Deictic Communication –

Theory and Application Conference

8-9 July 2019

Thomas Paine Study Centre (TPSC) and the Sainsbury Centre for Visual Arts (SCVA)

University of East Anglia

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Contents

Conference Programme

TIME	Event/Speaker	Location
Monday 8 July 2019		
09.00-09.30	Registration	TPSC Foyer
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10.30	Coffee Break	TPSC Foyer
11.00	**A comparative analysis of non-verbal communication patterns of typically developing children, children with autism and children at high risk for autism in a gesture elicitation interactive task** Sara Ramos Cabo, *Norwegian University of Science and Technology*	TPSC Lecture Theatre
11.30	**Gesture space and speech acts: Multimodal strategies for establishing joint action** Laura Ruth-Hirrel, *California State University Northridge*	TPSC Lecture Theatre
12.00	**Deictic communication in Italian Sign Language (LIS): encoding perspective of indicating verbs** Anita Slonimska, *ISTC, CNR Rome, & Radboud University, Nijmegen*	TPSC Lecture Theatre
12.30	**On the Selection and Use of Spatial Demonstratives** David Peeters, *Tilburg University*	TPSC Lecture Theatre
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14.00	**Keynote: The Targeting System of Language: unifying deixis and anaphora** Leonard Talmy, *University at Buffalo*	TPSC Lecture Theatre
15.00	**Spatial deixis in Spanish motion events** Iraide Ibarretxe-Antuñano, Andrea Ariño-Bizarro, *Universidad de Zaragoza*	TPSC Lecture Theatre
15.30	**Cross-linguistic Investigation on Deixis and Bilingualism: Spatial Demonstratives in Spanish and Catalan Mallorcan** Emanuela Todisco, *Universitat de les Illes Balears*	TPSC Lecture Theatre
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TIME	Event/Speaker	Location
18.15-19.00	Optional Guided Tour of The Sainsbury Centre collections (SCVA) *Bookable in advance*	SCVA
19.00	Welcome drinks	Kofra, SCVA
19.30	Conference dinner **Starter** Hot smoked salmon terrine, balsamic pickled quail's eggs, marinated fennel (GF, Fish) Pressed Fir Tree Farm pork belly & puy lentil terrine, homemade piccalilli, sourdough (Meat) Chargrilled asparagus, roasted garlic, toasted sourdough, spring onion, basil oil (Vegan) **Main** Moroccan spiced Compton Hall farm lamb rump, apricot puree, saffron poached potato, green beans, medjool date jus (GF, Meat) Tikka paneer, chickpea dahl, bhuna sauce, saffron rice (V) Pea & broad bean risotto (GF, Vegan) **Dessert** Passion fruit delice, mango gel, ginger sorbet, honeycomb, fresh raspberries (GF) Rich chocolate & salted caramel tart, vanilla ice cream, shortbread crumb, strawberries (V) Meringue shells, dark chocolate, honeycomb, vanilla ice cream, chocolate sauce, raspberries (VG, GF)	Modern Life Café, SCVA

Tuesday 9 July 2019		
TIME	**Event/Speaker**	**Location**
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11.00	***Here* and *there*, *how* and *where*. Bilateral network of dorsal regions supports comprehension of spatial demonstratives in naturalistic language processing** Roberta Rocca, *Department of Linguistics, Cognitive Science and Semiotics, Aarhus University*	TPSC Lecture Theatre
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12.30	**The Demonstrative Choice Task: Mapping the semantics of personality** Mikkel Wallentin, *Department of Linguistics, Cognitive Science and Semiotics, Aarhus University*	TPSC Lecture Theatre
13.00	**Exploring the acquisition of Deictic Motion verbs in L2 Spanish and L2 Modern Greek** Maria Andria & Alberto Hijazo-Gascón, *National and Kapodistrian University of Athens, & University of East Anglia*	TPSC Lecture Theatre
13.30	Lunch	TPSC Foyer
14.30	**On the Use of Deep Models for Gesture-Word Understanding in Developmental Robotics** Gabriella Pizzuto, *Machine Learning and Optimisation Group, The University of Manchester*	TPSC Lecture Theatre
15.00	**Digitally Mediated Gesture and Speech in the Description of Symbols** Bryan Maddox & David Edwards, *University of East Anglia and Assessment MicroAnalytics & ACT Next*	TPSC Lecture Theatre
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Poster Presentation Programme

Poster numbers correspond to poster boards

1. **Towards Scalability in Empirical Studies on Nonverbal Communication through Augmented Reality and Motion Digitization**
   Mehmet Aydın Baytaş, Qualisys AB, Gothenburg, SE & Koç University, Istanbul; Damla Çay, Koç University, Istanbul; Tyler Thrash, ETH Zürich, Zürich, CH & University of Zürich, Zürich; Asım Evren Yantaç , Koç University, Istanbul; Morten Fjeld, Chalmers University of Technology, Gothenburg,

2. **Spatial demonstrative and perceptual space in right and left-handed participants**
   Michela Caldano, School of Psychology, University of East Anglia, United Kingdom

3. **Free Indirect Discourse meets character viewpoint gestures: Evidence for the mixed quotation approach**
   Cornelia Ebert and Stefan Hinterwimmer, Leibniz-Zentrum Allgemeine Sprachwissenschaft, Berlin and Institut für Deutsche Sprache und Literatur I, Sprachwissenschaft des Deutschen

4. **Spatial demonstratives: the very first words, a very slow development**
   Patricia González-Peña, Andrew P. Bayliss, Kenny R. Coventry, Martin J. Doherty, School of Psychology, University of East Anglia, United Kingdom

5. **Situated language use: a model of face-to-face communication applied to aphasia**
   Willemijn J. Doedens, Arpita Bose & Lotte Meteyard, *University of Reading, UK*

6. **Remote Deictic Communication, Technologies and Challenges**
   Samuel Navas Medrano, Max Pfeiffer, Christian Kray, Institute for Geoinformatics, University of Münster

7. **The deictic gestures as indicator for explicit information in architectural drawings**
   Yesol Park, Eidgenössische Technische Hochschule (ETH) Zürich

8. **Spatial deixis and anaphoric reference: Estonian, Finnish, and Russian referential devices in comparative perspective**
   Renate Pajusalu, Helen Hint, Tiina Nahkola, Maria Reile, Piia Taremaa, University of Tartu, Tartu, Estonia.

9. **Place and the ground in signed languages**
   Sherman Wilcox, University of New Mexico; Rocío Martínez, Universidad de Buenos Aires & CONICET

10. **Declarative multimodal communication is where language begins**
    Joana Rosselló, Departament de Filologia Catalana i Lingüística General, Universitat de Barcelona

11. **Where is the deictic centre? Sound localization modulates demonstrative comprehension: an EEG study**
Debbie Griffiths[1], Louis Renoult[1], Emanuela Todisco[2] and Kenny R. Coventry[1]
[1] University of East Anglia, Norwich Research Park, Norwich, NR4 7TJ, [2] Universitat de les Illes Balears, Mallorca, Spain

12. **Spatial demonstratives: universals and differences in English and Japanese**
Harmen Gudde, Jacqueline Collier, & Kenny Coventry

Keynote Speakers

Leonard Talmy
University at Buffalo, State University of New York

Anna Borghi
Sapienza University of Rome and Italian National Research Council

The Targeting System of Language: unifying deixis and anaphora

Leonard Talmy
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University at Buffalo, State University of New York

This talk proposes that a single cognitive system underlies the two domains of linguistic reference traditionally termed anaphora and deixis.

In anaphora, the referent is an element of the current discourse itself, whereas in deixis, the referent is outside the discourse in its spatiotemporal surroundings. This difference between the lexical and the physical has traditionally led to distinct theoretical treatments of such referents. Our proposal, on the contrary, is that language engages a single linguistic/cognitive system -- "targeting" -- to single out a referent whether it is speech-internal or speech-external.

This system can be outlined as follows.

As a speaker communicates with a hearer, her attention can come to be on something in the environment -- her "target" -- that she wants to refer to at a certain point in her discourse. This target can be located near or far in either the speech-external(deictic) or the speech-internal (anaphoric) environment. She thus needs the hearer to know what her intended target is and to have his attention on it jointly with her own at the relevant point in her discourse. The problem, though, is how to bring this about. She cannot somehow directly reach into the hearer's cognition, take hold of his attention, and place it on her selected target at the intended moment.

Language solves this problem through targeting. First, at the intended point in her discourse, the speaker places a "trigger" -- one out of a specialized set of mostly closed-class lexical forms.
English triggers include: *this/these, that/those, here, there, yonder, now, then, therefore, thus, so, such, yay, the,* personal pronouns, relative pronouns, and tense markers.

Next, on hearing the trigger, the hearer undertakes a particular 3-stage procedure. In the first stage, he seeks all available "cues" to the target. Such cues belong to ten distinct categories, representing ten different sources of information about the target. In the second stage, he combines these cues so as to narrow down to the one intended target and rule out alternative candidates. And in the third stage, he maps the concept of the target he has found back onto the original trigger for integration with the sentence's overall reference.

The ten cue categories, divided into five groups of two each, are (lexical:) core and co-form cues; (bodily:) gestural and corporal cues; (collateral:) targetive and hearer-focus cues; (background:) environmental and epistemic cues; and (temporal:) chronal and perichronal cues.

Abstract concepts and action

Anna Borghi °*
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*Institute of Cognitive Sciences and Technologies, Italian National Research Council (CNR)

The capability to use abstract concepts (e.g. “fantasy”) is one of the most complex ones humans are endowed with. Yet, great part of the words we use are abstract. In the last years the topic of acquisition and representation of abstract concepts has become increasingly debated, also because explaining them represents a real challenge for embodied and grounded cognition views. While compelling evidence has clearly shown that concrete concepts are grounded in perception and action, evidence on grounding of abstract concepts is more sparse. In the talk I will focus on concrete determinants of abstract concepts, highlighting the importance of sensorimotor exteroceptive experience but also of linguistic, social and interoceptive experience for their acquisition and representation. I will focus on the role that inner speech can play for abstract concepts, and on the consequent activation of the mouth motor system during their processing. I will conclude arguing that words, and abstract words in particular, can be intended as social tools, that involve others in the process of meaning negotiation.

