



Book of Abstracts

ESLP/AttLis 2019

August 28th – 30th, 2019
Humboldt-Universität zu Berlin



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Acknowledgements

The organizing committee:

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The organizing committee would like to thank all the members of our program committee:

Dato Abashidze, Briony Banks, Ana Bessermann, Anna Borghii, Arielle Borovsky, Isabella Boux, Ruth Corps, Samuel Cospes, Heather Ferguson, Martin Fischer, Diego Frassinelli, Chelsea Gordon, Nicole Gotzner, Ernesto Guerra, Lauren Hadley, Adriana Hanulikova, Florian Hinz, Edmundo Kronmuller, Julia Kröger, Anna Kuhlen, Elena Kulkova, Sol Lago, Jarosław Lełonkiewicz, Dermot Lynott, Beatriz Martín-Luengo, Piermatteo Morucci, Claudia Männel, Milena Rabovsky, Alba Rodriguez, John Tomlinson, Elli Tourtouri, Heather Weston, Cai Wingfield, Masataka Yano, Bo Yao

We would also like to thank the following people for their support in organizing the conference:

Carsten Schliewe, Ingrid Häfner, Jakob Wunsch, Luise Henneberg, Lea-Sophie Adam, Melis Odabaş, Esmā Tamis, Humboldt Innovation

ESLP/AttLis 2019 was sponsored by:



Institut für deutsche Sprache und Linguistik
[ʔɪnstɪtu:t fy:ə dɔɪtʃə ʃpɛa:χə ʔunt lɪŋɡuɪstɪk]

Venue

The conference will take place in the main building of the Humboldt University in Mitte, at **Unter den Linden 6, 10117 Berlin** in **room 2097**. The room is on the left (**west**) wing of the building, one floor above the ground floor (American 'second floor', British 'first floor', German '1. Obergeschoss'). To find it, enter the building through the **main entrance** (pictured below) and follow the signs with the name of the conference.



Photo by Heike Zappe, used under a creative commons license

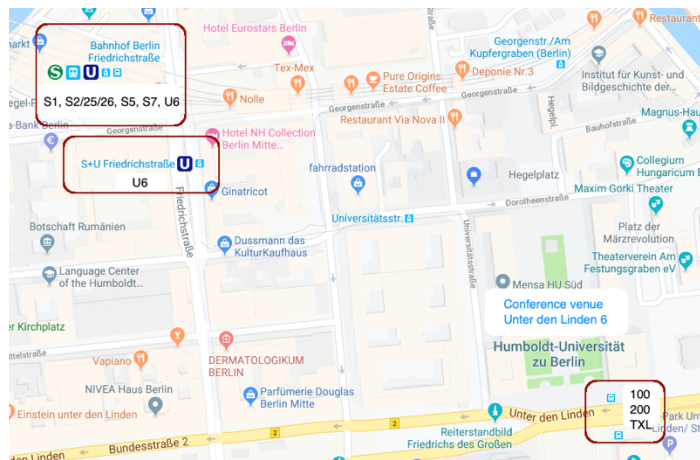
Registration will take place outside the conference room (**2070A**) on Wednesday morning. The coffee breaks will take place in the same room.



Getting here

The conference venue (Unter den Linden 6) is closest to:

- **Friedrichstrasse subway station**
Overground 'S-bahn':
S1, S2/25/26, S5, S7,
Underground 'U-bahn':
U6
- **Staatsoper bus stop**
Bus routes:
100, 200, and
TXL (from Tegel airport)



Buying transit tickets

- Tickets can be bought at automated ticket kiosks in train/subway stations, on a bus directly from the bus driver, or on a tram at an automated ticket kiosk
- Single or day tickets must be validated upon entering a tram or bus, or on the platform before entering the S-/U-Bahn, and are valid for 90 minutes
- Alternatively: single, multiple, or day tickets can be purchased through the Berlin transit app: **BVG Fahrinfo Plus Berlin** (PayPal set-up required)
- you will likely only need AB-zone tickets (unless you're travelling from Schönefeld airport, see below)

Directions to the conference

From **Tegel airport (TXL)**

- **The TXL bus** runs every 5-6 minutes and takes approximately 40 minutes to reach the city centre (major stops: Hauptbahnhof, Alexanderplatz), as well as directly in front of the conference venue (Staatsoper bus stop)
- You can **buy transit tickets** from yellow kiosks outside the airport entrances, or directly from the bus driver. You must punch your ticket once inside the bus, behind the bus driver on the left hand side

From **Schönefeld airport (SXF)**

- The **S9** (above ground train) will take you to major stations such as Alexanderplatz, Hauptbahnhof, or Friedrichstrasse station in about 40 minutes. Friedrichstrasse station is a 5-10 minute walk to the venue
- The Schönefeld train station is a 5 minute walk from the airport's main building: follow a long sheltered pathway between the main building and the train station. You can **buy transit tickets** at red kiosks once you reach the train station tunnel. You must punch your ticket at the machines next to the kiosks (additional machines on the platforms) before boarding!
- Schönefeld is outside the AB transit zone, so you must purchase an **ABC ticket** to get to the city centre

