinguals, they might have adapted their German strategy of gesturing; viz. placing the gesture on that part of the verb which is encoded first. Hence, the English data might be explainable as transfer phenomena.

A follow-up experiment with native speakers of German and English was conducted. Participants were asked to produce main and subordinate clauses to examine whether a change of word order influences gesture patterns and gesture-speech synchronisation in German. Since the word order in English does not vary across clause types, no change of gesture patterns was expected.

To elicit main and subordinate clauses and to control the speech outcome, participants had to retell 13 different cartoon scenes depicting a motion event whilst including certain elements in their retellings. The first element determined the sentence structure (e.g. "I can see in the video that") and the second was the particle verb depicting the motion event (e.g. roll into). Furthermore, participants were instructed to retell every motion event within one sentence and to use their hands while explaining what the cartoon characters are doing. Preliminary results of the participants' gesture-speech alignment will be presented.

18

Language shapes the production of gestures: Evidence from Chinese vertical spatial metaphors

Gu, Mol, Hoetjes, Swerts

People universally use space to represent time conceptions (Boroditsky, 2000). For instance, English speakers can use spatial metaphors to talk about time ("The future lies not too far ahead", and "The day has been long."), and they often assign the past to their back or left side, and the future to the front or right side (Calbris, 2008; Clark, 1973: 49). This space-time mapping is also shown in speakers' co-speech gestures (Casasanto & Jasmin, 2012). That is, English speakers produce horizontal and sagittal gestures to indicate timelines. Interestingly, Chinese speakers can additionally express time conceptions vertically by employing vertical spatial metaphors, e.g., "above (shàng) week" (last week), and "below (xià) week" (next week). Therefore, they are expected to gesture about time vertically as well (cf. Chui, 2011). Yet would this vertical gesturing result from Chinese speakers having different time conceptualisations in general (Boroditsky, 2001), or is there an additional online effect of how time is encoded in Chinese?

According to Kita & Özyürek's (2003) Interface Hypothesis, gestures not only reflect imagistic (spatio-motoric) representations of events, but also aid thinking-for-speaking. The hypothesis predicts that linguistic encoding possibilities influence gesture production during formulation. Evidence supporting this claim predominantly comes from studies of motion event descriptions (Kita et al., 2007; Özyürek et al., 2005). Would the Interface Hypothesis also apply to describing the abstract concept of time in a bilingual context? That is, do the different linguistic encoding possibilities in Chinese and English shape Chinese-English bilinguals' gesture production online?

In a production study, we addressed two specific questions: (1) Given the fact that English and Chinese speakers may think of time differently (Boroditsky, 2001), will Chinese-English bilinguals produce more vertical gestures in Chinese than in English? (2) In Chinese, will verbally producing time conceptions with vertical spatial metaphors lead to more vertical gestures than that of verbally producing non-vertical ones?

Method

46 Chinese-English bilinguals explained wordlists to listeners in both Mandarin and English. The Chinese wordlists consisted of words that conveyed time conceptions by using vertical spatial metaphors (e.g., "last/next week") or without using them (e.g., "yesterday, today, tomorrow"). The English version was a translation of the Chinese version (non-vertical, since English). The planes of temporal gestures were coded as vertical, horizontal, or sagittal.

Results

1) Only for the wordlists with Chinese vertical spatial metaphors, significantly more vertical gestures were produced in Chinese (M=0.56, SD=0.71) than in the English translation (M=0.05, SD=0.31), $t(40)=4.40$, $p<0.001$.

2) In Chinese, more vertical gestures were produced when speakers described time conceptions containing vertical spatial metaphors (M=0.56, SD=0.71) than about non-vertical ones (M=0.24, SD=0.43), $t(40)=2.81$, $p=0.004$.

Conclusions

The results of the comparisons between and within languages showed that gestures are shaped by the online interface between spatio-motoric thinking and speaking in which spatial imagery is adjusted to fit the verbalisation, rather than by the pre-determined language-specific spatial conceptual schemas only (vertical conceptualisations of time). The study provides evidence for the Interface Hypothesis and suggests that gesture production is dynamic and sensitive to linguistic encoding possibilities.

19

Gesture form: Analysis and typology. Operations describing the conceptualization of pointing and drawing gestures

Hassemer

In form-based gesture analyses, hands are often described in terms of parameters including configuration, location, and motion (Stokoe 2005/1960). These parameters describe articulator form, the physical form of the hands both in motion and held still. In contrast, the present work proposes a model of gesture form, that is, the articulator form interpreted through cognitive-semiotic strategies, consonant with work on modes of mimesis (Müller 2010, 1998), gesture practices (Streeck 2008), and metonymy in gesture (Mittelberg & Waugh 2009). Although these works do imply the distinction between articulator form and gesture form, Gesture Form Analysis (GFA) intends to provide a systematic approach to the form (and function) following heuristic principles.

In exemplifying GFA, the basic categories of pointing and drawing gestures will be questioned. These different practices would traditionally be classified as deictic and iconic gestures respectively (e.g., McNeill 1992), although they can be performed with the same hand shape. Breaking the practices down into their underlying principles (see list below) will pinpoint the commonalities (principles 1-4) and differences (principle 5a vs. 5b) in gesture form conceptualization (Hassemer et al. 2011; Hassemer 2014).

I claim five gesture form operations to be the "Condition of Possibility" (Kant 1868:59) for understanding a pointing gesture; independently of the articulator be it pointing with the index finger, the thumb, a leg, or even a stick. In other words, omitting any one of the following operations will render it impossible for any observer to identify the referent of a pointing gesture.

(1) Articulator Profiling. Not the entire shape of the body, but just one specific part of it ("articulator unit", AUTHOR 2009) is profiled: For a pointing gesture, the articulator unit could span arm, hand and index finger.

(2) Shape Profiling. Not the entire shape, but only one salient aspect is profiled: Here, the dominant axis of the outstretched articulator unit, evoking a line segment.

(3) Continuation. The line segment is continued away from the body along the established axis, resulting in a line of undefined length.

(4) Intersection. The line intersects with the surface of another object in a point. This point is the location pointed at.

(5a) Adjacency. The object adjacent to this point is the referent.

In comparison, a "pointing"-hand configuration, moved laterally, is an example of a drawing gesture. To interpret a gesture as a drawing gesture, another operation is necessary, instead of (5a). All prior operations overlap with the pointing gesture.

(5b) Trace Leaving. The point leaves a trace in the form of a line.

Functional distinctions of pointing and drawing gestures have been noted (Kendon 1988; McNeill 1992; Enfield 2003), yet their classification as distinct does not account for their structural similarity. At the example of data taken from an object-description study, GFA will be shown to systematically distinguish gesture practices on the basis of gesture form principles. These heuristic principles also define the (topological) dimensions of the resulting form - similar to prepositions defining the dimensionality of reference objects (Talmy 2000:191).

My poster shows a typology that includes systematizing pointing and drawing with regard to gesture form.

Learning to put time in its place: The development of spatial gestures for time

Marghetis, Tillman, Srinivasan, Barner

Background. Languages typically describe time using a rich system of spatial metaphors (e.g. "Looking forward to Christmas.") (Clark, 1973; Lakoff & Johnson, 1980). In adults, spatial metaphors for time are also expressed spontaneously as metaphorical, temporal gestures (e.g. Calibris, 1990; Núñez et al, 2012). English-speaking adults, for instance, point leftward [/backward] to refer to the past, and rightward [/forward] for the future (Casasanto & Jasmin, 2012; Cooperrider & Núñez, 2009). However, little is known about the development of temporal gestures, or of metaphorical gestures more generally. When do spontaneous, systematic temporal gestures arise in development, and how does this relate to children's understanding of temporal language?

Methods. In an ongoing cross-sectional study, children (5;0 to 8;12 years old) and adults are completing a series of tasks designed to elicit temporal gesture and probe their understanding of temporal language. To elicit spontaneous temporal gestures, participants are asked to explain the meanings of contrasting temporal terms (e.g. tomorrow vs. yesterday). These questions lack spatial language, to avoid encouraging spatial gesture. Other items evaluate knowledge of temporal language: participants are asked to answer binary-response questions about generic events (e.g. whether they will eat dinner this morning or tonight), to identify the first event in temporal sequences (e.g. "Which will happen first, next year or next week?"), and to place temporal terms (e.g. last week) on a physical timeline extending from past to future.

Results. Data collection and analyses are ongoing. Here, we report preliminary evidence that children as young as five spontaneously spatialize temporal concepts, gesturing about time in ways previously documented only in adults (Cooperrider & Núñez, 2009). Below are examples of observed gestures:

Duration marking gestures demarcate a spatial extent that metaphorically represents a temporal duration. For instance, a 6-year-old child (AH) described the duration of a month as "the whole one of them," while producing a bimanual stroke with fingers extended, hands apart, and palms facing inward, demarcating a line segment representing the month's duration.

Placing gestures situate an event at a location. For example, a 5-year-old (ML1) explained why yesterday differs from tomorrow by saying, "Because there's one day in the middle," while using a bimanual, downward stroke to place the day immediately in front of his body.

Pointing gestures indicate locations associated with times or events. A 6-year-old (ML2) located "last week" in the past by rapidly pointing leftward while saying, "the day the week that just passed," and then, while describing next week as "the week that's gonna come next," pointed rightward. In addition to the horizontal (left-right) axis, some children made use of the sagittal (back-front) axis (e.g. waving backwards while saying "the day before").

Pilot data indicate that temporal gestures are rare in 5-year-olds but increasingly common in older children, perhaps due to increased experience with reading and writing, or with artifacts such as calendars, which each encourage use of the horizontal axis. Ongoing analyses are determining the systematicity and prevalence of such gestures across development and their relation to knowledge of temporal language.

21

Embodied exploration and expression in a museum

Renner

How do children use their bodies to make meaning from experience? Children explore the world, actively sensing and integrating information from multiple modalities. Iconic gestures, observed among children in a natural history museum, carry expressive force, but not always communicative purpose. Gestures, embodying representational content, act as exploratory vehicles as children coordinate sensorimotor activity with semiotic resources they make meaningful. Children make iconic gestures alone and with others, with and without utterances of speech or sounds. Their iconic gestures perform two different functions. They use their bodies to give form to structure they perceive in the world. Children also create iconic gestures to represent novel structure, filling gaps they perceive in museum models designed to illustrate geologic processes.

Children use gesture to create embodied representations in relation to objects in a museum. They create form-to-form correspondences (Taub, 2001) using their hands and bodies to selectively represent what they perceive in museum models. Although children use their bodies to, in a sense, repeat what they see, these iconic gestures are not redundant or superfluous. Representing perceivable structure can have multiple cognitive consequences: highlighting features and relations deemed interesting by the child; managing attention of self and/or others; enacting a representational movement to generate a sensorimotor experience of visual input.

A unique set of dynamic representational gestures occurs when children interact with a model of subduction and volcanism. When children see the museum model as a set of volcanoes, they use the model as a material anchor for a conceptual blend (Hutchins, 2005). Features of the physical model correspond with features of a volcano exemplar, with a very important exception. Whereas the interactive model represents a tectonic plate melting at depth and magma rising through volcanic vents, the model does not represent the eruption of lava and gas at Earths surface. Children use their bodies, with great fluidity and flexibility, to fill the gap that they perceive in the museum model. Their gestures, environmentally coupled with spatial and temporal precision (Goodwin, 2000), enact volcanic eruptions, with oozing spreading lava or explosive force. The body also serves as a material anchor.