Oral presentation abstracts

A comparative analysis of non-verbal communication patterns of typically developing children, children with autism and children at high risk for autism in a gesture elicitation interactive task

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Despite a vast amount of evidence shows that children with Autism Spectrum Disorders (ASD) produce a reduced number of gestures compared to their typically developing (TD) peers, little is known about the qualitative differences between the communicative patterns of ASD and TD. Most gesture production studies in ASD have focused on the *imperative* (to produce a gesture to obtain something) and *declarative* (to produce a gesture to share the interest about something) gesture motives (Baron-Cohen, 1989) as well as on the gesture-language relation in ASD (Özçalışkan, Adamson & Dimitrova, 2016). The few studies describing ASD's gesture patterns (Mastrogiuseppe, Capirci, Cuva & Venuti 2015; LeBarton & Iverson, 2016) focused on gesture function (referential function in the case of pointing, representational function in the case of pantomimes/iconic gestures and reinforcement of the content of speech in the case of beats) during free play interactions. The aim of the present study is to expand the knowledge on gesture production patterns in ASD with a focus on hand configurations during a semi-naturalistic paradigm. Additionally, we tested a set of identified non-explored gesture measures: *repeated* gestures (gestures with multiple strokes), gesture complexity and gesture duration. To do so, young children (age range=1-6 years old) with ASD (n=16), children at high risk for autism (n=13) and TD children (n=18) performed a gesture elicitation task in which they interacted with a caregiver. Participants were videotaped for 5 minutes and the occurrence of each gesture and object manipulation instances were coded offline with the linguistic annotator ELAN. Results showed significant differences in gesture counts, proportions and duration across groups and gestures types. Children with ASD exhibited an overall pattern of reduced gesture counts but higher object manipulation and higher gesture proportions in a number of gesture types compared to their TD peers. Children at risk for ASD displayed a similar pattern to ASD in gesture count measures but not in gesture proportions and duration. The study of gesture patterns could help us identify ASD markers and further characterize the behavioural manifestations of the condition.

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Gesture space and speech acts: Multimodal strategies for establishing joint action

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The majority of gesturing that occurs with speech is performed directly in front of a speaker's torso in what has been termed "central gesture space" (McNeill, 1992, p. 83). This can be thought of as an unmarked location for co-speech gestures that does not contribute rich semantic content to the meaning of the gestural expression. Other locations in space, such as the shared space located (approximately) midway between interlocutors in face-to-face interactions, have been found to be used in meaningful ways. Sweetser and Sizemore (2008) find that this region of space, which they call *interpersonal space*, is reliably used for the purpose of highlighting that the interaction is being regulated in some way. This broad functional characterization of interpersonal (IP) space hints at its deictic symbolic nature. The specific speech management function that is highlighted through the performance of a co-speech gesture in IP space is "derived via the situational context of the utterance" (Cornish, 1996, p. 22).

The current study explores how the schematic function associated with IP space (i.e., drawing attention to some type of speech regulation) gains specification in context. This study identifies meanings that emerge when gestures performed in interactional space include a palm-up-open- hand (PUOH) configuration or a circular movement, two gesture forms that previous research studies have identified as meaningful (Duncan, 2002; Ladewig, 2011; Müller, 2004; Zima, 2014). Data include approximately 200 tokens collected from American English talk shows. Gestures were isolated and formal properties coded using ELAN software. Circular movements were identified using a frame-by-frame approach described in Seyfeddinipur (2006, p. 105). Functional-semantic properties of utterances that aligned with the gestures were coded to explore relationships between gesture forms and spoken language meanings.

This study finds that PUOH configurations and circular movement gestures performed in deictic IP space have a tendency to align with spoken language at the level of speech acts. Gestures of the PUOH-IP type occurred with assertive speech acts that either established a new discourse- level topic or indicated speaker alignment with a stance previously expressed by the interlocutor. PUOH-IP gestures also occurred with interrogative speech acts in which the speaker-gesturer invited the interlocutor to align with their stance. On the other hand, gestures of the circular movement-IP type occurred with interrogative speech acts in which the function was to elicit an actual propositional response to the question. The findings suggest that English speakers integrate IP space with other meaningful units expressed in gesture when they are calling upon an interlocutor to establish joint action through uptake of an interactional proposal (Clark, 2006). The type of proposal that is indexed by a particular IP gestural expression is elaborated by speech acts in spoken expressions (and their function in context). Specific examples from the data are analyzed to illustrate how meaningful units in gesture and speech are integrated for specific calls for joint action.

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Deictic communication in Italian Sign Language (LIS): encoding perspective of indicating verbs

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Encoding transitive actions sometimes requires specification of not only agent and patient of the action but also the location on patient's body where the action is performed (e.g., punching *the face*, kissing *the check*, caressing *the shoulder).* While in spoken languages action roles and the location of action are encoded consecutively, in sign languages it is possible to encode this information simultaneously by using indicating verbs (Cormier et al, 2015) expressing deictic reference to the signers own body.

Some research suggests that transitive actions that require deixis to the location on the body are encoded through complex verb constructions consisting of two parts, called *AB verbs* (BSL, Morgan et al, 2002). The A part of the verb encodes the action from the perspective of the agent. A signer maps the agent onto his/her body and encodes an action by directing it to the space conceptually associated with the patient. The B part requires signer to adopt the perspective of the patient and by means of *body partitioning* (Dudis, 2004) encode the action of the agent directed to the specific body part of the patient represented by the body part of the signer. Some research suggests that encoding both perspectives is not necessary and instead the attentional focus might be at play when choosing specific encoding perspective (Engberg-Pedersen, 2015; Jenzen et al., 2001).

Whether encoding of both perspectives of AB verbs is indeed obligatory also in other sign languages than BSL and what are the attentional focus features that lead to specific strategy choice has not been investigated systematically so far. In the present study we aimed to investigate, first, whether AB verbs are obligatory encoded with both perspectives also in Italian Sign Language; second, we aimed to investigate whether and what kind of attentional focus (i.e., visual vs. agentive) would influence the use of specific perspective encoding.

The material for the experiment consisted of 12 GIFs in which 2 characters interacted with each other. There were 6 GIFs for each condition where we manipulated attentional focus (visual prominence – agentive prominence). Twenty-three deaf adult signers described the GIFs (presented in semi- randomized order) to another deaf adult. For the present study, we annotated whether the target action (e.g., caressing, licking, scratching etc.) was encoded from agents, patients or both perspectives.

We found that LIS signers encoded AB verbs by using both perspectives significantly less in comparison to patient's perspective, but comparably to encoding of agent's perspective. Thus, our results reveal that at least in LIS, there is no obligatory encoding of both perspectives for AB verbs. We also found that in both conditions signers were significantly more likely to encode the AB verbs by mapping the more visually prominent character onto their body and encoding patient's perspective by indicating the specific location of the action.

We conclude that in LIS, the visually more prominent character is sufficient for attentional focus allocation and action per se does not influence the encoding perspective. Moreover, the verb encoded from patient's perspective not only carries information of both thematic roles but as well deictically refers to the exact location of the action. Thus, this strategy is arguably more informatively efficient than encoding only agent's perspective and more cost effective in comparison to encoding both perspectives.

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On the Selection and Use of Spatial Demonstratives

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In everyday human communication people often refer in speech and/or gesture to entities in their immediate environment, thereby expressing their communicative intentions and shifting their addressee's attention to a specific object, person, or event. Particularly spatial demonstratives and manual pointing gestures canonically co-occur in everyday spoken referential communication. The large majority of the world's spoken languages contain more than one type of spatial demonstrative (e.g. English *this* and *that*). This has raised the longstanding question which factors determine whether someone uses one demonstrative term and not another while pointing at a referent. In this talk, I will present i) the results of four recent behavioral experiments using the Memory Game paradigm (Coventry et al., 2008; Gudde et al., 2018) in which Dutch participants used significantly more proximal demonstratives when sitting opposite their addressee versus when sitting side-by-side, ii) the results of a recent cross-linguistic comparison of Dutch (the Netherlands) and Ticuna (Peru), using the Memory Game paradigm, which showed effects of a referent's distance to the speaker, the location of the addressee, and the visibility of a referent on demonstrative choice in both languages, but distributed over a different number of demonstrative terms (Dutch two-term versus Ticuna four-term), and iii) a multilevel conceptual framework that specifies the various factors influencing a speaker's choice of demonstrative across different languages. Together, these findings contribute to a better understanding of the complex interplay between action, attention, language, and space in the production of multimodal deictic acts core to human face-to-face communication.

Spatial deixis in Spanish motion events

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This paper examines the role of spatial deixis in the lexicalization of motion events in Spanish. According to Talmy's (1991, 2000) theory of lexicalization pattern, Spanish is a verb-framed language. That is, speakers tend to omit Manner information and encode Path in the main verb. Path is a complex semantic component that comprises three subcomponents: Vector (different types of trajectories—source, goals, etc.), Conformation (shape or geometric complex of Path), and Deictic (motion to/from speaker and addressee).

Despite the abundant literature on Spanish motion events, little research has been conducted on the interaction and usage of these Path (sub)components. The goal of this study is to explore these issues further. More specifically, the paper addresses this research question: Given a motion event situation where several of semantic (sub)components are being enacted at the same time, which semantic (sub)component(s) will Spanish speakers choose to verbalise, and how?