Where to eat near the conference venue

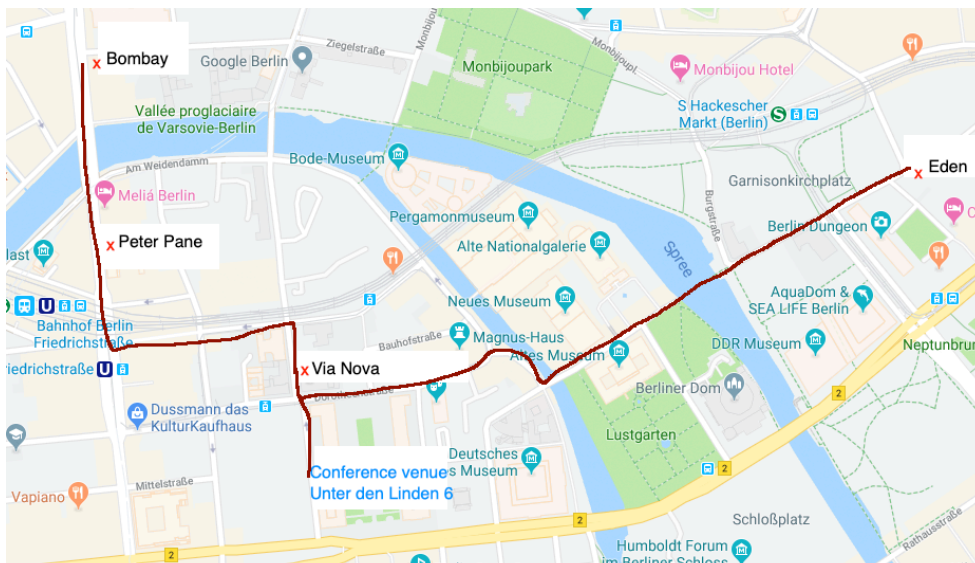
All suggested locations have **vegetarian and vegan options**

€ = lunch for around €5

€€ = lunch for around €15

Restaurants

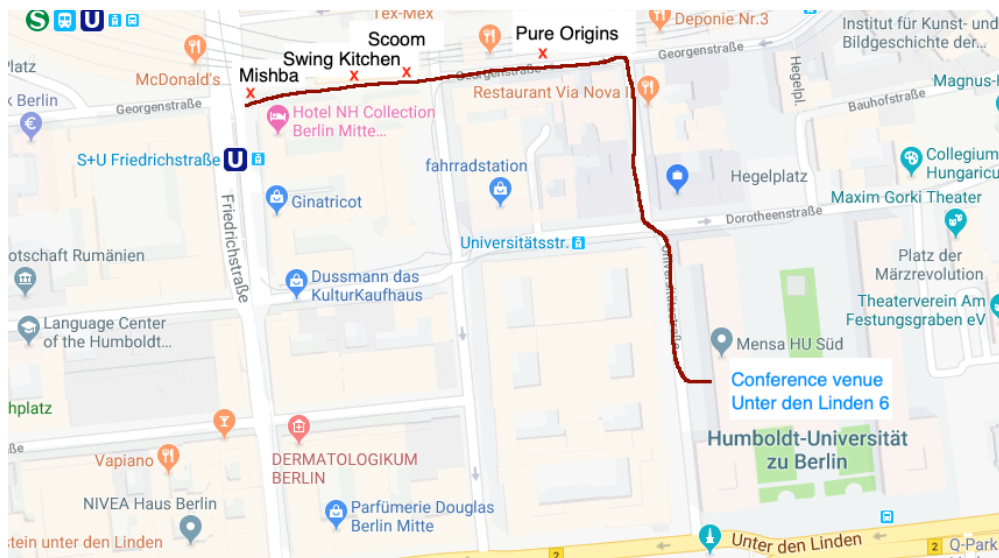
- **Peter Pane** (€€): nice burgers (vegan too) and dinner deals including cocktails
10 mins walk (Friedrichstraße 101)
- **Via Nova** (€€): Italian cuisine with lunch offers
2 minute walk (Universitätsstraße 2)
- **Eden** (€€): Vietnamese restaurant, great ambience
10 min. walk (Rosenstraße 19)
- **Bombay** (€): Indian restaurant with lunch menu deals
10 mins walk (Friedrichstraße 106b)



On-the-go:

the following places can be found under the S-Bahn tracks, along **Georgenstraße**

- **Mishba** (€): burritos and kumpir (i.e., jacket potatoes)
- **Scoom** (€): various wraps and healthy lunch options
- **Swing burger** (€€): all vegan burgers and fast food
- **Pure Origins** (€€): great coffee, sandwiches, fresh soups, etc.



Social events

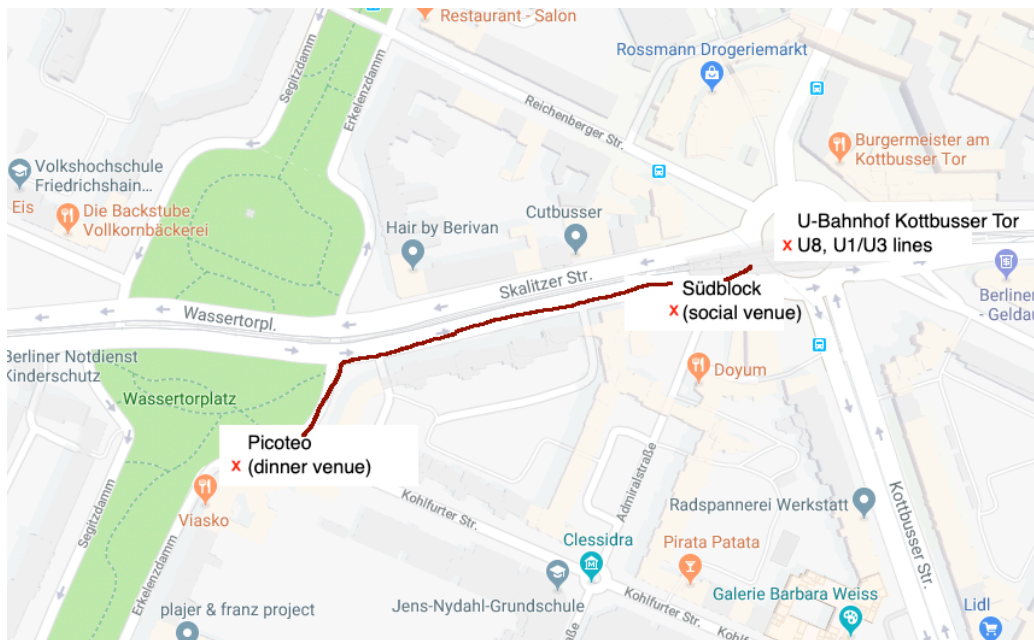
Both venues offer vegan/vegetarian options

Dinner

- Thursday, August 29th at 6pm
- *Picoteo Restaurant and Tapas Bar*, Erkelenzdamm 47, 10999 Berlin

Social

- Friday, August 30th from 6pm
- *Südblock*, Admiralstraße 1-2, 10999 Berlin
- They serve drinks and food (Flammkuchen, jacket potatoes, cake, etc.)