The childrens iconic gestures, whether representing perceived structure or novel structure, often occurs in the absence of others, with speech or sonification. These gestures, like self-directed speech (Vygotsky, 1934/1986), lend organizing structure to the childs perceptual and motor activity. In the museum, children seek out opportunities for action. They create iconic gestures to uniquely embody meanings in the museum, while showing signs of discovery and enjoyment.

These findings, derived from a mixed methods video-based ethnography of children in a museum, suggest implications for design and education. Gesture can serve an expressive social function and a personal exploratory sensorimotor-semiotic function. Learning environments can elicit iconic gesture production through the deliberate design of gaps in educational materials. Iconic gesture provides one way for children to coordinate their bodies with museum exhibits, using their imaginations for the joy of physical engagement and to make experiences meaningful.

22

Multifunctionality in gesture and grammar

Kok

Several proposals for a multimodal grammar - a model of linguistic structure that incorporates speech and gesture - have been made over recent years. Many of these depart from established cognitive-functional grammatical frameworks, including Systemic Functional Grammar (Muntigl 2004), Construction Grammar (Andrén 2010; Breslow et al. 2010; Turner and Steen 2012), Cognitive Grammar (Cienki, 2012; Wilcox, 2004; Wilcox & Xavier, 2013), Functional Discourse Grammar (Connolly 2010) and Eisenberg's grammar (Fricke 2012; Ladewig, 2012). Accommodating co-speech gesture in grammar, however, is not straightforward on all counts. Theoretical problems that arise when taking the notion of a multimodal grammar seriously include (1) the potential of gestures to express meaning in a non-categorical manner, (2) the different levels and degrees to which gestural expression can be systematic, and (3) the multifunctionality of the gestural medium.

The latter provides a serious challenge to current grammatical formalisms: many gestures do not only have representational functions, but concurrently provide emphasis to what is being said, and/or express the speaker's personal commitment. In order to arrive at an analysis of gestures in terms of form-meaning mappings, a better understanding is needed of the formal correlates of these functions, and the way they are combined during the dynamics of face-to-face discourse. The current contribution presents an attempt to identify such mappings on the basis of a large scale video corpus analysis (the Bielefeld Speech and Gesture Alignment corpus; Lücking, Bergman et al. 2012), which consists of 25 dialogues between individuals involved in a route-description task.

In an internet-based study, approximately 500 route-description gestures have been rated in terms of a set of eleven possible functions (e.g., reference, ascription, emphasis, hedging, meta-communicative) on a 7-point likert scale, each by fifteen independent raters. This yields a "functional distribution" for each gesture: a characterization of the different functions it carries out, and to what degrees it does so. Because the corpus has also been annotated in terms of a range of gesture form parameters (e.g. handshape, orientation, and movement), it allows for a detailed, large-scale investigation of the possible formal correlates of the functions that gestures carry out.

Altogether, this research suggests that a statistical approach can provide a solution to the problem of multifunctionality: gestural "meaning complexes' might best best understood in terms of stochastic patterns of co-occurrence with several layers of the discourse (semantic, discursive and interpersonal), rather than in terms of strict, invariable categories or mappings. Based on such an approach, a better understanding can be gained of the degree to which gestural patterns are subject to "entrenchment" and "conventionalization", two defining characteristics of grammaticality according to Langacker (1987). I conclude by considering how a statistical approach to multimodal language structure can be represented visually.

23

The neural integration of intrinsically meaningful gestures: An EEG and fMRI study

He, Steines, Gebhardt, Kircher, Nagels, Straube

One of the key features of gesture comprehension is that comprehenders autonomously integrate gestures with up-coming speech. However, it is not fully clear how this integration process is represented in the human brain. Previous research has identified posterior superior temporal sulcus/middle temporal gyrus (pSTS/MTG) and left inferior frontal gyrus (LIFG) to be the most possible neural substrates of gesture-speech integration. More interestingly, depending on different levels of semantic relationship between gesture and speech, the two areas are found to be differentially involved in multimodal integration: while the integration of co-speech iconic gesture activates both areas, speech-pantomime integration only activates pSTS/MTG. This may suggest that human brain works differently when integrating different kinds of gestures with speech.

In the current study, we aim at extending previous results by investigating two different types of gestures as an ensemble (emblems and tool-use gestures) and we label them as "intrinsically meaningful gestures (IMG)". IMGs are similar to pantomimes in the sense that they are meaningful without speech but they cover wider abstract-concrete spectrum than pantomimes. In addition to an fMRI experiment, we carried out an EEG experiment, for the first time, looking at temporal and oscillatory aspects of multimodal integration. We presented participants short video clips of three speech and IMG gesture conditions (Gesture-German speech, GG; Gesture-Russian speech, GR; only Speech-German, SG). Of the three conditions, only GG requires gesture-speech integration. For the fMRI experiment, given that the semantic representations of IMG are not dependent on speech, following previous literature, the integration of IMG and speech may involve pSTS/MTG but not necessarily LIFG. For the EEG experiment, as relevant literature is insufficient, we could only predict potential alpha (7-13 Hz) and beta (14-30 Hz) decrease for the gesture effects in general (GG and GR vs. SG) which reflects motor activities, no specific prediction concerning the integration process is available.

The results of the fMRI experiment revealed that the gesture-speech integration of IMGs (GG>GR and GG>SG) activates pSTS. As for the EEG experiment, time-locked to the onset of the critical integration word, both GG>SG and GR>SG showed central-parietal alpha (0.1-1s) and beta (0.3-1s) power decrease. A centrally-distributed alpha decrease is also found for GG>GR (0.6-1s). Taken together, the more focal alpha decrease (the overlay between GG>SG and GG>GR) could most likely be interpreted as reflecting the gesture-speech integration.

The pSTS activation found in the fMRI experiment for the integration process mirrors previous study on pantomimes: as the meaning of IMG is not dependent on speech, only pSTS is involved in linking/matching the representations from both modalities. The results from the EEG experiment provide further insights into this process: at least for the integration between IMG and its corresponding speech, this process could be reflected by a centrally-distributed alpha power decrease elapsing from 600-1000ms. In sum, the current study extends gesture-speech integration literature by looking at a novel grouping of gesture and for the first time offers temporal and oscillatory evidence for multimodal integration.

Poster Session 2 – Wednesday, July 9th 12:00 pm – 2:00 pm

1

High stakes communication: Gesture makes the point

Hilliard, O'Nea, Plumert, Wagner, Cook

How do speakers adjust their gesture for their listeners. Characteristics of listeners influence the gestures that speakers produce (Goldin-Meadow & Singer, 2003; Holler & Stevens, 2007; Özyürek, 2002) and speakers gesture more when the communicative stakes are high for their intended listener (Kelly, Byrne, & Holler, 2011). However, it is unknown whether speakers adjust their gesture online during interactive discourse to meet their listeners' changing communicative needs. To investigate this question, we examined speech and gesture during interactive mother-child conversations about safety.

Sixty-six mothers and their eight-to-ten-year-old children discussed safety in the lab. Mothers and children first individually rated the safety of images depicting a child engaged in an ambiguously dangerous activity. Then, dyads were instructed to discuss each image and to jointly rate them. We coded these conversations for the semantic information conveyed in gesture and speech (described below), and for the amount and types of gestures used (deictic, iconic, beat) to convey this semantic information.

Mothers tended to provide rationales in speech that referred to features (e.g., "That burner is hot") and outcomes (e.g., "She could burn herself"), both dangerous and non-dangerous, in each situation. Moreover, these rationales were expressed in both speech (M=1.421 spoken rationales/trial) and gesture (M=1.523 gestures/trial).

If mothers dynamically alter their gesture for their children, then the child's rating of an individual picture should influence mother gesture in addition to any effect of the mother's own rating. We analyzed the amount of gesture within each of our coded rationales as a function of 1) disparity: the difference between the mother and child ratings; 2) mother rating. We used disparity to account for the child's perspective because we expected mothers' behavior to be directed at changing their children's thinking, and disparity directly captures the amount and direction of change necessary. Because we expect that gesture will change with speech, we controlled for the amount of information mothers expressed in speech. For dangerous rationales, there was a significant interaction; mothers increased their gesture with greater disparity, beyond what would be expected given the mothers' own rating and the increase in the amount of dangerous rationales in speech. When analyzed separately by gesture type, the proportion of deictic gestures for dangerous features specifically significantly increased with disparity. For non-dangerous rationales, mothers decreased their gesture, this time as a function of mother rating, but not as a function of disparity; the more dangerous the mother rating, the less gesture about non-dangerous rationales. Additionally, iconic gestures for non-dangerous rationales were significantly reduced with increasing disparity.

Thus, mothers modulate their gesture in judicious ways when communicating with their children about safety. Mothers were particularly likely to gesture for high stakes situations - when they perceived a situation as dangerous and their child simultaneously did not. Moreover, mothers' gestures highlighted danger, and downplayed non-danger, and they did so on a trial-by-trial basis rather than as a global assessment of a child's general perspective or communicative needs. Speakers may use gesture to selectively highlight information that they believe a listener needs.

2

Representing actions in co-speech gestures in Parkinson's disease

Humphries, Holler, Crawford, Herrera, Poliakoff

Parkinson's disease (PD) is a progressive, neurological disorder caused by the loss of dopaminergic cells in the basal ganglia, which is involved in motor control. This leads to the cardinal motor symptoms of PD: tremor, bradykinesia (slowness of movement), rigidity and postural instability. PD also leads to general cognitive impairment (executive function, memory, visuospatial abilities), and language impairments; PD patients perform worse at language tasks such as providing word definitions and naming objects, generating lists of verbs, and naming actions. Thus, there seems to be a particular impairment for action-language. Despite the fact that action and language are both impaired in PD, little research has explored if and how co-speech gestures, which embody a link between these two domains, are affected. The Gesture as Simulated Action hypothesis argues that gestures arise from cognitive representations or simulations of actions. It has been argued that people with PD may be less able to cognitively represent, simulate and imagine actions, which could account for their action-language impairment and may also mean that gestures are affected. Recently, it has been shown that while there is not a straightforward reduction in gesture use in PD, patients' gestures which described actions are less precise/informative than those of controls. However, participants only described two actions, and to a knowing addressee (so the task was not communicative).

The present study extended this by asking participants to describe a wide range of actions in an apparently communicative task, and compared viewpoint as well as precision between the two groups. Gesture viewpoint was examined in order to provide a window into the cognitive representations underlying gesture, by demonstrating whether or not the speaker has placed themselves as the agent within the action (character viewpoint), requiring a cognitive simulation of the action. Overall, studying gestures in PD has clinical relevance, and will provide insight into the cognitive basis of gestures in healthy people.