Data were elicited using Experiment A of the NINJAL-Kobe Project on cross-linguistic Motion Event Descriptions. These videos depict situations where manners (walk, run, skip), paths (into, to, up) and deixis (venitive, neutral, andative) are combined. For this talk, a subset of 30 videos was selected. 20 Spanish native speakers participated in the production study.

Results show that Spanish speakers encode Path information (vector information) overall. Deixis is predominant only in "walk venitive situations", but overridden when the direction is "up" or "into". Manner is overridden by Deixis and by Path, except for "run" situations.

Cross-linguistic Investigation on Deixis and Bilingualism: Spatial Demonstratives in Spanish and Catalan Mallorcan.

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Deixis is a natural phenomenon cross-linguistically widespread (Diessel, 1999) and demonstratives are the most grammaticalized class of deictic expressions.

Demonstratives' classification and preference usage depend on differing parameters: proximity/distance of referents in relation to speaker and hearer (Diessel, 2006), perspective-taking (Küntay & Özyürek, 2006), psychological proximity (Peeters et al., 2015), ownership, visibility and familiarity of referent (Coventry et al., 2014). They are pivotal in sharing context-creating perspective (Stukenbrock, 2015) and in manipulating co-participants focus of attention (Kita, 2003) thanks to a shifting *origo* (Bühler, 1934; Fricke, 2014), which constantly projects reference via verbal and nonverbal strategies. Their central role during interaction not only increased their frequency of use, but also exposes them to continuous restyling processes (Da Milano, 2015). Notwithstanding the extensive research on deixis, little is known about its interaction with bilingualism. Specifically, what characterizes the deictic production of simultaneous and sequential bilinguals who speak two languages with different systems of demonstratives? Is there a cross-linguistic influence/transfer due to language preference/dominance? Moreover, is the current encoding of the demonstratives' systems reflecting the actual use by the speakers? Do specific positions of the hearer affect the choice of demonstratives during interaction?

To that end, we discuss a pioneering analysis of the use of demonstratives in 142 Spanish - Catalan Mallorcan bilinguals and 30 Spanish monolinguals. In accordance with the methodology developed by Coventry et al. (2008), a psycholinguistic experiment (i.e., a memory game) was employed to elicit the verbal and gestural deictic production of both languages. The bilingual sample was grouped according to two degrees of language preference/dominance - balanced vs. unbalanced - assessed via the Bilingual Language Profile (Birdsong et al., 2012) and two types of bilingualism – simultaneous vs. sequential – according to the age of acquisition reported (Klein et al., 2014). Demonstratives' elicitation referred to the three-way system of demonstratives [*este/ese/aquel*] for Spanish (Diessel, 1999; Jungbluth, 2003) and to the (assumed) two-way system of demonstratives [*aquest-(aqueix)/aquell*] for Catalan Mallorcan (Alomar & Melià, 1999; Brucart, 2002; Nogué-Serrano, 2015).

According to our results, the hypothesized cross-linguistic influence/transfer in the use of demonstratives, depending on bilinguals' language preference/dominance, was not found. In addition, our within subjects' statistical analysis showed an equal distribution of space in three subspaces across samples and a significant effect for the frontal position of the hearer only in Catalan Mallorcan, but not in Spanish, either in the monolingual or bilingual sample. Moreover, the exhaustive analysis of the demonstrative system in Catalan Mallorcan shed new light on an ongoing restyling process due to analogical levelling (Fertig, 2013). This process consists in a reduction from a three-termed [*aquest-aqueix/aquell*] to a two-termed system [*aquest/aquell*], as the low frequencies of occurrences of "*aqueix*" showed. In view

of our results, the present study represents a fundamental contribution to current debates on bilingual perception and production (Kroll et al., 2012; Miller et al., 2018), and provides a more fine-grained description of the system of demonstratives of the Catalan variety spoken in Mallorca (Alomar & Melià, 1999; Brucart, 2002; Nogué-Serrano, 2015).

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Replicating Infants' Behaviours with a Babybot: Early Comprehension of Pointing Gestures

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Deictic communication, such as using pointing gestures to create a common attentional ground with another agent, is not an easy capability for artificial cognitive systems and robots. The challenge of modelling embodied agents that have human-like cognitive skills goes hand in hand with the theoretical research on the underlying mechanisms of those skills in humans, as well as how they are acquired during development. In this study, we followed the developmental robotics approach where developmental psychology studies are taken into consideration to design computational models for robots, so that these robots can autonomously and incrementally acquire cognitive skills (Cangelosi and Schlesinger, 2015).

The current study focused on enhancing our previous cognitive robotics model for the representation of spatial joint attention (Serhan et al., 2018) and evaluating it on a variation of Posner's cueing task. This was conducted in developmental psychology to investigate infant's understanding of dynamic pointing gestures (Rohlfing et al., 2012). The cognitive architecture involved the combination of a connectionist model for learning pointing gestures (Nagai, 2005) and a dynamic field model for the representation of spatial attention in infants (Ross-Sheehy et al., 2015). Our previous model allowed the iCub robot to learn and gaze towards pointed locations in space by extending these previous methods by embedding them into a new dynamic neural fields model for object perception and pointing gestures.

In this study, the model was optimised by adding two other feed forward neural networks for a better understanding of gestures. Furthermore, all the neural networks were implemented on a state of the art machine learning framework (i.e. Keras API) to monitor better the learning steps and to increase the accuracy of the models over 95% in some cases. Moreover, the eye gaze was supplemented by three additional degrees of freedom to produce the head movements using the open access motor control library iKinGazeCtrl (Roncone et al., 2016). Our main contribution is the evaluation technique of the cognitive model. The iCub robot replicated the behaviour of human infants in the aforementioned experimental study. The preliminary results showed that when a pointing hand is dynamic, increased activation levels on the pointing neural field caused faster reaction times on the iCub's gazing to congruently cued objects. However, when the object was at the incongruent location, the mutual inhibition between neuron populations related to object and pointed locations on the spatial attention field, together with the local excitatory connections, caused slower reaction times.

Ongoing experiments will help us understand the similarities in the comprehension of the pointing gestures between human infants and our artificial embodied agent. As the model gives the opportunity to inspect neural time dynamics and the internal states of the neural networks, it would improve our comprehension of the underlying cognitive mechanisms of

deictic gestures. Furthermore, it may provide new predictions to be tested in novel experiments to developmental psychologists, as cognitive robotics models are open to manipulation to test in different experimental scenarios (Cangelosi and Schlesinger, 2018).

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Here and *there*, *how* and *where.* Bilateral network of dorsal regions supports comprehension of spatial demonstratives in naturalistic language processing.

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Spatial demonstratives, i.e. words like *this* and *that*, are high-frequency deictic expressions used to establish joint attention. As all deictic expressions, demonstratives do not convey explicit semantic information on the intended referent. To correctly identify it, the addressee has to integrate linguistic representations, perceptual processes, and social information regarding the speaker's position and intentions as well as mutual common ground (Clark & Bangerter, 2004; Rocca et al., 2019).

So far, no research has been conducted on which neural resources support the comprehension of spatial deictic expressions, arguably because such investigation raises major methodological challenges. Uncovering the neural underpinnings of deixis call for paradigms simulating rich linguistic and physical environments within the constraints intrinsic to neuroimaging methods.

Using a novel naturalistic fMRI paradigm, we conducted an experiment (N = 28) where participants listened to specially crafted dialogues with a controlled number of spatial demonstratives. The dialogue involved two synthesized voices, each recorded onto a separate channel of a stereo track. Demonstratives were thus embedded in a rich linguistic context and a 3D spatial setting. A fast acquisition sequence (TR = 388ms) was used to capture signal changes at word-level resolution, relying on evidence for the presence of high-frequency components in the BOLD signal (Lewis et al., 2016).

We modelled neural response via FIR models (20 bins, 500ms lags), using RETROICOR cardiac and respiratory models for denoising. Random-effects univariate analyses showed that spatial deixis is supported by bilateral superior parietal areas associated to functional representation of space.

Univariate parameter maps were then used to extract similarity between neural representations of spatial demonstratives and neural responses to wh-words (*where*, *what* and *who*) over a 10 seconds window after stimulus onset. These wh-words prime processing of spatial information, object identity, and personal/social information respectively. As expected, on a whole-brain level, similarity was largest between representations for spatial demonstratives and neural representations for *where*. ROI-based analyses showed that similarity was highest in fronto-parietal areas belonging to the dorsal processing stream.

Our results suggest that spatial deixis relies on bilateral neural resources belonging to the *dorsal* processing stream, which is associated to manipulation-oriented spatial encoding.

These results are in line with behavioral evidence (Coventry et al. 2008; Rocca et al. 2018; Rocca et al., 2019) showing that spatial demonstratives encode functional properties of the referent (e.g. graspability).

The involvement of bilateral parieto-frontal resources is consistent with earlier studies showing an overlap between linguistic and non-linguistic representation of space (e.g. Wallentin et al. 2006, Wallentin et al. 2008). Moreover, our results speak in favor of distributed models of language processing. In the context of naturalistic stimuli, language processing extends beyond the traditional language network. It relies on resources that are not markedly left-lateralized (de Heer et al., 2017) and that map onto fundamental processing streams (dorsal vs. ventral) shared across multiple domains of cognition.

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Iconicity in spatial deixis: A cross-linguistic study of 180 demonstrative systems

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The term "iconicity" refers to the resemblance between the form and meaning of a linguistic expression. Despite its cross-linguistic pervasiveness and large impact on vocabulary structure (see Dingemanse et al. 2015), iconicity has received relatively little attention in the context of demonstratives. Analyzing data from a balanced sample of 180 languages, this paper provides a comprehensive account of the ways in which distance contrasts are iconically encoded in deictic systems. Specifically, the paper argues that two formal properties of demonstratives are iconically motivated: (i) the phonetic quality of their stem vowels, and (ii) their length.