Getting there

Both social events take place in Kreuzberg near Kottbusser Tor (U1/U3, or U8 underground lines). From the conference venue, you can either take the:

- **U6** at *Friedrichstr.* station (underground, direction *U Alt-Mariendorf*) for 4 stops.
- transfer at *Hallesches Tor* to the **U1/U3** (above street level, direction *S+U Waschauer Str.*)
- get off two stops later at *Kottbusser Tor*. Go down to the street level and cross to the south-west corner.

or,

- any train on **platform 5** from *Friedrichstr. station* (aboveground, trains S3, S5, S7, or S9) for 3 stops
- transfer at *Jannowitzbrücke* to the U8 (underground, direction *Hermannstraße*) for three stops
- get off three stops later at *Kottbusser Tor*. Go down to the street level and cross to the south-west corner

Keynote Speaker Abstracts

Keynote Speaker

Wednesday, August 28th, 2019
9.30 - 10.30

Falk Huettig

Max Planck Institute for Psycholinguistics,
Nijmegen, NL



Six challenges for embodiment research

Twenty years after Barsalou's seminal perceptual symbols paper (Barsalou, 1999), embodied cognition, the notion that cognition involves simulations of sensory, motor, or affective states, has moved in status from an outlandish proposal advanced by a fringe movement in psychology to a mainstream position adopted by large numbers of researchers in the psychological and cognitive (neuro)sciences. While it has generated highly productive work in the cognitive sciences as a whole, it had a particularly strong impact on research into language comprehension. The view of a mental lexicon based on symbolic word representations, which are arbitrarily linked to sensory aspects of their referents, for example, was generally accepted since the cognitive revolution in the 1950s. This has radically changed. Given the current status of embodiment as a main theory of cognition, it is somewhat surprising that a close look at the state of the affairs in the literature reveals that the debate about the nature of the processes involved in language comprehension is far from settled and key questions remain unanswered. We present several suggestions for a productive way forward.

Keynote Speaker

Thursday, August 29th, 2019
9.30 - 10.30

Rasha Abdel Rahman

Humboldt Universität zu Berlin, Germany



Language production in social-communicative contexts

Speaking is inherently social and communicative. Yet, while the role of semantic processing is relatively well-investigated, little is known about how social and emotional meaning shapes different planning stages. In my talk, I will discuss our work on emotional language production and language production in social-communicative contexts. Our research highlights a high degree of plasticity of meaning processing during conceptual preparation and lexical selection as a prerequisite for socially situated language production. This plasticity allows for dynamic adaptations of lexical-semantic processing to meaningful contexts and situational requirements ranging from considering the social appropriateness of planned utterances and representations of conversational partners including shared meaning-based situation models to communicative affordances in social interactions. I will argue that emotional and social-communicative meaning processing forms an integral part of conceptual preparation and lexical access that, integrated into theoretical frameworks, enhances our understanding of language production as a communicative act.

Keynote Speaker

Friday, August 30th, 2019
9.30 - 10.30

Heather Ferguson

University of Kent, UK



The effect of perspective on language: Evidence from adults with autism spectrum disorders

Perspective can be signalled using explicit verbal cues (e.g. 'self' or 'other', first or third person pronouns) or inferred indirectly from features of a particular individual (e.g. their voice, or eye gaze). Cognitive research has shown that perspective provides a salient means of biasing processing across multiple domains. For example, when used in language, 'I' and 'you' activate an internal perspective (i.e. seeing an action/event from your own perspective), while 'he'/'she' activates an external perspective (i.e. seeing an action/event from an observer's perspective; Brunyé et al., 2009). Individuals can also rapidly integrate information about a speaker (based on stereotypes from their voice) and their intended meaning to guide online sentence processing (Van Berkum et al., 2008). Much less is known about whether and how these perspective effects are manifest in clinical disorders that impact social cognitive abilities. In this talk I will raise some questions about the replicability of personalization effects between individuals and paradigms, and present a series of experiments that have sought to understand how and when perspective influences language comprehension, including how these processes might be affected in adults with autism spectrum disorder (who experience deficits in both social and executive functioning).

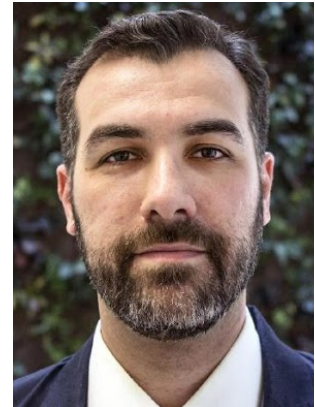
Keynote Speaker

Special Session Part 1:
Analyzing Data Collected with the Visual World Paradigm

Friday, August 30th, 2019
13.15 - 14.00

Dan Mirman

University of Edinburgh, Scotland



Modeling the time course of fixation in the visual world paradigm

The visual world paradigm provides a very sensitive way to measure the time course of language processing and language-vision interactions in a naturalistic context with a wide variety of participant groups. To get the most out of this paradigm, we need robust and sensitive ways to model the time course of fixation. A central and difficult challenge is to define the shape of the data or, in more technical terms, the “functional form” of the data. The functional form can be based on a specific theory of the underlying processes or on more general mathematical forms such as polynomials or splines. This talk will discuss the strengths and weaknesses of each approach and how to mitigate the weaknesses and take advantage of the strengths.