25 PD patients and 25 age-matched controls viewed 10 pictures and 10 videos depicting a range of actions and described them to help an addressee identify the correct stimulus. No difference in the rate of gesture production between the two groups was found. However, the precision of gestures describing actions was found to be significantly lower in the PD group. Furthermore, the proportion of gestures produced from character viewpoint was found to differ between the groups, with PD patients producing significantly less C-VPT gestures. This suggests that the cognitive representations underlying the gestures have changed in PD, and that people with PD are less able to imagine themselves as the agent of the action. This supports the GSA hypothesis by demonstrating that gesture production changes when the ability to perform and to cognitively simulate actions is impaired. Our next study will assess the relationships between cognitive factors affected in PD and gesture, and motor imagery ability and gesture. The study will also examine gestures produced by people with PD when describing a wide range of semantic content in various communicative situations.

3

What makes me point with open palm or index finger extended?

Jarmolowicz-Nowikow, Juszczyk

Pointing gestures are fundamental in the development of communicative abilities (Tomasello et al. 2007, Cochet and Vauclair 2010) and constitute an indispensable component of adult communication (Kita 2003). Even though they might be considered as the most primary and ”evident” category of gestures (McNeill 1992) with the growing body of research devoted to them, their complexity is gradually being discovered (Haviland 2003, Jarmolowicz-Nowikow, Karpinński 2011).

The aim of the presentation is to discuss potential determinants of the form of pointing gestures made by native speakers of Polish. It will be shown that the referent of pointing gesture (person or object) as well as Polish cultural norms for realizing pointing gestures influence the form of the gesture.

To achieve the aim of the study, two experiments were conducted. In one of the experiments, the arrangement of the recording studio and the experimental task were designed to evoke object-directed pointing gestures. The aim of the other experiment was to elicit pointing gestures made to indicate people (the participants were asked to place a group of people in a certain configuration and to photograph them). Also a survey was carried out in two age groups to find out how pointing gestures are perceived by Polish people and what is their personal opinion about pointing gestures.

There were 1026 pointing gestures distinguished in the two experiments; however not all of them were analyzed. Only pointings indicating people and objects were taken into consideration, and so 361 pointing gestures indicating objects and 360 indicating people were analyzed. Three main categories of pointing gestures were distinguished in the recorded material on the basis of their forms:

- open palm;
- extended finger;
- gaze as pointing gesture.

Each of the categories consists of subcategories comprising recurrent specific realizations of the category’s basic form. The results of the analysis show a tendency among subjects to produce different forms of pointing gestures depending on the referent. A significant majority of the gestures serving to indicate an object (paper figure in this case) had a form of extended index finger (86%), while the majority of those used to point at people were performed using an open palm gesture or gaze (66%).

The results of the video recordings analysis confronted with the results of the survey showed that the behaviors of subjects in an experimental situation are in agreement with their opinions concerning the realization of specific forms of pointing. The analysis of the video recordings made in the experimental conditions described above were also compared with the results of the analysis of pointings realized during spontaneous dialogues between two people: coach and client talking about self-development, learning and career. The pointing gestures distinguished in this video material refer to people (speakers point at themselves) and objects (parts of the picture drawn during the session) as well as to abstract ideas (stage of the speaker’s career, certain moments in time).

4

Effects of gesture restriction on quality of narrative discourse

Jenkins, Coelho, Coppola

Many studies of language production and gesture focus on how co-verbal hand movements interact with spoken language on the lexical and sentential levels (McNeill, 2008). There has been little quantitative analysis of how gestures interact with language production on a discourse level, despite observations of frequently repeated gestural forms and movements in discourse samples (e.g., McNeill et al., 2001). Natural language production is not isolated to the consideration of single word and sentence production; therefore, an account of gesture’s role in discourse production would be fruitful.

This study examines the effects of the free use of gesture on the length, content, and organization of discourse. We manipulated participants' freedom to gesture in a narrative production task in the following within-participant conditions: i. Restricted gesture (speaker holds the bottom of their seat while speaking, effectively prohibiting the hands from gesturing); ii. Unrestricted gesture (no mention of the hands; however, speaker must maintain their feet on two spots in front of them). Imposing a physical restriction in each condition (i.e., hands and feet) controls for any cognitive load effects that may be introduced from body restriction in general.

Ten participants (3 males) produced a narrative sample by verbally describing a picture book that contained no words (Barrett & Barrett, 1969). Each participant produced the narrative twice, once in the Restricted and once in the Unrestricted condition, each time to an unfamiliar listener, in order to control for learning and common ground effects. Additionally, gesture restriction order was counterbalanced to control for potential order differences (e.g., gesture restriction first may produce different outcomes on our discourse metrics vs. no gesture restriction first). Discourse samples were coded for length (T-units, or number of individual main and attached dependent clauses), organization (story grammar, or episode structure), and syntactic complexity (total number of subordinate clauses) (L'Coelho, Mozeiko, & Grafman, 2011).

A significantly higher number of complete episodes were produced in the Unrestricted condition (Wilcoxon Signed-Rank Test, p = .0117). Participants consistently produced higher numbers of subordinate clauses in the Unrestricted condition as well as higher numbers of incomplete episodes in the Restricted condition across all participants, though these differences were not reliable (Wilcoxon p=ns). We found these results despite finding no differences in the overall number of T-units produced in each narrative. Interestingly these same trends were preserved when condition order was separated into 2 groups (i.e. Unrestricted first vs. Restricted first). These patterns suggest that while gesture restriction does not dramatically affect narrative length or content, the ability to produce gesture promotes production of more complete episodes in a narrative sample and higher syntactic complexity.

We conclude that the freedom to use gesture in discourse production may facilitate better discourse production. This finding may lend itself to a novel therapeutic intervention in the treatment of acquired language disorders specific to discourse production (e.g. individuals with aphasia and Traumatic Brain Injury). For example, encouraging patients to gesture while speaking (instead of focusing exclusively on spoken language) may improve the organization of their verbal discourse.

5

Is there evidence for a cline of syntacticization in signed languages, not just a cline of lexicalization?

Johnston

Parkinson's disease (PD) is a progressive, neurological disorder caused by the loss of dopaminergic cells in the basal ganglia, which is involved in motor control. This leads to the cardinal motor symptoms of PD: tremor, bradykinesia (slowness of movement), rigidity and postural instability. PD also leads to general cognitive impairment (executive function, memory, visuospatial abilities), and language impairments; PD patients perform worse at language tasks such as providing word definitions and naming objects, generating lists of verbs, and naming actions. Thus, there seems to be a particular impairment for action-language. Despite the fact that action and language are both impaired in PD, little research has explored if and how co-speech gestures, which embody a link between these two domains, are affected. The Gesture as Simulated Action hypothesis argues that gestures arise from cognitive representations or simulations of actions. It has been argued that people with PD may be less able to cognitively represent, simulate and imagine actions, which could account for their action-language impairment and may also mean that gestures are affected. Recently, it has been shown that while there is not a straightforward reduction in gesture use in PD, patients' gestures which described actions are less precise/informative than those of controls. However, participants only described two actions, and to a knowing addressee (so the task was not communicative). The present study extended this by asking participants to describe a wide range of actions in an apparently communicative task, and compared viewpoint as well as precision between the two groups. Gesture viewpoint was examined in order to provide a window into the cognitive representations underlying gesture, by demonstrating whether or not the speaker has placed themselves as the agent within the action (character viewpoint), requiring a cognitive simulation of the action. Overall, studying gestures in PD has clinical relevance, and will provide insight into the cognitive basis of gestures in healthy people.

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6

Gesture rates vary with clarification and elaboration during discussion of familiar topics

Koranda, Volante, Shepard, Prichard

It is generally accepted that co-speech gesture is sensitive to many dimensions of discourse, but a possible concern is that many of the findings are from experiments that utilize non-personal, novel stimuli for message generation. Considering much of daily dialog contains non-novel, personal content, it is important to determine the generalizability of existing findings. The status of generalizability is unclear in part due to the still-uncertain mechanism of gesture in speech production. Theories differently predict the influence of message type and working memory on the relationship between speech and gesture production. Using non-novel, personal stimuli in a discourse setting intended to carry high ecological validity, the present study sought to extend the findings that conversational feedback (Holler & Wilkin, 2011) does not influence gesture frequency.

Undergraduates (n=28) volunteered in video-taped, one-on-one conversations regarding their opinions and strategies of coursework and campus life. Participants were told they were participating in a study of student attitudes, and they were asked about their knowledge and opinions in a question-answer dialog with a confederate. To manipulate feedback type, the confederate was trained to respond to participants' initial statements (baseline segment) with a request for clarification either initiated by incomprehension (e.g. "I'm not sure what you mean. Could you say more about that") or agreement (e.g. "That makes sense. Could you say more about that"), at which point participants generated a subsequent message. Participants were not restricted in their production length. All participants received both a block of four topics paired with incomprehension-related feedback, and another block with elaboration-related feedback.

To control for response length, gesture frequency was divided by word count from the verbal response. Gesture frequencies in messages before feedback across all topics (8 items) showed high homogeneity in gesture elicitation, Cronbach's -.89. Participant gestures were contrasted in the baseline segment (before any feedback from the confederate) and post-feedback. Feedback type significantly affected the change in gesture frequency during first and second utterance after feedback (M= .006, SD= .003), with incomprehension feedback increasing and elaboration feedback decreasing frequency by .008 gestures per word, t (216) = -2.54, p <.05. These data show that gesture frequency is sensitive to feedback manipulations in relatively unscripted conversations. These results suggest that listener feedback has a substantial effect on producers' gesture rates despite wide individual differences in the topics and opinions produced by the participants.

7

Exploring transitional knowledge in response to gestured instructional input across live and video mediums

Koumoutsakis, Brown, Chruch, Ayman-Nolley

As important as instructional input is to learning, is the child's readiness to benefit from that input. Studies that have examined gesture's role in communication have found that children and adults process gestured input and that gesture can improve the processing of speech (Church, Kelly & Lynch, 2000; Church, Garber & Rogalsky, 2004). Thus, gesture may be important to include in instruction and indeed studies have shown in fact, that gesture included with speech in instruction does benefit children's learning for certain concepts (e.g., Cook, Duffy & Fenn, 2013). Previous research examining the role of gesture in math instruction have included studies that use live instruction (e.g., Cook & Goldin-Meadow, 2006) and studies that use video instruction (e.g., Cook, Duffy & Fenn, 2013), but none have examined gestured instruction in live versus video instruction. Moreover, few studies have examined gesture's communicative influence as a function of the learner's knowledge state; that is whether the learner who is in transition (as indexed by the production of speech-gesture mismatches in problem explanations) reacts differently to gestured instruction compared to children who are not in transition.

The current two studies expand the research on gesture's role in learning math by examining the following factors. (1) Gesture in instruction as a function of different mediums (live vs. video). (2) The learner's knowledge state (as indexed by speech-gesture mismatches in problem explanations) in response to instruction. We ask how do children in different states of readiness to learn respond to gesture in instruction when it is presented live or on video.

Study 1 had a total of 63 participants from local elementary public and private schools. Results revealed speech instruction accompanied by gesture improves learning regardless of medium. However, the video medium enhanced the impact of gestured instruction. Study two examined a portion of these 63 children asked to explain their math problem solutions prior to instruction. These explanations were transcribed and coded to determine the degree of mismatching information between speech explanations and accompanying gesture. When learners produce speech-gesture mismatches when explaining math problems are in transition with respect to learning a particular concept and ready to learn (Church & Goldin-Meadow, 1986; Church, 1999; Perry, Church & Goldin-Meadow, 1988).