VOWELS. There is good psycholinguistic evidence that speakers associate high-front vowels with small size and low-back vowels with large size (Ohala 2006). In accordance with this finding, a number of studies have shown that proximal demonstratives tend to occur with high-front vowels (e.g. /i/, /e/), whereas distal demonstratives tend to occur with low and back vowels (e.g. /a/, /o/, /u/) (Woodworth 1991; Johansson and Zlatev 2013). Elaborating on these accounts, the present study shows that iconicity does not only influence the encoding of proximal and distal deictics but also that of medial and distal terms (cf. Hatam: *ni* PROXIMAL, *ma* MEDIAL, *mu* DISTAL). In fact, in our data the vowel contrast between medial and distal demonstratives is more frequently iconic (75%) than that between proximal and distal deictics (69%).

Moreover, this study argues that tone (which is phonetically related to vowel height) is used iconically in deictic systems. There are nine languages in our data in which the semantic contrast between proximal and distal demonstratives is indicated by tone. While this number is too small to draw a firm conclusion, it is interesting to note that the tones of proximal demonstratives tend to be higher than those of the corresponding distal terms (e.g. in Aghem, Anywa, Kunama, Wampis).

LENGTH. A second aspect of demonstratives that is arguably iconic concerns their length. Our data show that distal demonstratives tend to be longer than proximal terms, which is arguably related to Givón's (1991) hypothesis that the size of a word reflects iconically the size of its referent. There are various phonetic strategies to create a contrast in length between proximal and distal deictics. In a number of cases, distal demonstratives are reduplicated (Garrwa: *na-* PROXIMAL vs. *nana-* DISTAL) or pronounced with a prolonged stem vowel (Uduk: *ttan* PROXIMAL vs. *ttaan* DISTAL). Moreover, distal terms tend to contain more syllables than proximal terms: of those proximal–distal contrasts that display a difference in length, 79% have a shorter proximal demonstrative.

In sum, this study presents new cross-linguistic evidence for the hypothesis that deictic systems are iconic. In accordance with previous research, we show that the vowels of proximal demonstratives are higher and more advanced than those of distal deictics, but

this is not the only aspect of deictic systems that is iconically motivated. In addition, vowel lengthening, reduplication and other lengthening strategies are used to create an iconic contrast in length between proximal and distal terms.

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The Demonstrative Choice Task: Mapping the semantics of personality

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Spatial demonstratives (*this*, *that*) are among the most frequent spoken words (Leech, et al., 2001). Previous experiments have investigated how elicitation of demonstratives reveals both something about the speaker's relationship to the objects referred to (Coventry, et al., 2014; Coventry, et al., 2008; Rocca, et al., 2019) and about the conversational situation (Rocca, et al., 2018).

We most often use the proximal demonstrative (*this)* to refer to objects within manual reach (Coventry, et al., 2008). However, demonstratives are also consistently used to establish contrasts in conceptual space, where meaning may be negotiated in the absence of visible objects and interlocutors. In a recent study (Rocca et al., 2019), we introduced a new *Demonstrative Choice Task (DCT)*, where participants are asked to match words (e.g. *tiger*, or *apple*) with a demonstrative (i.e. *this* or *that*) without any further context. Across three languages, we found that participants consistently use the distal demonstrative (*that*) for a word like *tiger*, whereas they consistently choose *this* for a word like *apple*. This effect was found to be related to the inferred manipulability of the object, both related to inferred perceptual (size) and psychological (harmfulness) semantic dimensions.

However, part of the variance in the data in the DCT remains unexplained. Analogously to what has been observed with personal pronoun use (Schwartz, et al., 2013), demonstrative use might also be affected by the way preferences, experiences, and personality traits interact with semantic properties of the referent. If this is indeed the case, participants' response patterns in the DCT could be used as a tool to predict individual differences in personality.

We conducted a large-scale survey based on the DCT on the website http://prolific.ac. Native English-speaking participants are presented with 60 words, selected from a database of 535 words, which have been rated on 65 different semantic dimensions (Binder, et al., 2016). The subset of words that each participant is presented with are selected to span all semantic dimensions and participants are subjected to a different subset of words in a pseudorandomized manner.

For each participant, we extract a *demonstrative index* per semantic dimension. The semantic ratings of stimulus words for which the participant has chosen to couple the words with *that* are subtracted from the ratings for words that the participant has chosen to couple with *this*. This yields one score for each dimension, i.e. a total of 65 indices that make up each participant's semantic profile. Across participants, these profiles will be used in a multivariate decoding analysis to predict individual traits from a very brief (10 item) Big 5 personality test (Gosling, et al., 2003) and current experienced mood (Kroenke, et al., 2001) and anxiety level (Spitzer, et al., 2006).

Analyses of data from two pilot studies suggest that we are able to significantly predict prominent individual traits such as anxiety and gender.

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Exploring the acquisition of Deictic Motion verbs in L2 Spanish and L2 Modern Greek

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The study of deictic motion verbs has been an important area of research for studies on Language and Cognition. Gathercole (1977, 1978) establishes a typology of the expression of deictic motion verbs across languages. The venitive verb (i.e. the COME verb) can be used to express direction towards the speaker and the addressee in some languages (e.g. English). However, the venitive verb can be used exclusively for motion towards the speaker in other languages (e.g. Japanese). In Talmy's (1991, 2000) motion events typology, Deixis is considered a subcomponent of Path. The typological differences in the encoding of deixis may impact on the thinking-for-speaking patterns (Slobin, 1996). These crosslinguistic differences, make deictic motion verbs particularly difficult for learners of a second language (L2).

The aim of this study is to explore how the typological contrasts between Modern Greek and Spanish imply a challenge for their acquisition as an L2. There are important semantic differences that justify the study of this language pair. First, Modern Greek allows both interlocutors as a deictic center whereas Spanish allows only the speaker to play this role (Gathercole, 1977; Hijazo-Gascón, 2017). Second, Greek presents specificities with regard to accompaniment situations (e.g. *Would you like to come/go to the party?*), where the verb chosen will imply the presence (COME) or absence (GO) of the speaker (Andria & Hijazo-Gascón, 2019; Antonopoulou & Nikiforidou, 2002). Our hypothesis is that these different deictic patterns will lead to cases of crosslinguistic influence (Jarvis & Pavlenko, 2008) for both Greeks learning Spanish and Spaniards learning Greek.

Participants were Greek learners of Spanish as an L2 and Spanish learners of Greek as an L2. Both groups had a B2 proficiency level according to the *Common European Framework for Reference of Languages* (Council of Europe, 2001) and native speakers of both languages. Data were elicited by means of four videos that encouraged the use of motion verbs. Participants, after watching the video, had to orally describe it from the perspective of one of the characters. A cloze test activity which included the target verbs was also used. Moreover, in an attempt to gain more insights into participants' perceptions towards the patterns under exploration, oral protocols were also collected. The study performed a mixed-method analysis.

Results showed evidence of crosslinguistic influence during the acquisition of deictic motion verbs. In line with previous studies, restructuring of the L1 deictic patterns has been found to be a demanding process when the L1 and the L2 have different lexicalization patterns (in this case, in relation to Deixis). Both groups of learners encountered difficulties in relation their use of deictic motion verbs. Findings pointed that Deixis is an area of difficulty for a "re-thinking for speaking" (Robinson & Ellis, 2008) and prone to crosslinguistic influence. Even though these verbs are taught at early stages of the learning process, the influence of L1 patterns seems pervasive in how they are used in the L2, even at a B2 level of proficiency.

Keywords: Deixis, Motion, Second Language Acquisition, Crosslinguistic Influence, Spanish, Greek

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On the Use of Deep Models for Gesture-Word Understanding in Developmental Robotics

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During the initial stages of infant language acquisition, gestures and speech are integrated (Iverson et al. 2005). Prior to the onset of multi-word production, children make use of gesture-speech combinations, where the complementary modality, i.e. the gesture does not add new information to speech, leads to increased verbal complexity and vocabulary size, and the supplementary modality, i.e. the gesture adds new information to speech, predicts the age of onset of two-word utterances (Capirci et al. 1996).

Inspired by this approach in human development, our research efforts have focused on achieving such integration on the humanoid robot iCub. Our work here focuses on leveraging a multimodal deep learning network for comprehension of complementary gesture-speech combinations. Our main objective is to ground advancements in machine learning in a real-world application where our architecture demonstrates a solution for using deictic gestures to aide in robot language learning. This contributes to an improved human-assisted language learning for fluid human-robot interaction.

As a result of deep networks achieving unparalleled success in vision and language tasks (Le Cun et al. 2015), this method was adopted for the task at hand. Our vision system is composed of a cascaded network comprising Mask Regional Convolutional Neural Networks (R-CNNs) and the Residual Network (ResNet). First, it utilises a Mask R-CNN for wrist keypoint detection; its function is to focus on the area close to the gesture. This is succeeded by another Mask R-CNN for object classification and a ResNet labels the deictic hand gesture. Speech understanding and motor control functions were also added to the gesture-object vision mechanism. The complete system was trained on a dataset recorded directly from the iCub's cameras. We evaluate our network with deictic gestures across real-world objects in video recorded directly from the iCub's cameras. Our results further strengthen the potential of using complementary gesture-word combinations for robot language acquisition.

In summary, this study presents a novel deep model which uses deictic gestures for equipping a humanoid robot with language skills. Whilst taking inspiration from research in infants' developmental stages, we show how gestures can also play a pivotal role in gesture-word comprehension on a robotic platform. Here, we showed how state-of-the art deep learning-based solutions lead to this. We proposed a pipeline which fuses visual and linguistic information to fulfill the task of complementary gesture-word comprehension in a human-robot interaction scenario. In this context, our contribution is a vital step towards robots that can acquire language through a developmental approach.