Keynote Speaker

Special Session Part 2:
Analyzing Data Collected with the Visual World Paradigm

Friday, August 30th, 2019
14.00 - 14.45

Dale Barr

University of Glasgow, Scotland



Using cluster randomization to detect the relative timing of effects

Often it is desirable in visual-world studies to detect the relative timing of various effects, while remaining agnostic about the functional form of the effects over time. I will discuss how 'cluster randomization' techniques from neuroimaging (Bullmore et al., 1999; Maris & Oostenveld, 2007) can be applied to visual-world data to meet this goal. This approach solves two problems with traditional bin-by-bin analyses: (1) correction for multiple comparisons; (2) arbitrary definitions of bin size. The advantages of the approach will be demonstrated through a case study, and I will introduce an R software package with functions that facilitate these analyses.

Talk & Poster Abstracts

Day 1

**Investigating the impact of perceptual simulation on word comprehension:
a large-scale approach based on data-driven computational models**

Marelli, M., Petilli, M., Günther, F., Vergallito, A., Ciapparelli, M.
University of Milano-Bicocca, Milano, Italy

Findings of sensorimotor activity during conceptual processing suggest a role for perceptual simulation in language comprehension. However, semantic priming seems not to be affected by the visual similarity between the objects denoted by the prime and target words (e.g., a facilitation is found for pairs like pizza-pasta, and not for pairs like pizza-clock; Hutchison, 2003). Here, we address this issue by relying on a (i) large-scale, megastudy approach evaluating responses for more than 1000 word pairs and (2) a state-of-the-art computational system estimating the degree of language-based vis-à-vis vision-based similarity between prime and target. If perceptual simulation is necessary for comprehension, then visual similarity should contribute to the semantic effects observed in a language-focused priming experiment.

Speeded naming and lexical decision data for 1184 targets following primes after 200 ms (short SOA) and 1200 ms (long SOA) were extracted from the largest database on semantic priming available (Hutchison et al., 2013). For each prime-target pair visual-similarity estimates were computed: a visual recognition system (Vedaldi and Lenc, 2015) was used to extract distributional properties of prototypic images of prime and target items, as extracted by ImageNet; visual similarity between prime and target was then quantified as the cosine similarity between their respective distributional representations. Conversely, language-based similarity was computed by means of a state-of-the-art, neural-network, vector-space model trained on a large text corpus and building on lexical statistics (Mandera et al., 2017). In order to assess the role of perceptual simulation on word comprehension, we evaluated to what extent visual similarity can explain variance in behavioral data from the priming megastudy over and above language-based estimates.

First, we fitted a baseline model including as predictor the text-based similarity estimates. Then, we added vision-based data and compared the two models to assess whether this additional piece of information improved the model fit. A significant improvement in the model fit was observed only in the lexical decision task with short SOA. No improvement in the model fit was observed in the other conditions (lexical decision task - long SOA; naming task – long SOA; naming task – short SOA).

Our results indicate that visual properties predict behavioral performances in a language-centered task. This finding suggests that perceptual experience can affect language comprehension and, therefore, is consistent with the idea of perceptual simulation during the access to word meaning. However, the effect was observed only for early behavioral effects in the lexical decision task, suggesting that the activation of perceptual information might be quick-decaying and task-modulated.

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Spatial effects in word categorization are accounted for by un-embodied, task-related, symbolic/linguistic compatibility principles , not by perceptual simulations.

Remo Job¹, Claudio Mulatti¹, Simone Sulpizio², & Barbara Treccani¹

¹University of Trento, Trento, Italy; ²Vita-Salute San Raffaele University, Milan, Italy

In this study, we focused on the effects of spatial features of objects to which words refer on word recognition. Specifically, we investigated the origin of the effects of the (conceptual) compatibility between the typical location of the entities denoted by written words (e.g., “up” for eagle and “down” for carpet) and either the actual position of the words on the screen (e.g., upper vs. lower part of the screen) or the response position (e.g., upper- vs. lower- key presses) in binary categorization tasks (cf., Šetić and Domijan, 2007). In two experiments we observed faster RTs when the typical position of the stimulus referent in the real world was compatible with either the stimulus (Experiment 1; N=24) or response (Experiment 2; N=12) physical position. In contrast to the predictions of the perceptual simulation account (e.g., Barsalou, 1999), these conceptual compatibility effects do not seem to depend on whether there was an overlap between simulated processes possibly triggered by the presented stimulus and sensory-motor processes actually required by the task: in Experiment 2, response keys can be represented as one above the other (i.e., one lower key and one upper key), but one key was actually closer to the participant and the other was further away. Rather, they appear to depend critically on whether the involved stimulus and/or response dimensions had binary, variable values: the stimulus-stimulus compatibility effect observed in Experiment 1 disappeared when, in a third experiment (N=24), the stimulus physical position did not vary randomly but was kept constant within each block of trials. Notably, a compatibility effect between response position and another (non-spatial) conceptual dimension of the stimulus (i.e., its semantic category) was observed in all three experiments: further (unplanned) analyses revealed faster RTs when stimuli referring to living entities were responded to with either upper or right-key presses and stimuli referring to non-living entities were responded to with either lower- or left-key presses. This effect is analogous to the so-called MARC [*linguistic markedness of response codes*] effect, which is usually observed in the number domain (i.e., faster right and left responses to even and odd numbers, respectively, when participants have to judge the number parity status). Both this semantic MARC-like effect and conceptual spatial compatibility effects (as well as their disappearance when one of the critical stimulus dimensions is presented in a blocked design) are accounted for by the polarity principle (Proctor & Cho, 2006), according to which these effects originate from the alignment of the polarities of either different stimulus dimensions or stimulus and response dimensions.