Results from study 2 revealed that children who were not in transition (produced speech-gesture matches in the pretest) were more likely to benefit from video speech + gesture instruction than any other instruction conditions. In contrast, children who were in transition (produced speech-gesture mismatches in the pretest) were highly likely to learn regardless of the instruction they received. The role of prior, implicit knowledge as reflected in gesture during the learning process will be discussed."

8

Co-speech gesture development in bimodal bilingual children

Kozak

While much research has been conducted on hearing children and adult bimodal bilinguals, such research has not been conducted on bimodal bilingual children. This study focuses on the longitudinal development of two koda children that were recruited to a longitudinal language study at the "one-word/gesture" stage.

Both were recruited and began filming at roughly 11 months of age, displaying co-speech gestures that matched those of their unimodal counterparts, displaying mainly indexical co-speech gestures in their speech. Much like unimodal hearing children, the two bimodal bilinguals expressed mostly emblems (such as e(shh) "he's sleeping"), deictic gestures in conjunction with short phrases (IX(interlocutor's earring) "What's that?"), and exhibited ritualistic play in their co-speech activity, such as utilizing an item in place of pretending to speak on the phone.

However, both children developed past these simplistic gesture patterns. While they began with unmarked handshapes as described by Boyes-Braem (1990), as they gained fine motor control of their signing skills, the range of their handshapes patterned after findings by Casey and Emmorey (2012) of adult bimodal bilinguals in their co-speech gesture use.

This study aims to look at not only co-speech gesture usage by these participants in naturalistic settings with interlocutors who all have an amount of signing ability, but also to see whether their co-speech gesture develops similar to monomodal monolingual children, or their adult bimodal bilingual counterparts.

The participants developed and displayed co-speech gestures in-line with Coda adults, and showed a preference for deictics and emblems early on, which was later replaced by a preference for co-speech depicting verbs when speaking with interlocutors knowledgeable about sign language. Their range of handshapes also exceeded that of unimodal counterparts, and followed that of Casey and Emmorey as their fine motor skills improved.

In this case study, the koda children are not only analyzed from a gestural standpoint, but also from a bilingual bimodal standpoint. While they pattern after their unimodal peers early on, their co-speech gesture usage later develops to match that of their adult Coda counterparts, exhibiting a range and usage of handshapes not normally seen by hearing unimodal children, but often witnessed in adult bimodal bilinguals in their depicting verbs and co-speech gestures.

9

Micro-briefings in hospital corridors

Lê Van

Conversational analytic studies on work meetings have mostly concentrated on scheduled regular meetings following a pre-established agenda, with pre-set participants occupying circumscribed spaces and adopting static body positions (Asmuß, Svennevig, 2009; Boden, 1994; Deppermann et al., 2010; Ford, Stickle, 2013; Mondada, 2004; Schmitt, 2006). In hospital services, the nursing staff takes part in several daily hand-over meetings, the organization of which has been studied for instance by Bangerter et al. (2011), Grosjean (2004); Payne et al. (2000) or Cohen, Hilligoss (2009). Beyond these institutionalized meetings, hospital nursing staff carry on building, sharing, and updating common knowledge on their Service functioning. My poster presents the activity of "micro-briefings": a meeting involving nursing staff that occurs in corridors and other interstitial spaces of the Service, as its participants come in and out of the rooms. Nurses produce a general overview of their on-going and immediate activities in the Service, and decide on upcoming actions. The poster describes micro-briefings sequential and multimodal accomplishment, as well as their contribution to the teamwork organization. When accomplishing micro-briefings, participants use various semiotic resources. I will focus in particular on pointing gestures contributing to space representation.

I am studying "micro-briefings" as the topic of my PhD dissertation, which is part of a broader research project on mobile and contingent work interactions at the hospital (SNF grant no PDFMP1-134875/1). Our setting is a hospital outpatient clinic in the French speaking part of Switzerland. For this video-based field study (Heath & Hindmarsh, 2002), we used a setup of four video cameras and eight wireless microphones operating simultaneously, to collect 336 hours of video recordings of staff activity in the clinic corridors. Recordings were supplemented by ethnographic material. Analysis followed the approach of multimodal conversation analysis (Goodwin, 2000; Stivers, Sidnell, 2005).

Drawn from the original research corpus, I have built, for my own study, a collection of fifteen excerpts showing micro-briefings. First observations show that micro-briefings are very short, lasting on average less than two minutes. Participants review the cases being handled in the clinic and the caretakers' past and present actions related to them. They also decide on upcoming actions to be taken by team members. When doing this, participants share information on a limited number of subjects, in a very concise way. When producing micro-briefings, participants use multimodal resources, articulating talk and body behavior (gaze, gesture, body postures, and moving in space). Micro-briefings are a contingent activity, arising depending on practical circumstances (such as managing a large number of cases, for instance). They happen on the spot, when necessary, without delay, with only indispensable temporal and spatial arrangements to secure mutual hearing and visual contact among participants. Finally, micro-briefings rely on common professional knowledge, specific to this particular work environment, to deal with the addressed matters. The study of micro-briefings opens to a better understanding of care teamwork organization achieved outside the framework of scheduled regular meetings. It is an in-situ interactional form of work organization, implemented by the team through multimodal conversational practices that deserves to be brought to light.

10

The TV news archive: An innovative new tool for gesture research

Lucero, Zahrachuck, Casasanto

The Internet Archive is a non-profit digital library that aims to offer all people free "universal access to all knowledge." Two years ago, the Internet Archive released the TV News Archive (https://archive.org/details/tv), a massive online database of over 500,000 news programs from over four years of American television. All archived broadcasts include both video clips and captions. These video clips can be used to search for specific verbal expressions and associated gestures, and a single search can yield hundreds or even thousands of videos for gesture analyses. The broadcasts include speech and gestures generated by everyday people, journalists, news anchors, politicians, celebrities, and others.

As will be discussed in our presentation, the TV News Archive has a great deal to offer gesture researchers. It can be used for large-scale data-driven language-centered approaches, where many different gestures for the same verbal expression can be readily analyzed. In particular, the archive can be used to answer a number of questions related to gesture research, including the following: How consistent are particular kinds of gestures (e.g., path gestures showing fictive motion and actual motion, precision grip gestures showing size) used across various types of reporting and across various topics (e.g., economic trends, road conditions, wildfires). What differences arise, and when.

In our talk, we discuss the utility of the TV News Archive as a research tool for gesture analysis. Our talk will include discussion of several projects in our lab that take a novel approach to gesture analysis using this tool, including a study on size and quantity of abstract entities, a study on non-literal motion descriptions, and a study on metaphors in wildfire reporting. We also discuss some strengths and weaknesses in using the archive as a research tool and present implications of the work for gesture research, including approaches that emphasize semantic and pragmatic contributions to everyday interactions (Clark, 1996; Goldin-Meadow, 2003; Goodwin, 2007; Kendon, 2004).

11

Gesture use in children is fictional and autobiographical narratives

MacLurg, Marentette, Furman, Nicoladis

In this study we use different narrative tasks as a means of exploring the function of gesture in school-aged children. Previous research has focused on fictional stories. We predict that autobiographical stories will differ in gesture frequency and perspective. Five children between 8- and 11-years-old were asked to recount a fictional story (Pink Panther, In the Pink of the Night) and an autobiographical story that revolved around an event and its outcome (e.g., a time when you had resolved a disagreement with a friend). This age group can be expected to tell a coherent story (Bamberg & Damrad-Frye, 1991). We predicted that gesture frequency would increase in autobiographical stories because these stories are likely to be more complex. Increased gesture production might provide a means of managing cognitive load (Goldin-Meadow, 2005). We also predicted that autobiographical stories would have a higher rate of character-viewpoint gestures, since it is the child's own experience. Children's autobiographical stories tend to be more complex (Geist & Aldridge, 2002). We measured story complexity by comparing the production of evaluative clauses (Shapiro & Hudson, 1991), counting the number of emotion words (Han, Leichtman, and Wang, 1998; Lagattuta & Wellman, 2002), and counting the shifts in perspective, both in speech and gesture (MacWhinney, 2005; McNeill, 1992). We expected to find that autobiographical stories included more evaluative clauses, more emotion words and more shifts in perspective, both in speech and representational gesture.

Our results align with some of these expectations. Pronoun use indicated that children told autobiographical stories using the first person (100% of clauses) and fictional stories primarily from the third person (230/233 clauses, 99%). Only one child told a story that shifted perspective within the story. Autobiographical stories were associated with a higher proportion of evaluative clauses (M=.15) than fictional stories (M=.07). There were more emotion words per clause in autobiographical stories (M=.09) than fictional stories (M=.05). Almost all emotion words were used in evaluative clauses. Children produced more gesture when telling autobiographical stories (M=5.11 gestures/100 words) than fictional stories (M=2.64, despite one outlier in this condition). Children used more observer viewpoint gestures than character viewpoint, regardless of the type of story they were telling. There is a trend to the production of more character viewpoint gestures in autobiographical stories (M =1.1) than fictional stories (M=.8). For two of the five children there were more shifts in perspective in autobiographical stories than fictional stories.

This preliminary study shows that children differentiate autobiographical and fictional stories. There is preliminary support for a claim that the children's autobiographical stories were more complex. Although we did not see a difference in complex perspective indicated in their speech, we did see more complex perspective in the children's use of gesture. Their autobiographical stories showed greater use of evaluative clauses and emotion words. Finally, autobiographical stories were associated with a higher rate of gesture production. These preliminary results indicate that a variety of narrative types should be investigated to adequately reflect the natural use of gesture in children's daily lives.

12

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Matlock, Bergmann, Banks, Perlman, Winter

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13

Children's understanding of scientific concepts: Exploring the benefits of gesture and elaborative talk

McLay, Salmon, Brown

An understanding of, and interest in, scientific concepts is fundamental for children's appreciation of their surroundings, development of critical thinking skills, and is a basic requirement for many career pathways (Settlage & Southerland, 2007). Children typically perceive science subjects to be difficult however, which may adversely affect their engagement in learning (Andre, Whigham, Hendrickson, & Chambers, 1999). Research suggests the key to enhancing interest and achievement in science is early exposure (Alexander, Johnson, & Kelley, 2012). Thus, an important question is how can adults optimise scientific learning experiences so children best understand and remember them?

Gesture may be particularly useful for enhancing children's learning and memory during science instruction. Adults often use gesture to scaffold children's learning, particularly when conveying abstract ideas, as complex concepts can be presented in a more concrete way (Iverson, Longobardi, Spampinato, & Caselli, 2006). Observing adult gesture can also improve children's encoding and recall of information (Goldin-Meadow, Kim & Singer, 1999; So, Chen-Hui & Wei-Shan, 2012) and assist children in learning new concepts (Singer & Goldin-Meadow, 2005).

Gesture typically occurs concurrently with talk, and the style of talk engaged in may also support children's learning and memory during science instruction. An elaborative style of talk, which elicits children's participation in conversations through the use of wh-questions (who, what, where, when, how and why), benefits learning and memory. Elaborative talk increases both the amount and accuracy of information reported by children about their experiences (Boland, Haden & Ornstein, 2003; McGuigan & Salmon, 2006), and supports children in learning new concepts (Benjamin, Haden, & Wilkerson, 2010).