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Digitally Mediated Gesture and Speech in the Description of Symbols

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As McNeill and others have argued, observations of communicative practices reveal the dynamic nature of deictic communication, in which thought and joint action are supported by speech and gesture (McNeil 2005; Goldin-Meadow 2007; Goodwin 2007). In this paper we discuss the presence of gesture in digitally mediated communication, as people draw from multi-modal resources including audio, text chats, video and textual information. Those communicative resources are typical features of digitally mediated face-to-face communication.

We examine speech and gesture in dyads as they complete collaborative problem-solving tasks in an on-line game involving asymmetrical access to information. The research was conducted as part of study to develop non-invasive, in vivo assessment of collaborative problem solving (Chopade et al. 2019). The task described asked participants to identify and describe series of abstract symbols in order to cooperatively solve a puzzle. As each player has access to unique interfaces, success requires that they describe and share information.

Following Muller (2007) and Gerofsky (2011) we examine the dynamic character of gesture and metaphor as cognitive and communicative resources. We use a micro-analytic methodology (Bavelas 2007; Maddox 2017), to analyse moment by moment speech, gesture and gaze. Using dual eye tracking and video we capture information on dyad alignment. The micro-analysis was enhanced by artificial intelligence and machine learning (Liu et al. 2016; Huang-Khan 2016). We discuss how the participants combine metaphoric imagery and gesture and the possible implications for communication and cognition. In the conclusion we consider the significance of gesture in on-line problem-solving, and its implication for the design and use of communication software.

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Poster presentation abstracts

Towards Scalability in Empirical Studies on Nonverbal Communication through Augmented Reality and Motion Digitization

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Empirical studies on nonverbal communication (including deictic communication and sign languages) are often limited in terms of participant sampling, in that experimenters are often only able to recruit participants within close geographic proximity. Access to diverse participant pools, i.e. scalability, is an ideal that remains elusive in practice. In previous work, scholars have taken steps towards achieving scalability by leveraging technological platforms such as web applications and virtual reality (Moussaid et al. 2018). Although these efforts represent significant progress, the ecological validity of such methods is often closely related to the design of particular digital artifacts in use, and thus needs to be verified case-by-case. This motivates further investigation into platforms and artifacts to support scalable and ecologically valid empirical studies in psycholinguistics. Towards this end, we have envisioned a novel approach to stimulus presentation inspired by recent developments in augmented reality technologies and interaction design (Baytaş, Yantaç, & Fjeld 2017; Orts-Escolano et al. 2016). We present a system based on two technologies: a commodity augmented reality headset for superimposing holographic content over real-world objects, and a professional motion capture system for digitizing human movements with high precision (see Baytaş et al. 2017). Upon these platforms, we have built novel open source software components to enable interoperation, and support stimulus presentation and data acquisition in synchrony. This software provides access to the motion data on various levels of granularity (e.g. point, rigid body, and skeleton streaming), and can be used to drive movements of human-like holographic agents. The system affords playback of motion data, as well as live streaming, which may also be leveraged to support remote nonverbal communication for other purposes.

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Spatial demonstrative and perceptual space in right and left-handed participants

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Spatial demonstratives – including the words *this* and *that* in English - constitute an important class of lexical items across all languages. Not only are they present in all languages and are among the highest frequency words within a language (Deutscher, 2005; Diessel, 1999, 2006), but they are also among the earliest words to be acquired (Clark, 1978, 2003). Moreover, they are closely linked with the action system; indeed, demonstratives often involve pointing at objects (Clark,1996; Diessel, 2006). Typologically, the most common demonstrative system across languages is a binary system, as in English (Diessel, 1999, 2005). This has prompted many linguists to assume that the binary distinction is distance based, with one term, the proximal term, used for near distances and the other (distal) term for far distances. Experimental work on demonstratives has provided support for a link between PPS and the use of proximal versus distal demonstratives, with a gradually drop-off in the use of this as the object move further from the participant (Coventry *et al*., 2008; Coventry et al., 2014).

In this study we want to further test the mapping between demonstratives and perceptual space. We manipulated the location of objects in both the sagittal and lateral planes. If the PPS-extrapersonal space distinction is indeed important for demonstrative choice, one should find a drop off in the use of *this* in lateral locations dependent on the hand used to point at the object when naming it. Specifically, pointing at an object on the far left should be associated with increased use of *this* when pointing with the left hand (as the object can be reached) compared to the same location when pointing with the right hand (where the object cannot be reached) and vice versa. We also consider two other potential variables that may affect demonstrative use: the hemifield in which an object appears (left versus right visual field of the speaker) and the handedness of the speaker. Given the processing biases from left to right, often also associated with writing direction (Bergen & Lau, 2012; Shaki et al., 2009) or the dominance of right handers (Marzoli et al., 2014), one can postulate that *this* might be used more in the left visual field than in the right (and vice versa for *that*). Regarding handedness, it is generally easier to manipulate objects with one's preferred hand, so one can also predict that pointing with the preferred or dispreferred hand potentially could affect the language one uses to describe object location, with *this* being used more when pointing with the preferred hand. No effect of handedness or hemifield was found. Results strongly support the mapping between perceptual space and demonstrative choice, with an increased used of *this* when pointing with the left hand toward a position in the left hemifield (object reachable with the left hand but not with the righ hand) compared to when participants were using the right hand (and vice versa).

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Free Indirect Discourse meets character viewpoint gestures: Evidence for the mixed quotation approach

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Free Indirect Discourse meets character viewpoint gestures: Evidence for the mixed quotation approach

We discuss the interplay of gestures and perspective-taking in spoken language and here a phenomenon that to the best of our knowledge has gone unnoticed before: A speaker can use a third person pronoun while pointing to herself in Free Indirect Discourse (FID), as in (1), but not in indirect discourse (ID), as in (2).

(1) Why on earth did [he] have to go to this damn cinema, Paul asked himself.
(2) Paul asked why [he] had to go to the cinema.

We show that this phenomenon provides further empirical evidence for the quotation approach to free indirect discourse (FID) (Maier 2015, 2017) as well as for the quotation as demonstration approach of Davidson (2015) (as reconstructed by Maier 2017) and for the importance of character viewpoint gestures in conversation. Additionally, we show that the demonstration condition postulated by Davidson (2015) for quotes can be derived from the general account of gestures and demonstratives by Ebert & Ebert (2014).

In a first pilot study with 10 experimental items and 10 fillers in German and 32 participants, we investigated the above observation experimentally. We tested FID vs. ID in a rating study in a within-subject design. Participants had to judge an utterance presented in a video with utterances involving FID or ID with third person pronouns plus a pointing gesture towards the speaker, where the rating scale was from 1 (completely unnatural) to 7 (completely natural). The mean rate for ID plus gesture was lower than for FID. However, probably due to the small number of experimental items, the difference became only significant in the subject analysis, but not in the item analysis. We now plan to design a full study with more items and fillers.

The observed contrast between FID and ID can be accounted for by combining the following three assumptions. First, FID is a particular form of mixed quotation, with pronouns and tenses being unquoted, as argued for by Maier (2015, 2017). Second, it involves a perspective shift towards the reported speaker. Third, it can involve an additional demonstration/gesture as argued for by Davidson (2015) for direct quotes, *be-like* constructions, and role shift.

We argue that pointing to one's own body (plus potential face expressions, etc.) in FID serves to signal that the speaker's body acts as if it was the reported speaker's body (even if the quoted speech act did not involve such a pointing gesture). The pointing gesture is a character viewpoint gesture, which means that here the speaker impersonates a different person and enacts the event from his or her point of view (Parill 2010, Stec 2012). Hence, we argue that in the FID case, the gesture of pointing to oneself simply makes overt what has been argued for independently: that FID involves a perspective shift towards

the reported speaker. ID, in contrast, normally involves no additional demonstration and no perspective shift and hence does not allow for this kind of pointing.

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Spatial demonstratives: the very first words, a very slow development

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Demonstrative words ('this' and 'that' in English) are among the first utterances of infants. In combination with deictic pointing, they function to establish joint attention [1]. However, very little is known about the development of their production and comprehension [2] until adult performance is achieved. We investigated this in two studies.

Demonstratives refer to relatively close or far space and referents. Their deictic nature implies that their meaning changes anchored to the speaker. We tested demonstrative comprehension using an adapted object search task [3] in which participants had to find an object on the basis of distinguishing between the verbal cues 'this', 'that', 'here' and 'there'. Contrary to hypothesis, children made an equal number of errors when their perspective differed from the experimenter's than when they shared perspective. Participants reliably mastered demonstrative comprehension in this task from the age of four-and-a-half, and had the best performance on proximal terms ('this', 'here'). Spatial skills (as measured by copying a geometrical figure) and general language skills (but not vocabulary) were strongly related with demonstrative comprehension; theory of mind and visual perspective taking were not related.

Demonstrative choice relates to the distance between speaker and referent, however this distinction is relative and graded, and affected by a range of other object and context variables. The next study aimed to determine the age in that children produce demonstratives in an adult fashion. We adapted a task designed to elicit demonstrative production covertly [4]. Participants referred to objects on a table using 'this or 'that'. We tested seven- and eleven-year-old children and adults across two experiments. Discriminating between demonstratives for near and far locations was minimal in younger children and strongly increased with age. A non-linguistic memory for location taskperformed with the same objects and locations showed no group differences, suggesting that the late development of demonstrative production is not due to immaturity in spatial cognition.

Our findings show that the development of the use of spatial demonstratives is strikingly slow: The first demonstrative words appear in the second year, comprehension seems to be achieved late in the fourth year, yet spontaneous adult-like production only starts developing around the age of seven and continues to develop beyond the age of eleven. Implications for the development of spatial cognition and theory of mind will be discussed.