Thus, we provide empirical evidence suggesting that conceptual spatial compatibility effects in binary word categorization tasks – i.e., one of the most renowned phenomena reported as evidence in support of the embodied theory of language processing – might be only incidentally consistent with the embodied approach. Indeed, these phenomena appear to be more properly accounted for by an alternative view, which traces them back to more general, un-embodied, strategic, task-related, mechanisms of symbolic/verbal compatibility (Treccani et al., 2019)

References

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- Proctor R. W, & Cho I.S. (2006). Polarity correspondence: A general principle for performance of speeded binary classification tasks. *Psychological Bulletin*, 13, 416-442.
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Language Enhances Working Memory of Action Events

Briony Banks¹ & Louise Connell²

¹Lancaster University, United Kingdom, b.banks@lancaster.ac.uk

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Working memory of action events, such as the steps involved in constructing a model (e.g., Newton, 1976; Zacks & Swallow, 2007), likely relies on the sensorimotor information experienced during encoding (e.g., the visual features, sounds and actions that were experienced), but also linguistic information (i.e., the words and phrases used to label these experiences). We hypothesized that people habitually rely on linguistic labels, which can act as placeholders for sensorimotor representations, to encode and recall events, and that speed and accuracy of recall in a non-linguistic memory test of event re-enactment would be impaired when access to linguistic labels was blocked.

In a pre-registered study, 76 participants watched a video of a model birdhouse being constructed with no verbal instructions, and were then asked to construct the model from memory. Availability of language was manipulated during the task by asking participants to perform articulatory suppression (saying the word “the” out loud repeatedly), which specifically taxes the phonological loop of working memory (e.g., Larsen & Baddeley, 2003) and thus limits the use of covert linguistic labels. Participants were randomly assigned to one of four conditions: no suppression, suppression at encoding, suppression at recall, or suppression at both encoding and recall. Participants’ overall performance in the task (based on the accuracy, completion, number of attempts and serial order of 6 discrete events in model construction), as well as the time taken to complete the model, were analysed using a linear model with dummy-coded predictor variables of suppression at encoding and suppression at recall.

Blocking access to linguistic labels had a negative effect on performance, with participants performing best with no suppression at all, and worst with suppression at both encoding and recall. We observed independent effects of suppression at encoding and at recall on overall performance. Moreover, blocking access to linguistic labels affected working memory capacity: participants accurately recalled more events (i.e., the steps in constructing the model) when language was fully available (no suppression condition: $M = 3.0$ out of 6 events, $SE = 0.29$) compared to when language was unavailable (suppression at both encoding and recall: $M = 1.4$ out of 6 events, $SE = 0.31$). However, blocking linguistic labels had no reliable effects on completion time. Our results suggest that participants rely on linguistic labels to accurately encode and recall events in working memory – that is, both sensorimotor *and* linguistic information are important for working memory of ecologically valid events involving action sequences. The findings indicate the importance of language even in a task that is non-linguistic in nature and seemingly reliant on sensorimotor input.

References

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Newton, D. (1976) Foundations of attribution: the perception of ongoing behavior. In Harvey, J. H., Ickes, W. J. & Kidd, R. F. (Eds.) *New directions in attribution research* (pp. 223-248) Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Zacks, J. M. & Swallow, K. M. (2007) Event Segmentation. *Current Directions in Psychological Science*, 16(2): 80–84.

Is embodied cognition bilingual? Neurophysiological evidence and implications for the study of concrete and abstract linguistic concepts

Claudia Gianelli, University School For Advanced Studies Pavia IUSS

Accumulating behavioural and neurophysiological evidence supports the notion of linguistic concepts being grounded in sensorimotor processes. However, large part of the studies in this field has so far focused only on native speakers and investigations on bilinguals are sparse.

In this talk, I will first discuss the study of bilinguals as both a challenge and an asset for embodied and grounded accounts of language processing. I will then present results from two recent studies performed in my lab that investigated processing of concrete and abstract linguistic concepts in sequential bilinguals. The first study used Transcranial Magnetic Stimulation (TMS) to test the unfolding of action semantics while processing actions visually and linguistically in native German speakers (Experiment 1 = German stimuli, Experiment 2 = English stimuli). The second study used high-density electroencephalography (EEG) to investigate how processing abstract and concrete German words affects cortical oscillation in the alpha and beta range (Experiment 1 = native German speakers, Experiment 2 = native Russian speakers).

I will show how these two studies provide complimentary evidence on how concrete and abstract linguistic concepts might be differentially grounded in a first and second language based on timing, location and magnitude of the reported effects. Finally, I will discuss the theoretical implications of these results as well as the methodological insights they provide for future studies.

Language comprehenders also mentally represent the deformed shapes of objects

Oleksandr V. Horchak^{1*}, Margarida Vaz Garrido²

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*Corresponding author

Shape simulation task (Zwaan, Stanfield, & Yaxley, 2002), one of the hallmark findings in embodied cognition literature, implicates the activation of perceptual characteristics of objects during language comprehension. In this task participants are required to verify whether the object in a picture was present in the previously read sentence. Results showed that responses were faster when the shape of the object (e.g., an egg in a refrigerator vs. an egg in a skillet) matched the implied shape mentioned in the sentence.

Across four experiments, we extended the shape simulation task in a new direction that considers the role of the consequences of described action on perceptual representation of object's shape. To this end, we asked participants (total $N = 452$) to read 24 sentences such as "*You drop a bowling ball/a balloon on an {X object}*" and then verify the pictures depicting objects in either deformed (e.g., broken glass, smashed strawberry) or undeformed (e.g., intact glass, strawberry) shape. To prevent the comprehenders from guessing the purpose of the task, we have also used twice as many filler sentences. Experiments 1 and 2 showed that pictures depicting deformed objects were verified faster after participants read a "bowling ball" sentence than a "balloon" sentence. However, data did not show the same matching effect for undeformed pictures after participants read a "balloon" sentence.

In Experiment 3 we asked participants to read sentences such as "*You drop a bowling ball/a balloon full of air on an {X object}*" and found that both deformed and undeformed pictures were responded to faster when preceded by "bowling ball" and "balloon" sentences, respectively.