While both gesture and elaborative talk may promote children's learning and memory, their combined effects in enhancing children's understanding of scientific concepts has yet to be explored. The current study examined how gesture and elaborative talk may work separately and in tandem to support children's learning and memory. At least 75 children (7-9 years of age) individually learnt about the solar system during an interactive event. Children experienced the event in one of four conditions: 1. Gesture + wh-questions, where children answered wh-questions and observed gesture while being taught about the solar system; 2. Gesture alone, where children observed gesture alongside verbal instruction; 3. Wh-questions alone, where children were asked to answer wh-questions throughout the event but observed no gesture;

and 4. No additions, where children received the solar system information without gesture or wh-questions. The next day, children were interviewed to assess what they remembered about the solar system event. Group differences will be analysed to assess the effect of gesture, elaborative talk, and the combination of the two, on children's memory and understanding of the scientific concepts. Results and implications will be discussed.

14

Speaker-gaze modulates gestural adaptation

Mol, Althof

Numerous studies have found that perceiving representational hand gestures influences how we shape our own hand gestures (Bergman & Kopp, 2012; Holler & Wilkin, 2011; Kimbara, 2006, 2008; Mol, Krahmer, Maes, & Swerts, 2012; Parrill & Kimbara, 2006). Like verbal adaptation (Brennan & Clark, 1996), such gestural adaptation is thought to facilitate grounding (Holler & Wilkin, 2011). To draw attention to their gestures, speakers may employ gaze (e.g., Goodwin, 1981). Consistently, addressees gain more information from gestures that speakers gazed at (Gullberg & Kita, 2009). This shows that speaker-gaze modulates gestures' role in communication. If gestural adaptation is part of the grounding process, it follows that speaker-gaze modulates gestural adaptation too.

As a first step in testing if speaker-gaze modulates gestural adaptation, we tested whether a speaker's gaze at her own gestures affected the likelihood of these gestures being repeated by another speaker later on. Twenty-five Dutch participants (16 female) watched a life-size projection of a Dutch speaker narrating five cartoon episodes. In sum, she produced 24 iconic gestures and 10 beats, half of which she gazed at (alternating). The rest of the time, the speaker looked into the camera. One group of participants saw the speaker gaze at one half of her gestures (stimulus-movie 1) and the other group at the other half (stimulus-movie 2). Participants' own gaze was tracked with a freestanding eye-tracker. After watching a narrated episode, participants related its story to another (naive) participant, who answered questions on it afterward.

Narrating participants were videotaped. For each content-unit that had occurred with a gesture in the stimulus-movie (e.g. throwing a bowling ball, or swinging across), it was determined whether participants mentioned it and if so, whether they simultaneously produced: a repetition of the observed gesture, a partial repetition, another gesture, or no gesture. Twenty percent of the data was double coded. Percentage agreement on whether a content-unit was mentioned was 95%. Cohen's kappa on the original gesture labels was .61. The coders disagreed most on partial repetitions. Cohen's kappa for whether there was a complete repetition was .80. We report complete repetitions.

A paired-samples t-test revealed that participants repeated more gestures that the speaker gazed at (M=1.48, SD=1.42 vs. M=.80, SD=1.00), t(24)=2.37, p=.026, 95% CI = (.09, 1.27). Similar patterns were observed when normalizing by the number of content-units mentioned.

This study is first to show that speakers' gaze towards their gestures can increase gestural adaptation. This could result from a greater uptake from these gestures. Future analyses will reveal whether participants' own gaze mediated this effect (cf. Gullberg & Kita, 2009).

Observational studies are needed to assess to what extent the effect of speaker-gaze on gestural adaptation applies to natural interaction. From the literature, we expect the effect to be stronger in interaction, since the effect of speakers' gaze on addressees' gaze is larger for natural interaction vs. video-clips (Gullberg & Holmqvist, 1999) and natural interaction allows for interactive grounding.

15

Imitating or observing gestures while studying language animations

Onofrio, Bello, Caselli, Pettenati, Volterra

We present studies investigating whether observing and/or making gestures can positively affect learning from language animations, more specifically from animations that demonstrate a grammar rule (i.e., active-passive sentence transformation).

Post et al. (2013) showed that simultaneously observing a hand making the sentence transformation by moving the words to their new location and gesturing to follow along with this hand hindered learning for children with low levels of general language skills compared to an animation condition in which the words just moved to the new location.

In the studies that will be presented here, we investigated whether only observing gestures in the animations, without imitating them (Experiment 1, N = 180) or imitating them but not simultaneously (Experiment 2, N = 113) would be effective for learning. Participants in both experiments were Dutch children (10-13 years old). The hypothesis that observing and/or making gestures would enhance learning from animations is based on findings showing that gesturing can enhance learning with other types of learning materials (see Broaders et al., 2007) and on findings from embodied cognition research showing a link between semantics and the motor system (see Zwaan et al., 2010). Moreover, a meta-analysis of research on instructional animations shows only a slight benefit of animations over static visualizations, unless the animations show human movement procedures (Hoeffler & Leutner, 2007; Van Gog et al., 2009).

Experiment 1 (run in schools) tested the hypothesis that learning the grammar rule would not or only slightly be enhanced by animation compared to static visualizations (in line with prior research on instructional animations in other subject areas; Hoeffler & Leutner, 2007) and that animations incorporating human movement would be even more effective (i.e., animation + gesture observation >animation >static). In contrast to our hypothesis, results showed no significant differences among conditions.

Experiment 2 (run in Nemo Science Center) compared the effect on learning of making gestures that imitated the movement in the animation immediately after it occurred (i.e., the animation paused during which the movement was imitated). Instead of Dutch sentences, we now used the exact same transformation in an artificial language. Results showed that children in the imitation condition reported lower mental effort than children in the control condition. However, performance was worse (although not statistically significant) for the imitation condition than for the control condition.

These results together suggest that children's learning from dynamic visualizations on such abstract content as grammar rules may not benefit from observing or imitating gestures during animation study; but future research should verify whether this applies also to other types of gesturing and to animations with other types of content.

16

Non-manual components of sign language and co-verbal gestures of spoken language

Parisot, Szymoniak, Saunders

Co-verbal gesture components have been described as playing a role on the organisation of linguistic information in languages and more specifically on expression of motion events (eg. Kita & Ozyurek, 2003), discourse saliency (Colletta & Millet, 2002) or perspective shift (Kendon, 2004). Non-manual behaviour has been described in sign languages (SL) as acting at all levels of grammar and as being multifunctional, (one marker for several grammatical functions and one grammatical function realized by different markers (Herrmann & Steinbach, 2011)). Among many issues of interest in linguistic description of the scope of non-manual components and co-verbal gestures, this paper explores the questions of 1) typological variation in SL and 2) similarity of gestural uses between signed and spoken systems. More precisely, with three SL (American: ASL, French: LSF, and Quebec: LSQ) and co- verbal gestures in one spoken language (French), we explore 1) the notion of discrete units for body (BM) and head movement (HM) and 2) the possibility of different configurations of BM. The forms of BM described in the literature on the grammar of SL - backward/forward lean, lateral tilt and rotation - are associated with several functions, namely contrastive focus (van der Kooij et al., 2006; Wilbur & Patschke, 1998), subject agreement (Parisot, 2003) and role-shift (Engberg-Pedersen, 1995; Poulin & Miller, 1995; Quer, 2005). Even if specific marking functions have been properly attributed to different HM, it is not always clear if these markers are produced independently from the related BM (e.g. body shift and head tilt for subject agreement marking (Bahan, 1996), or topic marking (Sze, 2011)). Moreover, the different BM are not always distinguished and are sometimes treated as non-specified BM (e.g. Bras, Millet, & Risler, 2004, for role marking).

Our analysis of 12 elicited productions (9 deaf signers and 3 hearing speakers) will lead us to provide clues for the following theoretical questions: i) Do the three SL make use of distinct forms of BM and HM? ii) Do distinct forms of BM and/or HM have specific functions? iii) Do BM and HM have differential effects on meaning or are they just varieties of expressing spatial mapping in general? and finally, iv) Do hearing speakers make similar uses (distribution and functions) of BM and HM as deaf signers?

Our results are based on a qualitative analysis using 2D video. All video data were annotated using ELAN software according to 1) form and functions (coordination, role shift, new information and contrastive information) and 2) associate or dissociate position of HM and BM. Our first exploratory results show that both types of non-manual markers are found in the three SL and that they are mainly non-linguistically related. ASL, LSF and LSQ do not make the exact same use of BM and HM (distribution (frequency) and function marking). And even if HM and BM are mainly produced in dissociation, there seem to be different degrees of interdependence between them (marking different functions independently, marking the same function and marking a different function simultaneously toward same or different referent).

17

Finger counting shapes the Mental Number Line

Pitt, Casasanto

Across cultures, people map numbers onto space, forming a mental number line (MNL). For twenty years, the MNL has been studied via the SNARC effect (Spatial-Numeric Association of Response Codes).1 In tests of the SNARC effect, Europeans and Americans tend to respond faster to smaller numbers with their left hand and to larger numbers with their right hand, revealing an implicit left-to-right directed MNL. The direction of the MNL is reversed, however, in members of Arab cultures.2

What are the experiential origins of the mental number line, and what makes numbers flow rightward or leftward in our minds? The directionality of the MNL has often been attributed to reading direction1, but both correlational data2,3 and causal data1 fail to support this conclusion. Instead, mounting evidence indicates that the MNL may be grounded, at least in part, in finger-counting.4 In one study of finger-counting habits, stronger SNARC effects were found among people who start counting on their left hand than among those who start on their right, consistent with a left-to-right MNL.5 Likewise, people respond fastest to number stimuli when finger-digit mappings match their own idiosyncratic finger-counting habits.6 Although these data suggest a correlation, it remains unknown whether finger-counting habits play a causal role in shaping the MNL. Here we addressed this casual question.

Right-handed US English speakers were trained to count on their fingers according to one of two randomly-assigned patterns: standard (from left to right) or reversed (from right to left). After about 15 minutes of manual training, participants performed a parity- judgment task (Is the number odd or even?) and a magnitude-judgment task (Is it greater or less than 5?) to assess the strength and direction of the SNARC.

On average, after standard finger-counting, participants showed strong SNARC effects in the standard direction for both the parity task (mean slope=-10.84 ms/digit, p=.001) and the magnitude task (mean slope=-29.8 ms/digit, p=.001), indicating a clear left-to-right MNL. By contrast, after reversed finger counting, no reliable SNARC effect was found on either task. In both tasks, the mean slopes were significantly shallower after reverse finger counting than after standard (parity: p=.02; magnitude: p=.01), indicating a significant effect of finger counting on the MNL, overall. In an analysis of individual participants slopes, a greater proportion of participants showed a reversed SNARC effect in both tasks after reverse finger counting (38%) than after standard finger counting (0%), indicating a reversal of the standard MNL in these participants (p=.04).

Even brief exposure to a right-to-left finger-counting routine can reverse the direction of people's mental number line. These data provide the first causal evidence that finger counting shapes spatial representations of number, and clarify the experiential origins of the MNL. Number representations depend, in part, on motor experience.