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Situated language use: a model of face-to-face communication applied to aphasia

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Background

Aphasiology is the study of a language impairment caused by acquired brain damage such as stroke. In this field, naturalistic communication is seen as the principle outcome measure after speech and language therapy (SLT; Brady, Godwin, Enderby, Kelly, & Campbell, 2016; Thompson, Worrall, & Martin, 2008; Worrall, 1995). Historically, aphasiology has relied heavily on decontextualized psycholinguistic measures such as picture naming, repetition, single word- and single sentence comprehension. These measures give a linguistically well-defined profile of impairment, but research shows that these measures do not fully predict how People With Aphasia (PWA) use language in everyday life (Holland, 1982; Armstrong, Ciccone, Godecke, & Kok, 2011; Beeke, Maxim, & Wilkinson, Using conversation analysis to assess and treat people with aphasia, 2007; Davidson, Worrall, & Hickson, 2008; Kolk & Heeschen, 1992; Wilkinson, 1995). Currently, the literature in aphasia shows a lack of consensus over how real-world communication should be measured (Brady, Godwin, Enderby, Kelly, & Campbell, 2016; Wallace, et al., 2018), preventing the field from drawing stronger conclusions about therapeutic effectiveness at this level of functioning. Despite these crucial limitations, no attempt has yet been made to theoretically and systematically scrutinize the concept of real-world communication for PWA.

In order to investigate real-world communication in aphasia in a more structured and systematic way, we aim to apply experimental methodologies that are widespread in the fields of communication sciences, psychology and sociology. We use a theoretically founded definition of real-world, deictic communication which defines communication in narrow terms as *language use* during *face-to-face communication* (Clark, 1996). The framework gives three core components of face-to-face communication that are still poorly understood in aphasiology: communication is (1) interactive, a joint activity, (2) multimodal and (3) based on common ground (i.e. relies on the context such as the physical environment, and shared knowledge and experiences). The poster includes the proposed framework of face-to-face communication, the experimental design of the study and preliminary results from the experiment with adult controls and PWA.

Methods

We will compare communicative performance for PWA and healthy controls with familiar vs unfamiliar communication partners, widely recognised (or assumed) to be a key factor in communicative success for PWA. The experimental design of the study consists of a collaborative, referential communication task (Clark & Krych, 2004). PWA are paired with a familiar communication partner and asked to, in turns, direct the positioning of objects in a room (using play mobil figures and objects). They then repeat the same task with an unfamiliar communication partner (the partner of a different PWA). Pairs of healthy older

adults (age and education matched) complete the task to give normative data for comparison. Thus, familiarity is manipulated by comparing familiar subject pairs to strangers. Familiarity will vary on a personal level (i.e. having shared experiences) and on knowledge of aphasia (i.e. what the impairment is and how to support communication). The full method is pre-registered at http://osf.io/9xwm7 and data collection is ongoing.

Results

The preliminary results compare performance when the degree of familiarity of the conversation partner is manipulated (*common ground*). Differences in communicative efficiency (i.e. accuracy, time taken to complete) will be reported for both groups (PWA and age-matched controls) and conditions (familiar vs unfamiliar). Other outcome measures that will be included in the study are based on the literature and will include error detection, self- and other-monitoring, and measures taken from Conversation Analysis such as repairs and patterns of sequence construction (Beeke, Wilkinson, & Maxim, 2009; Damico, Oelschlaeger, & Simmons-Mackie, 1999).

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Remote Deictic Communication, Technologies and Challenges

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Deictic communication permeates everyday life and is instrumental to successfully exchanging information. Deictic gestures, as pointing (Kita, 2003), are an essential modality of deictic communication and often crucial to understanding our communication partner, human or computer (Alibali et al., 2001; Schmandt and Hulteen, 1982). If two parties are not collocated, communicating over a distance such as when making a phone or video call, those gestures expressions are often missing in the communication process. Using demonstratives without properly producing a pointing gesture, would make it difficult or impossible for the communication partner to correctly identify what the speaker means and to thus react appropriately.

While modern technology provides many means to relay information to a distant partner, remote communication is still limited compared to face-to-face interaction (Eisert, 2003), in particular regarding deictic expressions. Not being able to easily relay deictic information can lead to misunderstanding or lengthy explanations. Academics and practitioners have tried to facilitate a number of strategies to somewhat compensate these issues. However, these strategies can be inefficient, lead to misunderstandings, require additional steps compared to face-to-face communication, or deviate from natural behaviour.

In this work, we present a systematic review in the current state of the art of technologies and methods for facilitating deictic information across distances. We analysed current challenges that need to be addressed for successfully conveying deictic pointing remotely, and identify several potential directions for future research in the area. Our contributions can inform designers and researchers investigating future interfaces to successfully facilitate natural pointing gestures naturally across distances.

Keywords— Computer-mediated communication, remote communication, deictic gestures, electrical muscle stimulation

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The deictic gestures as indicator for explicit information in architectural drawings

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To solve certain design tasks, architects employ external representations such as plan, section, and perspective drawings, and interact with them. We expect that the way of representing spaces will influence the way architects think, and that this is reflected in their gesturing behaviour during the interaction with the medium. We attempt to determine whether and how gesture can indicate information that is explicitly presented or implicitly presented in a design medium.

A coding scheme was developed to investigate the connection between design medium, information type, and architects' gesture activity. The coding procedure comprises two steps: (1) The *design topic* will be identified based on speech. The design topic will capture the designers' focused task on a micro-level. (2) Based on both verbal and visual data, the referent for each gesture will be determined and be classified into one of two categories, depicted elements or conceptual elements. These two categories are derived from Suwa and Tversky's (1997) "depicted elements", "spatial relations", "functions", and "knowledge". The major dichotomy for the present study is between explicitly presented information and visually implicit information.

We assume that the amount of information available to architects differs depending on how well the external medium suits a certain task. When a design medium is suitable for a task, architects get more relevant information from the medium and the information is visually explicit in the medium. When a medium is less suitable for a task, however, architects would be lacking relevant information causing an increase of cognitive load when solving the task (cf. Ping, R. & Goldin-Meadow, S. 2010).

In addition, the type of information available to architects could be understood through observing types of gesture they created. For example, when relevant elements are explicitly presented in the medium we would expect designers to index them by deictic gesture. By contrast, when relevant elements are implicit, iconic gesture would describe or augment the missing aspect.

Following this expectation, the experiment in this study compared combinations of types of architectural representation and task conditions. For study materials, building cases were presented in two modes of representation; plan and section. Participants were asked to solve two different design tasks; one requires a focus on one particular floor, the other requires to consider the relationship between different floors. These tasks were designed to match with the plan or section either in an optimal or in a suboptimal manner. If horizontal circulation is considered across floors or vertical circulation is explained focusing on one floor, it would cause an increase of cognitive load. The previously developed coding scheme was applied as the measurements to identify the different gesture types and the elements in the design media they refer to.

Our preliminary results suggest that deictic gestures tend to indicate explicitly drawn elements in the medium while iconic gestures seem to complement visually implicit elements not depicted in the medium.

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Spatial deixis and anaphoric reference: Estonian, Finnish, and Russian referential devices in comparative perspective

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Many studies have shown that linguistic forms functioning as referential devices (e.g., deictic and anaphoric demonstrative pronouns, personal pronouns, and NPs) can have significantly different usage contexts and discourse functions in different languages even when their grammatical label is similar (Gundel et al. 1993, and Kibrik 2011). Thus, many researchers have applied empirical, including experimental, methods to investigate the exact nature of referential forms in different languages (Coventry et al. 2008, Kaiser 2011, and Arnold & Griffin 2007). Such studies usually focus on one context (e.g., spatial or textual) or on one referential device (e.g., demonstrative pronouns), but there are considerably fewer studies that compare different referential contexts (e.g., March & Pattison 2012).

In this presentation, we examine the similarities and differences between Estonian, Finnish, and Russian referential systems and compare the results of two production experiments conducted in all three languages. The experiments were designed to elicit the use of referential devices in two distinct linguistic contexts. For the first experiment, we devised a physical setting where participants were asked to describe and compare three houses that they could see around them. The second experiment used a picture-sequence based narrative elicitation: the participants were asked to tell a story based on the events performed by animate referents in picture-books. Thus, we investigate how the same referential devices are used as spatial deictics and as anaphorical referential devices. Both experiments were conducted with native speakers of either Estonian, Finnish or Russian, involving at least 20 participants per language and experiment. The data were tagged for the presence and type of various referential expressions (demonstrative and personal pronouns, demonstrative adverbs, zero reference, relative clauses) and for other variables (e.g., distance, animacy).

The following results can be outlined:

1) Some syntactic features seem to be influenced by areal-typological contacts, e.g., the use of article- like determiners in Estonian, in Finnish, and (less frequently) in Russian.
2) The spatial use of demonstratives remains rather different despite of language contacts. That is, each language exhibits its own system of spatial deixis.
3) Even if referential devices with similar grammatical labels are available in the three languages, they are not always used in a similar way. For example, in all three languages, it is possible to use demonstrative pronouns as determiners, and relative clauses as identification tools. However, the use of these devices in these functions diverges greatly across the languages and (experimental) settings.

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Place and the ground in signed languages

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Within the cognitive framework (Langacker, 1987, 1991, 2001, 2008), the ground (the speech event, the speaker and hearer, their interaction, and the immediate circumstances, i.e., time and place of speech) is typically considered a conceptual notion. It is one among the cognitive domains capable of being evoked as the conceptual base for the meaning of linguistic elements (Langacker, 2001: 144). However, for this presentation we would like to claim that for signed languages, the ground plays a significant role not only at the conceptual base but also at the phonological pole of linguistic units: signs are produced in the physical ground; entities that are perceptually accessible in the ground are pointed to; the phonological pole of the symbolic unit called Place (Martínez and Wilcox, 2018) is a location in signing space, which is in the ground; the grounding strategy of "placing" recruits existing locations (as the phonological pole of existing Places or entities that are perceptually accessible in the ground) or creates new Places with a phonological location in the ground.