In Experiment 4 we replaced "bowling ball" with "brick" (heavy condition) and "balloon full of air" with "bath sponge" (light condition) and found that the matching effect, similarly to Experiments 1 and 2, was again only limited to the pictures depicting deformed objects (the match advantage in all four experiments was at least 60 ms), thus suggesting that perceptual simulation involving light objects is quite specific.

Finally, in order to rule out the possibility that deformed objects were responded to more quickly because they attracted more visual attention than undeformed objects (e.g., Scholl, 2001), we also included a neutral condition (Experiments 3 and 4) in which participants processed the same sentences as those from the experimental condition, except that the preposition "on" was replaced by the preposition "near". The results demonstrated that verification times for pictures depicting deformed objects were significantly faster when these were preceded by a sentence with a preposition "on" than a sentence with a preposition "near".

Overall, these results provide novel evidence for the mental simulation of deformed shape and shed light on the level of complexity that is needed in visual simulation.

References

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As time goes by: space-time compatibility effects in word recognition

Camille Grasso¹, Jonathan Mirault¹, Marie Montant¹ & Johannes Ziegler¹

¹*Laboratoire de Psychologie Cognitive (LPC), Aix Marseille Université, Centre National de la Recherche Scientifique - CNRS*

Abstract

How do people conceptualize time and locate themselves in past, present and future? How do they process words that refer to time? Time is a mental construction that is supposed to result from both sensory-motor experiences with i) physical Space: activating cortical areas involved in processing space and control action in space; and ii) Language: using spatial metaphors and spatial representations. Thus, it has been argued that time activates spatial representations organized on a left-to-right axis, a mental timeline, where past events should be placed on the left and future events on the right. According to that view, processing past or future words should interfere with body movements on the left-right axis. Here, we investigated whether time words are represented spatially from left to right and thus interfere with hand movements that go in the opposite direction. To test this hypothesis, we conducted a lexical decision task on conjugated (past/future) words and pseudowords. Participants were all native French speakers and right-handed. To make their decision (yes/no), they had to move a pen to the right or to the left of a trackpad. In the congruent condition, grammatical time and hand movements went in the same direction (e.g., move to the left for past tense/words). In the incongruent condition, grammatical time and hand movements went in the opposite direction. Results shows that time-space incongruency slow down movements (i.e., reaction times) and increase significantly error rates.

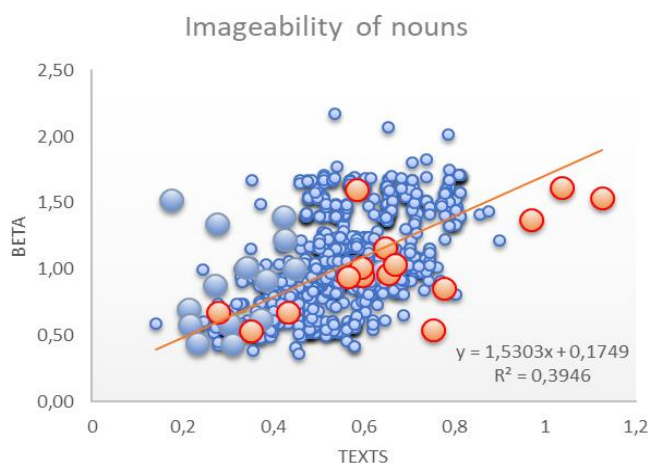
Key words: word recognition, embodied cognition, time perception

Beta-band spectral power during and after reading narrative and expository texts varies with text-elements characteristic of the two genres: An exploratory study

Cayol, Z & Nazir, T.A.

Institut des Sciences Cognitives - Marc Jeannerod (UMR 5304); CNRS, Université de Lyon, France.

In 2013 a study by Kidd & Castano suggested that consuming “literary” fiction of award-winning authors, but not nonfiction and “popular” fiction, could instantly improve our aptitude to recognize emotions of conspecifics. Yet, ensuing studies failed to replicate these findings. In view of its potential societal impact and given the currently inconclusive results, we believe though that the question addressed by Kidd and Castano merits further investigation. This is the more so, as a recent meta-analysis that looked at effect sizes in a number of different studies, concluded that reading narrative fiction does lead to a small but significant improvement in social-cognitive performance (Dodell-Feder and Tamir 2018). Our study is not a replication study but a test of the basic hypothesis underlying the original study, i.e. that different text categories (e.g. narrative texts and expository texts) affect a reader in distinct ways. Since performance-based measures might not be sufficiently sensitive to capture subtle effects in a systematic way, we used electroencephalogram (EEG) as dependent measure. Though it could sound trivial to assert that consuming different types of text, i.e. narrative texts and expository texts, produce different brain activity (see Aboud et al., 2019), it is not trivial to find neural markers for such categorization. Yet, if such markers can be uncovered we have an argument in favor of the assumption that consuming these different types of texts has distinct effects on experience and learning - with potential consequences on behavior. Following work by Bastiaansen and colleagues (2015; 2017) our analysis focused β -band activity because oscillations in this frequency range have been linked to the reactivation and maintenance in time of a cognitive state. Such reactivation and maintenance could be critical for monitoring coherence in text content. Our results show that narrative texts (NT) and



expository texts (ET) provoke distinct patterns of β -band activity during and after reading. Linear regression analyses further show that text-elements that facilitates the reader's identification with narrative characters, which are more frequent in NT than ET (e.g. the use of personal pronouns; of verbs that expresses viewpoints and actions; of high imageable words) predict variations in β -band activity. Our finding thus lends credibility to the notion that certain lexical variables modulates brain activity during reading.

Figure 1: Variability in the usage of nouns with different degree of imageability predicting Beta-band activity in right temporo-parietal electrode cluster.

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What can size tell us about abstract conceptual processing?

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Embodied cognition theories propose that abstract concepts can be embodied either via metaphorical extensions of experiences of the external world or through experiences of the internal world. While *love* can be metaphorically linked to a journey or the taste of sweetness, it can also be represented in feelings of happiness or in social situations of a romantic dinner or a wedding. What types of embodied experiences does the brain activate to represent an abstract concept like *love*? What are their relative contributions? Are such activations contingent on (modulated by) the task at hand?