18

Perception of co-speech gestures in aphasic patients: Gaze behavior during dyadic conversations

Post, van Gog, Paas, Zwaan

Background: Aphasia is a major language disorder typically occurring after left-hemispheric brain damage. Since patients suffering from aphasia are restricted in their verbal abilities, they may compensate their shortcomings by using gestures. Previous studies have shown that some patients could use gestures as compensatory strategies (Herrmann et al., 1988), while others did not (Cicone et al., 1979). In contrast to previous research which focused mainly on gesture production, the present study investigated co-speech gesture and face perception of aphasic patients while they were following dyadic conversations. We expected that aphasia will influence gaze behavior in patients and that altered gaze patterns would be associated with content-related comprehension.

Methods: Sixteen aphasic patients and 23 healthy control subjects participated in the study. Gaze data was collected by means of a contact-free infra-red eye tracker while subjects were watching videos of dyadic conversations.

Results: In line with Gullberg and Holmqvist (1999), we found that subjects rather gazed at the face of the speaking interlocutor than at the co-speech gestures. Aphasic patients fixated less the face region compared with healthy controls but showed no differences exploring the gesturing hand. Interestingly, we found a significant co-speech gesture x ROI interaction, indicating that the presence of a co-speech gesture encouraged subjects to look at the speaker.

Conclusion: Aphasic patients fixate less the face probably to avoid interference between the visual and the auditory speech signal. Co-speech gestures guide the observer's attention towards the speaker, the source of semantic input.

19

Effects of Motor Involvement in Learning from Science Animations

Pouw, Eielts, Van Gog, Zwaan, Paas, Preisig, Eggenberger, Zito, Nyffeler, Gutbrod, Müri

In this contribution to the thematic panel on Gestures in Learning with Static and Dynamic Visualizations, we present two experiments whether watching gestures can positively affect learning from animations about science concepts.

In science education, it has been suggested that the current educational spirit hinges on a "formalizations first view", holding that learning should take the route of mastering discipline-specific formalisms before immersing students in the practical (often perceptually rich) environments to which those formalisms apply (Nathan, 2012). This view stands in stark contrast with classic situated approaches in educational psychology (Bredo, 1994), but also with approaches in cognitive science that hold that knowledge-processes are intimately connected to bodily and situation-specific experiences (Barsalou, 1999). That "practical bodily experiences" can indeed be important for learning has been established in gesture research: observing, enacting, or imitating gestures can foster and performance (e.g., Goldin-Meadow, 2000; Goldin-Meadow et al., 2001; Goldin-Meadow et al., 2012; Macedonia & Knsche, 2011). Yet, it is still far from clear how and when practical bodily experiences benefit learning (e.g., Sloutsky et al., 2005; Stull et al., 2013; Zacharia & Olympiou, 2011).

Two experiments investigated the role of different degrees of bodily involvement in learning science concepts through instructional animations (IA). In the first Study learners (Experiment 1: 116 adults through Mechanical Turk; Experiment 2: 74 Dutch children from 11-13 years old) studied IA concerning the mechanical principles of levers, illustrated by a seesaw with various loads. Participants assigned to the critical condition watched an IA wherein they observed gestures of a bodily shape that was directly mapped onto the seesaw. The models body was projected onto the see-saw in such a way that the axis aligned with the model's body midline and the arms aligned with the arms of the seesaw. Based on earlier research that shows that mental rotation is easier when mentally rotated are modeled after the body (Amorim, Isableu, & Jarraya, 2006) as well as research that shows that learning about see-saws was best for those lacking relevant physical experience (Zacharia et al., 2012) we hypothesized that body-mapping would lead to better learning outcomes compared to the control condition, as measured by performance on a reaction-time task and transfer task.

Experiment 1 showed a positive effect for the body-mapping condition on accuracy reaction-time task, but this did not reach statistical significance. However, in Experiment 2 where we tested the animation with children it was found that only children who performed low on math (as measured by a standardized test) showed a significantly positive effect of body-mapping on accuracy reaction-time task.

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Investigating the relationship between empathy and gestures during pain communication

Preisig, Eggenberger, Zito, Nyffeler, Gutbrod, Müri

Empathy, the ability to accurately perceive another persons' experience, is thought to be fundamental to the process of delivering effective care to people in pain, with patients reporting greater satisfaction and less pain when clinicians are more empathic (e.g. Beck et al, 2002). Given that the ability to empathise with another person depends upon the ability to understand their experience as if it were your own (Rogers, 1957), effective communication about pain communication is essential if empathy is to be achieved. Co-speech hand gestures frequently contain additional information about various aspects of pain (e.g. location, sensation; Rowbotham et al., 2012, 2013a, 2013b), and observers appear to be able to use this information to enhance their understanding of the experience (Rowbotham et al., in preparation), suggesting that this modality has an important role to play in the communication of pain. However, little is known about the relationship between empathy and gestures in this domain. Empathy can be measured in terms of state empathy (i.e. the amount of empathy experienced or displayed towards another individual in a specific situation) or trait empathy (the degree to which people are generally able to empathise with others), and these "types' of empathy are likely to relate to gestural pain communication in different ways. We hypothesise that the enhanced pain understanding achieved through seeing gestures during pain communication should lead to increased levels of "state" empathy towards the sufferer, while an individual's "trait" level of empathy should impact on the amount of information they are able to obtain from those gestures. To investigate this, participants (n = 25 per condition) viewed clips of people describing a recently experienced pain under one of two conditions, 1) "speech only" and 2) "speech and gesture" (facial information was obscured in both conditions). Following each clip participants completed a number of questions assessing how empathic they felt towards the sufferer (their "state" empathy). The data from this study will be analysed to assess whether those in the "speech and gesture" condition feel more empathic towards the sufferer than those in the "speech only" condition. A second study examined whether "trait" empathy impacts on the ability to glean information from gestures during pain communication. Participants (n = 90) watched short clips of pain descriptions and answered questions about the pain being described (e.g. where was the pain located, what was the sensation of the pain), before completing the Empathy Quotient to assess their trait empathy. A "traceable additions' analysis (Kelly et al., 2002) will be performed to assess how much information participants obtain from gestures, and correlational analysis will explore whether trait empathy levels are correlated with the amount of information obtained from gestures. This research will extend our knowledge of the role of gestures in pain communication and our understanding of what factors influence the comprehension of information in gestures, with potential implications for the treatment and support the pain sufferers receive.

21

Shared neural systems for language and gesture comprehension

Redcay, Velnoskey, Rowe

Behavioral evidence and theory suggest that comprehension and production of gestures and words may be part of a shared cognitive system. This common system encompassing language and social cognition allows for the flexible use of gesture and linguistic symbols in the pursuit of communication. However the neural systems underlying language and social cognition are often studied as separate domains; in fact some argue that language systems rely on unique and specialized brain regions. The goal of the current study is to identify the extent to which the neural bases for language and gesture comprehension are shared and/or distinct in adults. Identifying core brain systems involved in both processes could provide insights into the cognitive link between these behaviors.

To address this question, 15 college students participated in a functional MRI session. During this session, we presented participants with short video clips of an experimenter producing communicative, participant-directed gesture strings (e.g., gesturing "Hello, come here") and contrasted these with "grooming gestures" of an experimenter producing hand and body actions that did not convey communicative intent (e.g. scratching her face and smoothing her hair). After each video clip, participants made a judgment about whether a still frame image was seen in the preceding clip in order to control for ensure attention. Viewing communicative gestures (CG), as compared to grooming gestures (GG) requires greater semantic processing and detection of communicative intent. To identify amodal brain regions supporting communicative and semantic processes, we presented participants with 3 language conditions. These included 1) communicative, participant-directed sentences, matched in content to the communicative gestures, 2) 3rd-person sentences that describe a character's actions, but not mental states, and 3) jabberwocky sentences which have grammatical structure but no semantic content. As with the gesture conditions, participants responded whether a word was or was not present in the immediately preceding trial. Stimuli across the five conditions were chosen based on prior ratings of perceived communicative intent and meaningfulness and all five conditions were presented in a single event-related design.

Comparison of communicative to grooming gestures (CG vs GG) elicited activation bilaterally along the full anterior-posterior extent of the superior temporal sulcus (STS). Conjunction analyses between communicative vs grooming gestures and participant-directed vs 3rd-person sentences revealed shared engagement of left posterior STS for processing communicative intent whereas conjunction between communicative vs grooming gestures and 3rd-person vs jabberwocky sentences revealed shared engagement of left anterior STS for semantic representations. These data suggest the STS provides a common neural substrate for both language and gesture processing but components of this shared system are represented differentially along the posterior to anterior extent of the STS. Future analyses will probe the extent to which these neural representations are shared by examining patterns of activation within the same individual using native-space regions of interest and multivariate pattern analyses.

22

Am I egocentric or allocentric? Gesture production in cases of misunderstanding

Saubesty, Tellier, Champagne-Lavau

Different theories exist regarding the function of co-speech gestures in conversation. On the one hand, gestures are considered as being mainly made for self (Krauss et al. 1991, 2000). This point of view is supported by the fact that speakers gesture in the absence of a visible addressee (for instance on the telephone, Bavelas et al., 2008) and that gestures help with word retrieval and speech organization (Morsella & Krauss, 2004). On the other hand, we can argue that gestures are mainly made for the addressee (Holler & Wilkin, 2009)..Speakers orientate their gestures toward the listener, making them visible (O´Ozy´urek, 2002) and also design their gestures to serve communicative needs especially when the addressee is a non-native speaker (Tellier & Stam, 2012). Considering both views, it seems that gestures are both made for self as well as for the addressee and one or the other of the functions depends on the situation of communication. The present study aims at differentiating when gestures are made for self and when they are designed for a partner in the course of a conversation. We observed the production of co-speech gestures in two different gestural visibility spaces: egocentric (i.e. gestures not visible by the addressee) vs. allocentric (visible by the addressee) according to Holler et al. (2011). Gestures made in a visible space seem to have a communicative function (Streeck, 1994; Holler and al., 2011).

We designed an experiment engaging 16 French women in pairs in a collaborative task with two roles. The director described the picture of a garden containing abstract objects in various places. The addressee had a blank scene of the garden and the abstract objects on little cards. Following the indications of the director, the addressee had to place the cards in the garden to match the director's picture. The task is repeated 3 times with the same objects but in a different order. Both partners were sitting face to face with a music-stand in front of them to display their pictures. These stands prevented each partner from seeing each other's picture. During the task, the directors produced gestures both in an egocentric space (i.e. hidden by the stand) and in allocentric space (above the stand).

Analysis consisted of comparing allocentric vs. egocentric gesture production of the directors in normal conversation and in repair situations (when a misunderstanding occurred). We hypothesized that in cases of misunderstanding more gestures would be produced in the allocentric space to disambiguate speech and help understanding.

Results show that speakers differ in terms of gesture profiles: some are more egocentric and others more allocentric and it has an effect on communication. Indeed, when the directors have an allocentric profile, fewer cases of misunderstandings occur. Results also show that through the task the number of allocentric gestures tends to increase while the number of egocentric gestures tends to decrease. Interestingly this tendency seems more important in cases of misunderstanding compared to normal conversation.