In order to discuss this, we analyzed qualitatively the use of Place throughout narratives in Argentine Sign Language (LSA). Following Martínez and Wilcox's (2018) cognitive approach, we define Place not as a phonological parameter (*location*) but as a symbolic unit formed by a phonological pole (*location*) and a semantic pole (*thing*). We used ELAN to code the Places throughout the narratives. In the constructions in which the Place symbolic structure could be identified we specified information on the phonological pole of the Place (*the specific location in signing space*) and on the semantic pole of the Place (*thing*). Since the latter is rather schematic, we analyzed the way the semantic pole of the Place is elaborated in discourse in our narrative data. Then we analyzed the types of placing throughout discourse, focusing on the way the ground was (or was not) incorporated in the phonological and/or semantic pole of Place for the identification of referents.

Our analysis showed that in LSA, the ground is capable of being evoked not only as the conceptual base but also as the phonological pole of Place. Specifically, we found that for LSA, the signing space –which is part of the ground– not only is "semantically loaded", as Engberg-Pedersen (1993) states for Danish Sign Language, but also "phonologically loaded". Although there are no strict rules, the choice of a specific location in signing space for placing and pointing to anaphoric referents in discourse or to perceptually accessible entities in the ground is not completely random or unlistable. On the contrary, it is influenced by discursive patterns of use, which involves abstractions of both conceptual and phonological associations from actual usage events as well as deictic strategies for incorporating entities that are accessible in the ground.

Declarative multimodal communication is where language begins

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According to a widespread view, natural language is an abstract system of thought that underlies two communicative modalities, sign and speech. Language would then be independent of modality and detached from its communicative implementations, which in turn should not be confused with nonverbal communication (gestures, facial expressions and eye gaze). Although such a view seems to put sign on a level with speech, it does not equate them completely since sign is closer than speech to nonverbal communication, or so is claimed (Goldin-Meadow & Brentari, 2018). In this poster the underlying assumption that there is a neat divide between nonverbal communication and language, as manifest clearly in speech, will be called into question. In particular, the idea that without language we can communicate nonverbally (Friederici, 2017) will be qualified in line with the results of an ongoing study on a group of 19 nonverbal children and adolescents with nonverbal autism (NA), with special attention to Álex, an extraordinary case among them.

NA amounts to (almost) complete absence of language (production and comprehension). Despite its obvious interest, it remains vastly unexplored; and misleading claims on the condition abound. A main one which needs to be corrected is that individuals with NA can communicate using sign language. Actually a detailed analysis of the performance of the participants on a brand-new special version of the ADOS (Autism Diagnostic Observation Schedule) points to the complete absence of iconic gestures, declarative pointing (whether distal or with object contact) and gestures of showing and giving. The repertoire of nonverbal communication is made up of ritualized gestures (open-handed reaching, pushing away, etc.) and imperative pointing (mainly distal). No way to sign!

Álex is an 11-year-old autistic boy whose communicative profile is essentially the same as that of the group just described. Yet, he possesses an open-ended trilingual lexicon (Spanish, English, Catalan) with a total absence of verbs and grammar, both in production and comprehension. How may this be? Part of the answer is that he started learning words through reading at two years and a half with the help of written words presented to him as captions of images that he was interested in. His excellent phonological skills are evident in his ability to mechanically read (hyperlexia) and in his occasional two content word requests (*batido rosa*, Spanish: *pinky shake,* English).

The lack of grammar and declarative communication in both gesture and speech in Álex are arguably closely related and speak in favor of a necessarily multimodal (vocalizations, facial expressions, eye gaze, gestures) communicative sustained interaction in the first year of life for speech (or sign) to develop. Furthermore, looking at the sequence of development (Oller 1987), namely phonation and vocal pre-babbling (even in deaf); babbling (in sign/speech) and declarative gestures, declarative pointing might well be an auxiliary pointer for phonologically precarious oral/signed words rather than a nonverbal precedent of them as is often claimed overlooking that infants understand words before producing them.

Where is the deictic centre? Sound localization modulates demonstrative comprehension: an EEG study

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Spatial demonstratives (words including *this/that* in English) are the primary means by which language is used to draw a hearer's attention to objects in physical space. However, there is not yet consensus regarding how demonstratives map onto physical space, if at all. Peeters, Hagoort & Özyürek (2015) presented EEG evidence claiming to falsify the view that there is a mapping between demonstratives and egocentric distance (e.g. Coventry, Valdés, Castillo, & Guijarro-Fuentes 2008). In their study participants viewed picture stimuli in which a person was seated behind a table pointing at objects located near and far from them on the sagittal and lateral planes. Participants heard descriptions through headphones containing a proximal or distal demonstrative (e.g. "I have bought *this/that* plate at the market"). The critical finding was that there were higher processing costs (larger N400 amplitudes) for distal as compared with proximal demonstratives when the objects were on the sagittal plane between the participant and the person in the photograph irrespective of the distance from the depicted person in the photograph. Thus Peeters et al. conclude that their results directly falsify the 'egocentric distance view' and rather support a mapping between demonstratives and dyad-oriented space (Jungbluth, 2003).

We hypothesized that the Peeters et al. results could be due to participants taking their own deictic centre cued by sound descriptions localized in their peripersonal space. To test this possibility, we attempted to replicate the Peeters et al. study, but descriptions were either heard localized beside the participant, or localized beside the computer where the photographs were shown. When participants heard descriptions beside them (in their peripersonal space), we partially replicated the Peeters et al. results, but critically when descriptions were heard at a distance from participants from the direction of the person in the photograph, the results support a mapping between distance and demonstrative comprehension. The results therefore support a mapping between egocentric space and demonstrative comprehension, but one where the deictic centre shifts as a function of sound source.

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Spatial demonstratives: universals and differences in English and Japanese

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Speakers of different languages have essentially the same vision and action systems, yet the systems of spatial language that different languages employ to talk about object location vary considerably. In six experiments we consider spatial demonstrative choice and the effects that spatial demonstratives have on object-location memory in speakers of two languages with purportedly very different spatial demonstrative systems – Japanese and English.

We first show that the Japanese demonstrative system is structured in terms of both egocentric distance and distance from the perspective of a hearer (when the hearer's position is misaligned with the egocentric perspective of the speaker). However, we fail to find consistent evidence of perspective taking in English speakers' use of demonstratives, suggesting that perspective taking as a function of language may vary between languages. Second, we report effects of perspective taking on object-location memory for Japanese and (to a lesser-extent) English speakers when demonstratives are used at encoding, but hearer position does not affect object-location memory in Japanese and English participants when language is not employed during an object-location memory task.

Conference Participants

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Vera	Da Silva Sinha	University of East Anglia
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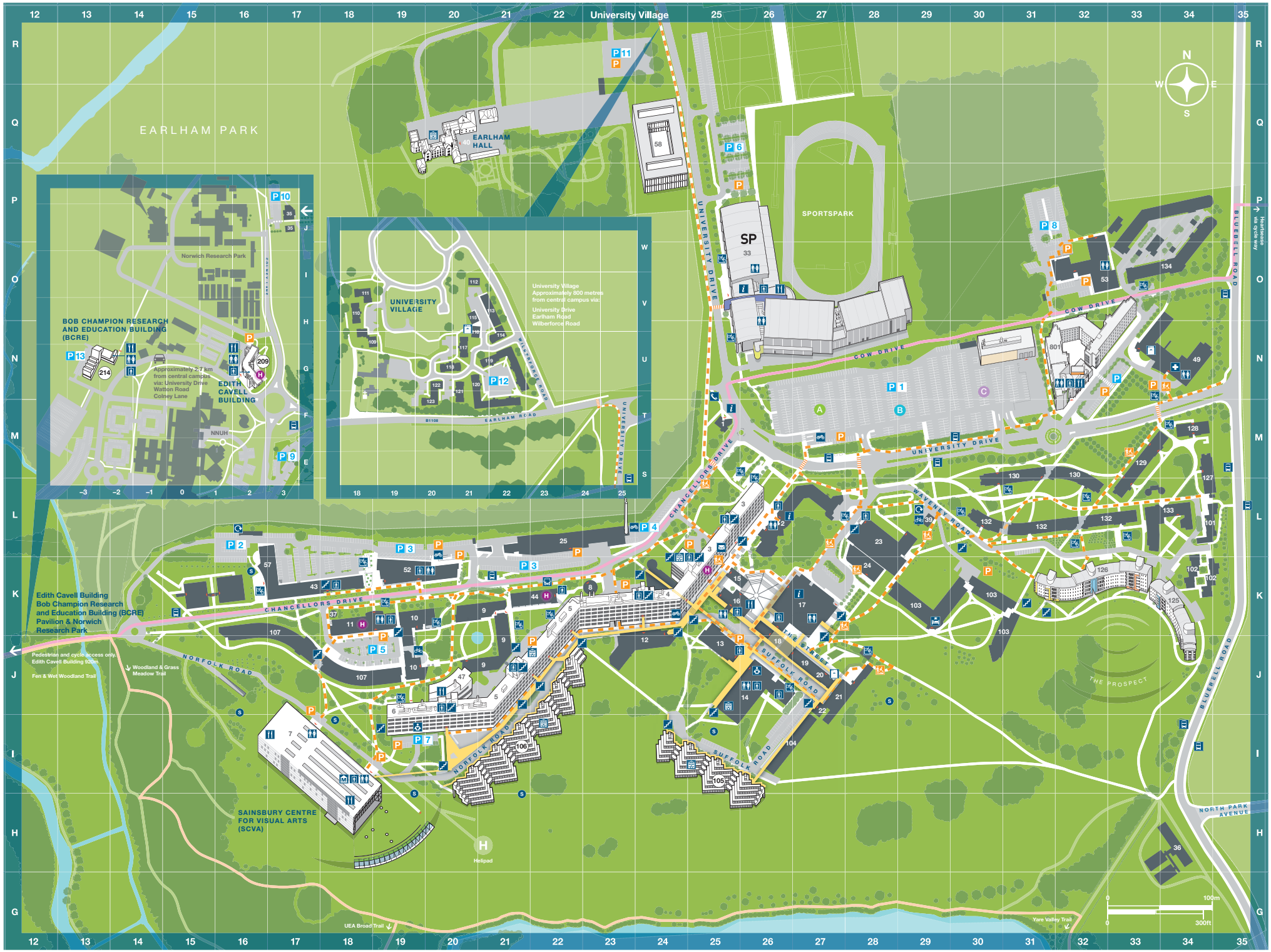
University Village
EARLHAM PARK
EARLHAM HALL
SPORTSPARK
SP
UNIVERSITY DRIVE
COW DRIVE
BLUEBELL ROAD
Heartsease via cycle way
CHANCELLORS DRIVE
WAVENEY ROAD
THE STREET
SUFFOLK ROAD
NORFOLK ROAD
THE PROSPECT
NORTH PARK AVENUE
Edith Cavell Building
Bob Champion Research and Education Building (BCRE)
Pavilion & Norwich Research Park
Pedestrian and cycle access only. Edith Cavell Building 920m
Woodland & Grass Meadow Trail
Fen & Wet Woodland Trail
SAINSBURY CENTRE FOR VISUAL ARTS (SCVA)
Helipad
UEA Broad Trail
Yare Valley Trail
Norwich Research Park
BOB CHAMPION RESEARCH AND EDUCATION BUILDING (BCRE)
Approximately 2.7 km from central campus via: University Drive Watton Road Colney Lane
EDITH CAVELL BUILDING
NNUH
UNIVERSITY VILLAGE
University Village Approximately 500 metres from central campus via: University Drive Earlham Road Wilberforce Road
EARLHAM ROAD
WILBERFORCE ROAD
UNIVERSITY DRIVE
N
S
E
W
100m
300ft