While psycholinguistic traditions often treat word meanings as canonical and static (Barsalou, 1982; Moors & De Houwer, 2006), the embodied perspective emphasises that experience-based representations are inherently “flexible” as they depend on context (Lebois, Wilson-Mendenhall, & Barsalou, 2015) and task demands (Wilson & Golonka, 2013). However, studying the flexibility of embodied representations is not easy. This is because experience mapping varies widely between concepts, particularly abstract ones: whereas *love* can be mapped to feelings of joy, *democracy* can be mapped to situations of voting. Since joy and voting exist in different dimensions, their relative contributions to the respective concepts are not directly comparable.

Here, we examined the relative contributions of visual (external) and emotional (internal) information to representing semantic size – a common semantic dimension across the concreteness spectrum – under various task demands. Experiment 1 used an *offline*, forced-choice association task that abstract size is metaphorically associated with the physical size of concrete objects. For instance, *wealth* is an abstract concept that is considered big. Participants were more likely to complete the sentence “*Wealth is like a(n):*” with “Canyon” (big) than with “Crevice” (small). Experiment 2 replicated this metaphorical relation during *online* lexical processing by demonstrating a semantic-font size congruency effect on reaction times in both concrete and abstract words. That is, semantically big words such as *castle* and *wealth* were recognised faster when presented in large font size than in little font size. Semantically small words were recognised faster when presented in little font size than in large font size. Experiment 3 found that the semantic-font size congruency effect was only observable when a word is judged by its size (*was it a big or small object/concept?*) rather by its emotionality (*was it an emotional or neutral object/concept?*), highlighting that visual experience of physical size is only engaged when it is task-relevant in both concrete and abstract words. Our results suggest that semantic size of abstract concepts can be represented in multidimensional experiences including emotion (Yao et al., 2013) and visual size (this study) and that such experiences are *flexibly* engaged under different task demands. The present findings advocate a multidimensional approach to studying semantic representations, with an emphasis on the role of task effects on conceptual processing.

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Projected motion paths in the visual world: replicated in Russian

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Anna Laurinavichyute (Center for Language and Brain, NRU HSE)

Simulation theories (e.g., Bergen et al. 2007) suggest that processing linguistic input involves mental simulation of the corresponding event. When a movement from one location to another is described, paths in space and time are being mentally simulated (e.g., Coventry et al., 2010). To find behavioral correlates of this phenomenon, we replicated the eye-tracking experiment reported by Kamide et al. (2016), which demonstrated that while processing verbs denoting either top- or bottom-oriented paths in space (e.g., *jump* or *roll*), participants fixated the respective part of the projected motion trajectory more. We investigated how native Russian speakers (N=27) distribute their attention during on-line comprehension of a motion path description in the absence of a visually depicted path. In a Visual world study, each experimental trial (N=72) included a display depicting an agent, a goal, and an obstacle in the way of the intended motion. A short phrase described the movement, e.g., ‘*Borisa is crawling towards the ladder*’. The verbs suggested either top-biased (e.g., *перелетать* ‘to move from the top of one object to the top of another while flying’) or bottom-biased (e.g., *подползать* ‘to crawl towards the object’) trajectory of motion (8 verbs per condition). We analyzed fixations in two interest areas covering the upper and the lower parts of the path region containing the obstacle (above and below the ‘horizon’ correspondingly).

Participants’ attention was more top-biased overall (see Figure 1): there were more fixations in the upper region (*Est.* = 2613 ms, *SE* = 124 ms, *t* = 21). Yet participants fixated the upper region even more if the trajectory of the motion described by the verb was top-biased (*Est.* = 190 ms, *SE* = 75 ms, *t* = 2.5).

Replicating the original study by Kamide et al. (2016), we confirm that the listeners’ attention during speech comprehension is generally biased in accordance with the spatial model of the described event. These tendencies in language processing are similar in English and Russian and might be expected to be found cross-linguistically.

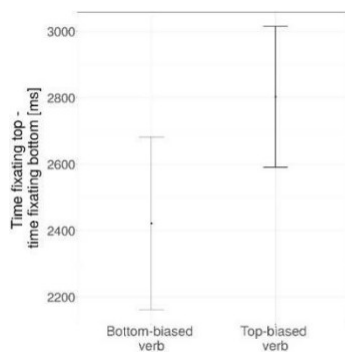


Figure 1. Time spent fixating the upper region minus time spent fixating the lower region across conditions (means and 95% CIs).

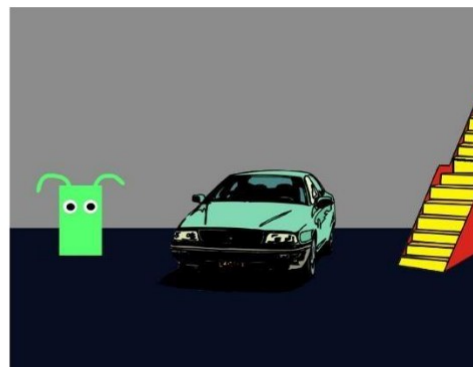


Figure 2. An experimental display.

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**Sequential Adaptation Effects Reveal Proactive Control in Speech Perception:
Evidence from Event-related Potentials**

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Sequential adaptation effects in cognitive conflict paradigms have revealed both proactive and reactive control mechanisms. The processes observed in response to speech errors can be considered as instances of reactive control in order to grapple with linguistic inconsistencies. In the present study we ask whether there is also proactive control of monitoring speech errors as a function of (1) errors in the preceding trial(s) and (2) cues revealing whether the upcoming sentence will be spoken in native or non-native accent. By reanalyzing a previous EEG experiment on auditory speech perception, we assessed – to our knowledge for the first time – the effects of previous-trial correctness on current-trial electrophysiological markers of linguistic processes. The P600 amplitude to both correct and incorrect target words was smaller after incorrect than correct previous sentences. Equivalent analyses of the N400 amplitude revealed no effect of the correctness of previous sentences. To assess proactive adaptation based on sentence-preceding cues, analyses were conducted on the N2 time-locked to putative native or non-native speaker portraits, presented before each sentence, indicating a corresponding speaker accent. N2 was smaller after incorrect than correct previous sentences, and it was larger if the speaker class switched between consecutive sentences rather than repeated. These results indicate that cognitive control modulates certain aspects of speech processing, especially those processes reflected in the P600 component, not only in reactive but also in proactive fashion.