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The impact of age and common ground on multi-modal utterance design

Schubotz, Holler, Özyürek

Previous work suggests that the communicative behavior of older adults differs systematically from that of younger adults. For instance, older adults produce significantly fewer representational gestures than younger adults in monologue description tasks (Cohen & Borsoi, 1996; Feyereisen & Havard, 1999). In addition, older adults seem to have more difficulty than younger adults in establishing common ground (i.e. knowledge, assumptions, and beliefs mutually shared between a speaker and an addressee, Clark, 1996) in speech in a referential communication paradigm (Horton & Spieler, 2007). Here we investigated whether older adults take such common ground into account when designing multi-modal utterances for an addressee. The present experiment compared the speech and co-speech gesture production of two age groups (young: 20-30 years, old: 65-75 years) in an interactive setting, manipulating the amount of common ground between participants.

Thirty-two pairs of nave participants (16 young, 16 old, same-age-pairs only) took part in the experiment. One of the participants (the speaker) narrated short cartoon stories to the other participant (the addressee) (task 1) and gave instructions on how to assemble a 3D model from wooden building blocks (task 2). In both tasks, we varied the amount of information mutually shared between the two participants (common ground manipulation). Additionally, we also obtained a range of cognitive measures from the speaker: verbal working memory (operation span task), visual working memory (visual patterns test and Corsi block test), processing speed and executive functioning (trail making test parts A + B) and a semantic fluency measure (animal naming task). Preliminary data analysis of about half the final sample suggests that overall, speakers use fewer words per narration/instruction when there is shared knowledge with the addressee, in line with previous findings (e.g. Clark & Wilkes-Gibbs, 1986). This effect is larger for young than for old adults, potentially indicating that older adults have more difficulties taking common ground into account when formulating utterances. Further, representational co-speech gestures were produced at the same rate by both age groups regardless of common ground condition in the narration task (in line with Campisi & zyrek, 2013). In the building block task, however, the trend for the young adults is to gesture at a higher rate in the common ground condition, suggesting that they rely more on the visual modality here (cf. Holler & Wilkin, 2009). The same trend could not be found for the old adults. Within the next three months, we will extend our analysis a) by taking a wider range of gesture types (interactive gestures, beats) into account and b) by looking at qualitative features of speech (information content) and co-speech gestures (size, shape, timing). Finally, we will correlate the resulting data with the data from the cognitive tests.

This study will contribute to a better understanding of the communicative strategies of a growing aging population as well as to the body of research on co-speech gesture use in addressee design. It also addresses the relationship between cognitive abilities on the one hand and co-speech gesture production on the other hand, potentially informing existing models of co-speech gesture production.

24

New developments in the multimedia annotation tool

ELAN Sloetjes, Somasundaram, Seibert

ELAN is a multimedia annotation tool that is being developed by “The Language Archive” (TLA), a department of the Max Planck Institute for Psycholinguistics. It is applied in gesture and sign language research, but in other areas of linguistics and beyond as well. ELAN is in development for more than a decade, organizing long-term availability and support is a challenge in itself, but this paper focuses on the main new features and improvements of the past few years.

Working with multiple audio tracks in multimodal research has become more convenient by the introduction of options for flexible switching of the visualization of audio files and of managing their volume levels. Major steps have been taken in the corpus exploration functions; the multiple files search has been made more powerful and many usability issues have been solved. Queries can be expressed using variables (in addition to exact, substring or regular expression matching), making possible queries that could not be constructed before or that would require a series of queries instead of a single one. The criteria for selecting the tiers in which to search can be applied more flexibly, the user can compile any possible combination of tiers for each query layer. A new Alignment view for the search results not only displays more tier and annotation properties but also includes a graphical visualization of duration and point-in-time of the constituents relative to each other. Other multiple file processes have been added as well, such as an option to create media clips in a batch based on annotations exported to tab- delimited text.

Working with controlled vocabularies is now more convenient than it used to be; controlled vocabularies can be created in an ELAN file and then exported in a format for external controlled vocabularies. Bigger vocabularies dont have to increase the size of individual annotation files anymore and vocabularies are more stable when stored outside the eaf on e.g. a webserver.

The interaction with the lexicon tool LEXUS has been extended such that several dependent annotations can be updated simultaneously after a dictionary lookup. Interaction with several other web services (such as developed within CLARIN-D) has been stabilized and released for use by the public.

ELAN is an open source project and special attention will be given to the extensions contributed by non-TLA developers. A library for calculating inter-annotator agreement has been added as one of the alternatives for assessing reliability. Another extension adds advanced N-gram and collocation analysis to the existing search and basic statistics capabilities. The N-gram analysis tools perform on a corpus as a whole, a selected part of it or on multiple corpora and allow exporting raw data and extensive statistical data to a spreadsheet application.

25

Pantomime strategies: What happens in aphasia?

van Nispen, van de Sandt-Koenderman, Mol, Krahmer

When having to pantomime an object people tend to have similar strategies (van Nispen et al., 2012). For instance and abacus is typically pantomimed by a combination of a shape (molding or outlining its shape) and a handling (pretending to use the object) pantomime. People with aphasia (PWA) are thought to mostly use conceptually simple gesture such as shape gestires (Cock et el., 2013; Mol et al., 2013). Would this mean that PWA are not able to apply these standard strategies in pantomime?

To investigate the influence of aphasia on the ability to apply pantomime strategies we compared PWA (N=39) to non-brain-damaged controls (N=20). We asked them to name 30 pictures of objects from Boston Naming Test (Kaplan et al., 1983) by using pantamimes only. Based on Müller's (1998) approach, we developed a coding scheme to analyse the different represetntations techniques used (e.g. pretending to drink is a handinng technique).

As compared to non-brain-damaged controls PWA made less use of standard strategies. This was found for almost all objects for which the norm was object, enact and handing, but not for the objects where the norm was a shape technique. This ca be illustrated with the abacus example. Almost all PWA (97%) used a shape technique, but only 18% used a handling technique (mean-diff= 0.64, $p < 0.05$). These differences might be explained by a general tendency to make less use of particular techniques. PWA used fewer handling $F(2,52)=10.98$; $p<0.001$, enact $F(2,52)=10.17$; $p<0.001$ and object $F(2.52)=27.90$; $p<0.001$ overall than non-brain-damaged controls, No differences were found in the use of shape techniques $F(2,52)=1.00$; $p=0.37$.

Our study shows that PWA, as a group, do not use the same strategies as healthy controls do. This is probably because they are no longer able to use conceptually complex pantamimes (such as handling, object, and enact) and have to rely on gesture instead. This is in line with previous findings by Cocks et al. (2013) and Mol et al. (2013). Since the use of shape pantomimes by PWA is not different from control behaviour this in itself is not to be seens as impaired behaviour. Rather, PWA seem to miss the additional techniques and strategies that non-brain-damaged controls would use.

26

Dissociations between sign, fingerspelling and gesture following CVA

Woll

British Sign Language, 2-handed fingerspelling and gesture are three forms of visual-manual communication used by members of the British Deaf community. The study reported here describes dissociations between preserved and impaired abilities in signing, fingerspelling and gesture in studies of two right-handed signers, Charles and Gordon, who had experienced motor and language problems following left hemisphere CVA. CVA in signers affords a rare opportunity to explore the relationships between gesture and language, including patterns of retained and relinquished hand dominance.

Study 1 describes anomia - a deficit in sign retrieval - as a prominent feature of aphasia in Charles following stroke. This showed many of the well.documented characteristics of speech anomia. For example, sign retrieval was sensitive to familiarity, it could be cued, and he made both semantic and phonological errors. Additionally, Charles often substituted fingerspelling or gesture in response to sign elicitation tasks. He also demonstrated a striking dissociation between sign and gesture, since, in contrast to signing, his gesture production was relatively intact. This dissociation was impervious to the iconicity of signs. Charles was no better at retrieving iconic than non-iconic signs, and his gesture production was superior to sign production even when the forms of signs and gesture were similar. The substitution of fingerspelling for sign also indicated that iconicity was not useful for sign retrieval.

In Study 2, adaptations to the production of two-handed signs, and to the use of the two-handed British manual alphabet were studied in Charles and Gordon. Both signers had right hemiparesis and had switched to using their left hand as their dominant hand for signing and gesture. Nevertheless both continued to use their impaired right hands as the dominant hand for fingerspelling. This was initially considered to be the case because the articulatory complexity of fingerspelled forms (articulation letter-by-letter) is greater than that of signs (which are mono- or disyllabic). However the dominance shift could be seen even when signs and fingerspellings had identical forms. For example, the BSL sign MOTHER is identical in form to the fingerspelled letter 'm', but MOTHER was produced with the impaired right hand dominant, while 'm' was produced with the unimpaired left hand dominant.

Motoric and linguistic accounts for these dissociations are considered. We conclude that rather than being competing influences, they are bound together. We argue that preferential access to left-lateralised phonological processing is essential for fingerspelling, becomes more important for signs where they exceed a threshold of phonological complexity, and is absent for gesture. Thus, complex trade-offs between language and motor execution underpin observed patterns of dominance-switching in these three forms of communication.

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The role of markedness in SASL handshape acquisition: The case of hearing adult learners

Wright, Morgan, Kunene

Hierarchies of handshape development and markedness, as classified by Ekman (1977), have been developed for children acquiring their manual L1 (Boyes Braem, 1990; Ortega & Morgan, 2010), but while studies of markedness in L1 signing abound, few authors have addressed L2 signing and its acquisition. Research into South African Sign Language (SASL) linguistics is scarce and few institutions offer its study at both school and tertiary level. There is little or no systematic research on how L2 learners of SASL acquire it.

This study investigates the role of markedness in the acquisition and production of handshapes in South African Sign Language by hearing adults. In particular, it seeks to examine the role of transfer from pre-existing gestural emblems. South Africa has a rich repertoire of quotable gestures (Brookes, 2001) and hearing adults tend to use these conventional symbols when learning sign language.

Transfer refers to the L2 acquisition being affected by the rules of phonology of the L1. Instead of learning a linguistic form (such as a phoneme or parameter) anew, a person perceives the form to be learnt as identical to one already existent in their first language and merely "transfers" that information into the language they are learning. The term "perceive" is used as this judgement can be true or false. If the new form is actually identical to that contained in the L1, transfer is said to be positive and the learner acquires that form with greater ease. If, however, the target form is mistakenly seen as identical to the existing form, transfer is said to be negative (Odlin, 1989).

While most scholars agree that transfer across modalities is unlikely (Rosen, 2004; Chen Pichler, 2009), it is possible that transfer from gesture rather than spoken language may influence L2 sign language acquisition (Chen Pichler, 2009, 2011).

This study took place at the University of the Witwatersrand in 2013, utilising 19 first-year students of SASL as participants. In a filmed assessment task, in which participants are required to have an interactive conversation in SASL, data is provided for an error analysis of the handshape parameter. The assessment students were required to perform was an interactive test where a native Deaf signer and the student were required to have a basic conversation. These occurred individually for each student one at a time. Participants had received one month of instruction in SASL before the assessment. Ethnographic observations of the classroom were also conducted to ensure that the errors to be observed occurred not only in a test environment but also in day-to-day dialogues and language tasks. This allowed for the opportunity to view a sign at its initial stage of being taught to the students.