Faculty of Arts & Humanities (HUM)	Building Name	Grid Ref.	Building No.
Art, Media and American Studies (AMA)	Arts SCVA and Registry	I18 L26	7 2
History (HIS)	Arts	K25	3
Interdisciplinary Institute for the Humanities	Arts	L26	3
Literature, Drama, Creative Writing (LDC)	Arts and Drama Studio	K25 K28	3 24
Politics, Philosophy, Languages and Communication Studies (PPL)	Arts	K25	3

Faculty of Medicine & Health Sciences (FMH)	Building Name	Grid Ref.	Building No.
Norwich Medical School (MED)	Medical Building Bob Champion Research and Education Building (BCRE)	K17 G-3	43 214
School of Health Sciences (HSC)	Edith Cavell Queens Building	G2 J19	209 10

Faculty of Science (SCI)	Building Name	Grid Ref.	Building No.
Biological Sciences (BIO)	Biology	I19	6
Chemistry (CHE)	Chemistry	K24	4
Pharmacy (PHA)	Chemistry	K24	4
Computing Sciences (CMP)	Sciences	J21	5
Environmental Sciences (ENV)	Sciences	J21	5
Mathematics (MTH)	Sciences	J21	5

Faculty of Social Sciences (SSF)	Building Name	Grid Ref.	Building No.
International Development (DEV)	Arts	K25	3
Economics (ECO)	Arts	L26	3
Education and Lifelong Learning (EDU)	Lawrence Stenhouse	K21	9
Law (LAW)	Earlham Hall	Q20	40
Norwich Business School (NBS)	Thomas Paine Study Centre	K19	52
Psychology (PSY)	Lawrence Stenhouse	K21	9
Social Work (SWK)	Elizabeth Fry	K18	11

Key to symbols

- Accessible Route
- Raised Walkway
- Walkway
- Cycle Way
- Ramped Access
- Level Access
- Accessible Parking
- Parking
- Bus Stop
- Coach Pick Up
- Toilets
- Lift
- Launderette
- Post Room
- Telephone
- Stairs/Steps
- Heritage Building
- Museum
- Library
- Information
- Bed & Breakfast
- Doctor / Pharmacy
- Café / Restaurant
- Cycle Repair
- Cycle Rack
- Motorcycle Parking
- Recycling Centre
- Sculpture
- Student Teaching Hub

Student Learning & Teaching (LTS) Hubs My School is:	My Course is:	Your Hub location is:	Grid Ref.	Building No.
AMA, DEV, ECO, HIS, LAW, LDC, PPL	Undergraduate and Postgraduate Taught courses	Arts building	K25	3
BIO, CHE, CMP, ENV, MED, MTH, NBS, PHA, SCI	Undergraduate and Postgraduate Taught courses	Elizabeth Fry building	K18	11
EDU, HSC, SWK, PSY	Undergraduate and Postgraduate Taught courses and placements	Zuckerman building	K22	44

General Services	Grid Ref.	Building No.
Accommodation Office	J30	103
Admissions, Recruitment & Marketing	K21	9
Blackdale Annexe	O32	53
Careers Central Plus	J27	22
Careers Central	J27	18
Cashiers Office	L26	2
Congregation Hall	L28	23
Dean of Students Office (DOS)	J27	19
The Enterprise Centre	P24	58
Estates Building – Main Office	L22	25
IT & Computing Services (ITCS)	J24	12
INTO @ UEA	N32	801
Julian Study Centre	K16	57
Lecture Theatres 1-4	J25	13
Multifaith Centre	K25	15
Music Centre	J27	21
Print Services	J27	18
Registry: Council House and Chamber CSED, Finance, Human Resources Registrar & Secretary's Office Vice-Chancellor's Office	L26	2
Visitors' Reception	L26	2
Research Enterprise Services (REN), East	L25	3
Research Enterprise Services (REN), West	J21	5
Sainsbury Centre for Visual Arts (SCVA)	I18	7
Thomas Paine Study Centre, Lecture Theatres	K19	52
The Lodge	M25	1

Residences (continued)	Grid Ref.	Building No.
Village Close (Block E) 9-12	V21	112
Village Close (Block D) 13-24	V21	113
Village Close (Block F) 5-8	V21	115
Village Close (Block G) 2-4	V21	116
Village Courtyard A	U21	120
Village Courtyard B	U22	119
Yew – University Village	U21	117

Amenity Services	Grid Ref.	Building No.
Barclays Bank	J26	18
Book Shop – Waterstones	K26	18
Broadview Lodge, Bed & Breakfast Guest Suite	K29	103
Coffee Shop – Ziggy's	J27	18
Dr.Bike Repair Centre	L29	39
Laundrette – University Village	U21	116
Laundrette – Health & Community Centre	N33	49
Laundrette – The Street	J27	18
Library	J26	14
Post Room	L25	3
Restaurants – Zest, Blend and VISTA	K25	16
Restaurants – INTO @ UEA	N32	801
Restaurants – Sainsbury Centre for Visual Art	I18	7
Sports Facilities – Sportspark	O26	33
Sports Facilities – Sports Pavilion	J3	35
Sports Facilities – Playing Fields	J3	35
Supermarket – Union Food Outlet (UFO) and Post Office	J27	19
Union House – Union Pub, Unio, Hive Bar & Lower Common Room (LCR)	K26	17
DEV Farm	H34	36

Residences	Grid Ref.	Building No.
Ash – University Village	T20	123
Beech – University Village	U20	118
Britten House	L32	132
Browne House	M34	127
Colman House (Block F)	K34	125
Colman House (Block G)	K32	126
Constable Terrace	J18	107
Crome Court	L34	133
Elm – University Village	U22	114
Hawthorne – University Village	U18	109
Kett House	M34	128
Larch – University Village	T21	121
Nelson Court & Broadview Lodge Guest Suite	K30	103
New Residencies (Opens Summer 2016)	O33	134
Norfolk Terrace	I21	106
Oak – University Village	U20	122
Orwell Close	L34	101
Paston House	M31	130
Pine – University Village	V18	111
Suffolk Terrace	I25	105
Suffolk Walk	I26	104
Willow – University Village	V18	110
Wolfson Close	K34	102
Victory House	M33	129

Postgraduate Research Service (PGR)	Grid Ref.	Building No.
Postgraduate Research Office	K18	11
NBI Graduate Studies Office	J1	*

* This office is in the John Innes Centre, in the large building in grid square **J1** of the inset map.

Health and Welfare	Grid Ref.	Building No.
Dean of Students Office	J27	19
Health & Community Centre	N33-34	49
Doctors	N33-34	49
Dentist	N33-34	49
Childrens Nursery	N33-34	49
Pharmacy – Boots Chemist	N33-34	49
Occupational Health	N33-34	49

Parking	Grid Ref.	
Main Visitors Car Park (pay on foot)	N29	P1
West Car Park (permit holders only weekday daytime)	L17	P2
West Car Park (permit holders only weekday daytime)	L19	P3
Permit holders (pre booked) visitors only Car Park	L24	P4
Central Visitors Car Park (pay & display)	K18	P5
Sportspark Car Park (Sportspark users only)	Q25	P6
Sainsbury Centre Car Park (gallery visitors only)	I19	P7
Blackdale Annexe Car Park (scratch cards, permit holders only)	P31	P8
Edith Cavell Building Car Park (UEA permit holders only)	E3	P9
Sports Pavilion Car Park (pay & display & permit holders)	J3	P10
Enterprise and Earlham Park Visitors Parking	R23	P11
Village Car Park (scratch cards, permit holders only)	U22	P12
Bob Champion Research and Education Building (permit holders)	G–3	P13

Notes:

University of East Anglia

Campus map listings

version 5.0 August 2015