All errors of handshape were coded on ELAN software. The frequencies of minimally and maximally marked handshape use were determined and markedness levels compared within substitution errors. Additionally, instances of both negative and positive transfer from gesture were identified.

After an analysis of all the target handshapes within errors that occurred, both marked and unmarked targets appeared to be subject to error. By looking narrowly at specific handshapes, the lesser marked handshape errors can be attributed to negative transfer from gesture. The results provide evidence that markedness can negatively influence handshape production and accuracy in adults. This influence differs significantly to that of L1 signing and these differences are attributable to positive and negative language transfer from acquired gestural emblems including gestures acquired preverbally (Özcaliskan & Goldin-Meadow, 2005).

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Children learn to use iconic gestures with different words through exposure

Zvaigzne, Oshima-Takane, Genesee, Hirakawa, Mayberry

Speakers use iconic gestures at varying rates with different types of words. For instance, Japanese monolingual adults (Kita, 1997; Kita, Ozyurek, Allen, & Ishizuka, 2011) and children (Kita, et al., 2011) gesture more when using sound symbolic words (SSW) than verbs or other words. The fact that even 3-year-olds show this pattern led Kita and colleagues to propose that SSWs and iconic gestures are linked early in development because they share an underlying mental representation. Kita et al. also observed that gesture rates with SSWs increase with age. Some evidence suggests that children learn gesture use from their caregivers (Ozcaliskan & Goldin-Meadow, 2005). Thus, it is possible that Japanese children learn that SSWs and iconic gestures are strongly associated through exposure to their co-expression. Here we asked 1) whether children's iconic co-speech gesture rates are consistently linked to specific word types across different languages, and 2) whether the production of these word-specific gesture rates is learned through exposure.

We created a dynamic referential communication task to investigate children's iconic gesture rates with SSWs and manner verbs (MV). Four- to six-year-old children described how two identical animals differed in their manner of motion (e.g., rolling, jumping). In Study 1, gesture rates with SSWs and MVs by Japanese monolingual children were compared, as were gesture rates with MVs by Japanese, English, and French monolingual children (n = 22 per group). We expected gesture rates to be higher with SSWs compared to MVs. We further expected gesture rates with MVs to be consistent across languages. The results fit our predictions. Japanese monolingual children gestured more with SSWs (71%) than with MVs (36%), $t(21) = 4.66$, $p<.001$, one-tailed. Also, the monolingual groups gestured at similar rates when using MVs (28 - 36%, $p>.05$).

In Study 2, we examined whether exposure influences children's word-specific gesture rates. We reasoned that bilinguals' reduced exposure to each language (in comparison to monolingual exposure) would reduce their gesture rates for SSWs (used only in Japanese) but not for MVs (used in Japanese, English and French). Using the Study 1 task, we tested three groups of bilingual children: 11 English-dominant English-Japanese bilinguals, 9 French- dominant and 8 Japanese-dominant French-Japanese bilinguals. In contrast to the Japanese monolingual children from Study 1, in Study 2 we found that the three bilingual groups gestured at similar rates for both word types when speaking Japanese: 40 to 54% with SSWs and 39 to 43% with MVs (p's>.05). Their gesture rates for MVs in each language were similar to that of the monolinguals' (26% - 43%) except that the English-Japanese bilinguals' gesture rate for English MVs was low (14%).

Our findings suggest that children learn to gesture at different rates with different words through exposure to the co-expression of iconic gestures and the words. When exposure is reduced, as in the case of bilingualism, the rate of gesture with such words is similarly reduced, as was found for Japanese SSWs. We also found that some word-specific gesture rates, such as those for MVs, are consistent cross-linguistically.

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Naming with words and gestures in children with Down Syndrome

Wilby, Riddell, Rowbotham, Lloyd, Wearden, Holler

Several researchers have shown a close relationship between gesture and language in typically developing children and in children with developmental disorders involving delayed or impaired linguistic abilities. Most of these studies reported that, when children are limited in cognitive, linguistic, metalinguistic, and articulatory skills, they may compensate for some of these limitations with gestures (Capone & McGregor, 2004). Some researchers also highlighted that children with Down Syndrome (DS) show a preference for nonverbal communication using more gestures with respect to typically developing (TD) children (Stefanini, Caselli & Volterra, 2011). The present study investigates the lexical comprehension and production abilities as well as the frequency and the form of gestural production in children with DS. In particular, we are interested in the frequency of gesture production (deictic and representational) and the types of representational gesture produced. Four gesture types were coded, including own body, size and shape, body-part-as object and imagined-object. Fourteen children with DS (34 months of developmental age, 54 months of chronological age) and a comparison group of 14 typically developing children (TD) (29 months of chronological age) matched for gender and developmental age were assessed through the parent questionnaire MB-CDI and a direct test of lexical comprehension and production (PiNG). Children with DS show a general weakness in lexical comprehension and production. As for the composition of the lexical repertoire, for both groups of children, nouns are understood and produced in higher percentages compared to predicates. Children with DS produce more representational gestures than TD children in the comprehension task and above all with predicates; on the contrary, both groups of children exhibit the same number of gestures on the MB-CDI and in the lexical production task. Children with DS produced more unimodal gestural answers than the control group. Children from both groups produced all four gesture types (own body 53%, size and shape 9%, body-part-as object 25 %, and imagined-object 14%). Chi-square analysis revealed no significant difference in the type of gesture produced between the two groups of children for both lexical categories. For both groups the distribution of gesture types reflects an item effect (eg. 100% of gesture produced for the pictures lion, kissing and washing were own body and 100% of the pictures produce for small and long were size and shape). For some item (e.g. comb, talking on the phone) children in both groups produced both types (body-part-as object and imagined-object) with similar frequency. These data on the types of representational gestures produced by the two groups show a similar conceptual representation in TD children and in children with DS despite a greater impairment of the spoken linguistic abilities in the letter. Future investigations, are needed to confirm these preliminary results.

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Adolescents with autism spectrum disorder highlight the varied functions of cospeech gesture

Kopple, Wozniak

Autism spectrum disorder (ASD) is a neurodevelopmental disorder defined by weaknesses in social communication skills along with the presence of restricted and/or repetitive behaviors and interests. Deficits in nonverbal communication broadly are required for a diagnosis. Impairments in gesture specifically are codified on gold-standard ASD diagnostic measures, in which absent or infrequent gestures are symptomatic. Clinical criteria suggest that individuals with ASD use all gestures less than typically developing (TD) peers. However, while a few studies report reduced rates of gesture in ASD, many fail to demonstrate group differences when controlling for overall amount of communication.

Gestures serve a variety of functions. We propose an explanation for the mixed empirical findings of gestures in ASD: Gestures serving certain (primarily social-communicative) functions are reduced in this population, while gestures serving other (primarily goal-oriented) functions are relatively intact. This theory is consistent with the well-replicated finding that protodeclarative pointing (i.e., pointing to share attention: a social-communicative function) is significantly reduced in ASD, while protoimperative pointing (i.e., pointing to request: a goal-oriented function) is not. To date, all studies of gesture production in ASD have focused on observations of naturalistic interactions and discourse, making it difficult to isolate the distinct functions of gesture. Here we attempt to disentangle the multiple roles that gestures may serve in ASD by comparing gestures produced during discourse to gestures produced during problem-solving. These latter gestures are thought to serve a primarily goal-oriented (i.e., cognitive organizational) role.

Adolescents with ASD and TD (n=18 per group), matched on age and IQ, completed two tasks designed to elicit distinct functions of gesture. The first, a narrative task, required them to narrate brief cartoon clips to a confederate; the second was a standardized executive function task (the Inhibition subtest from the NEPSY-2), designed to assess response inhibition and set shifting. The narrative task was coded for gesture rate (gestures per word). The executive function task was coded for number of trials (of 6) on which the participant pointed to the stimulus page.

Adolescents with ASD demonstrated a reduced gesture rate on the narrative task compared to controls, p=.03, Cohen's d=0.78. In contrast, adolescents with ASD gestured more than controls on the executive function task, p=.02, Cohen's d=0.84, despite similar performance on the task itself. The group X task interaction was significant with a large effect size, p<.001, partial 2=.31. Gestures produced during narration, while highly socio-communicative in nature, also support distinct cognitive processes, and thus vary widely in the functions they serve. While we found reduced gesture rates in a narrative task, consistent with some, but not all, of the ASD literature, we also demonstrated increased gesture rates in a task thought to serve a primarily cognitive-organizational role. Thus, the function that a particular gesture serves may be the best predictor of its presence or absence in this population. Individuals with ASD, who are often fluent speakers, but universally demonstrate impairments in social-communication, may help disentangle the multiple roles that gesture plays for both speakers and listeners.

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Individual differences in gesture production: Frequency and gesture type in relation to personal characteristics

de Marchena, Eigsti

While it is readily observable that some people gesture frequently while others gesture rarely if at all and that some people make extensive use of iconic gestures while the gestures of others consist mostly of beats, there is little published research documenting the nature of individual differences in either rate or type of gesture production. Until recently, those studies that reported data on the relationship of cognitive or personality variables to variation in gesture production generally found only weak relationships (Bucci & Freedman, 1978; Gifford, 1994; Gifford & O'Connor, 1987; Hostetter & Alibali, 2007). Several more recent studies (Chu, Meyer, Foulkes and Kita 2014; Gillespie, James, Federmeier and Watson, 2014; Hostetter and Alibali, 2007; Hostetter and Potthoff, 2012;) found significant but weak correlations between personal characteristics and gesture use, but focused on limited contexts. None sought to explore the relationship of personal characteristics to the relative stability of individual's gesture production over a widely varying series of tasks.

In the current study, 40 adult females participated in six different verbal tasks: recall of an animated cartoon, recall of a verbal narrative, description of a static visual image (an 18th Century gown), description of a spatial-motor routine (wrapping a package), presentation of a controversial political position, and description of the participant's own experience of participating in the study. Videotapes of participants' descriptions were analyzed and coded for occurrence and type (Iconic, Metaphoric, Deictic, Beat) of speech-linked gestures. Results indicated both wide variability (gesture frequencies totaled across the 6 tasks and averaged across total speaking time ranged from 0 to 44.54 gestures per minute) and remarkable consistency (mean intercorrelation in total gesture rate among the six tasks was rs (38) = .70, ranging from .58 to .91) in individuals' gesture production. Some participants, in other words, gestured at very high rates; others gestured hardly at all; and high/low gesturers in one task were very likely to be high/low gesturers in all tasks.

Variability and cross-task stability in total gesture rate did not relate consistently to measured personal characteristics. In addition, verbal skill (measured via the Retrieval Fluency Subtest, Woodcock, McGrew and Mather, 2001) and visual-spatial skill (measured via the Paper Folding Test and the Ornamentation Test, Ekstrom, French, Harman and Dermen, 1976) showed no relationship to specific gesture types. However, individuals' use of various gesture types was related to aspects of self-reported personality on the NEO-FFI (Costa & McCrae, 1991). Specifically, beat gestures and metaphoric gestures were moderately related to self-ratings of Neuroticism, and iconic gestures strongly related to self-rated Agreeableness. Implications for the conceptualization of gesture function are discussed.