Scaling up picture-naming to social interaction: speech production during communication

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Dialogue is arguably the primary site of language use (e.g., Brennan & Clark, 1996). Accordingly it has been suggested that language processing in dialogue takes advantage of processing mechanisms that facilitate rapid integration of speaking and listening (e.g., Garrod & Pickering, 2004). Recent studies have investigated lexical access during language production in joint task settings during which two participants take turn naming pictures. These studies suggest that speakers seek lexical access not only for pictures they name themselves but also for pictures named by a task partner. This can delay participants' own response when subsequently naming semantically related pictures (Hoedemaker et al., 2017; Kuhlen & Abdel Rahman, 2017). Such partner-elicited interference appears to stand in contradiction to facilitated language processing during dialogue.

In the current experiment we scale up joint picture naming to settings in which task partners speak to each other with communicative intentionality. We adapt a classic picture-word interference (PWI) paradigm to accommodate a communication game during which one participant instructs the other how to sort a stack of cards. Based on the typical finding of PWI experiments we expected that speakers (N=32) would be slower in naming their own card when their task partner had just previously named a semantically related card (compared to a semantically unrelated card). Furthermore, based on previous literature, we expected that this interference effect would be more pronounced when the distractor card (named by the partner) was followed by the target card (named by the participant) after a very short time lag (stimulus onset asynchrony = -100ms) compared to a longer time lag (stimulus onset asynchrony = -650ms).

However, our speakers showed no significant difference in naming latency when naming cards semantically related compared to cards unrelated to the partner's utterance. The mean difference in naming latency between related and unrelated cards was 9ms with a SOA of -100ms and -8ms with a SOA of -650ms. Given the robustness of picture-word-interference in single-subject studies this considerable diminishment is quite surprising. We suggest (and will follow up with further studies) that a communicative setting changes decisive parameters underlying picture-word interference.

Keywords: Lexical access, picture-word interference, dialogue, semantic processing

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Embodied lexical access during language production?

The relationship between embodiment and language comprehension is well-investigated, but little is known about the role of embodiment during language production. Here we investigated influences of sensorimotor experiences on lexical-semantic processing during free naming and picture naming.

In two experiments we asked participants to complete sentence fragments presented word by word on a screen. We manipulated the visual presentation mode of the sentences by presenting the words in an ascending or descending presentation mode. In Experiment 1 we focused on influences of sensorimotor experiences on lexical selection. Participants were asked to complete the sentences with suitable nouns of their own choice. If the activation of experiential traces plays a role during speech planning, activation spread in the lexical-semantic network – and thus the selection of the words completing the sentences – could be influenced by the task-irrelevant presentation mode of the sentences. After running the sentence completion study we obtained ratings of spatial attributes of the produced words by an independent group of raters. Interestingly, the spatial features of the produced nouns were not influenced by presentation mode (e.g. not more words related to locations in upper space completing sentences presented in ascending presentation mode, and not more words related to lower spatial locations completing sentences in descending presentation mode). However, the spatial attributes of the produced nouns' referents could be predicted by the spatial attributes of the presented sentences. The higher in space the situation indicated in the sentence takes place the higher up in the world would the referents of the produced nouns be. This finding was independent of semantic similarity between the sentences and the produced nouns. We therefore conclude that experiential traces of typical locations which are tied to sentences describing a situation can influence lexical selection.

In a second experiment we investigated influences of sensorimotor experiences on the time course of lexical access. The same set of sentences as in Experiment 1 and the same manipulation of presentation mode was employed. However, here participants were instructed to complete the sentences by naming an object picture presented at the end of each sentence above or below the location of the last word. The objects were selected such that their typical location in real life could match (e. g. bird and ascending sentence presentation mode) or mismatch (e. g. frog and ascending presentation mode) the presentation mode of the sentence fragment. Additionally, the object could be semantically related or unrelated to the sentence context; the two factors were manipulated orthogonally. We hypothesized that if sensorimotor experiences play a role during speech planning, naming should be faster not only for semantically related objects, but also for objects whose sensorimotor features match the sentence manipulation mode. Furthermore, the two factors may interact, suggesting shared functional loci at lexical-semantic processing levels.

In combination the two studies advance our understanding of embodiment in language production.

How perspective influences eye movements during real-life conversation: A study on mentalising about self vs. others in autism

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Socio-communication is profoundly impaired among individuals with autism spectrum disorder (ASD), sometimes in the absence of any language difficulties (Martin et al., 2003). Characteristic difficulties representing others' mental states have been linked to modulations of gaze and speech, which have also been shown to be impaired in ASD (Freeth et al., 2019). Additionally, ASD is associated with atypical self-other referential processes (Lombardo et al., 2007). Despite these observed impairments in 'real-world' communicative settings, research on ASD has mostly focused on lab-based experiments, where the language is highly structured (Nadig et al., 2010). Hence, this study compared the patterns of eye movements between people with ASD and typically developing individuals (TD) during real-life social interactions. Importantly, we tested whether gaze to social and non-social aspects of the environment differ when participants produced language that required them to mentalise about the 'self' vs. 'someone they know' (a familiar other) vs. a 'stranger' (an unfamiliar other).

In a pre-registered experiment, participants (N=50), first read short scenarios, describing a character (gender matched to participant), to introduce an unfamiliar other. Next, participants engaged in a short interview-style conversation with the experimenter, while a mobile eye-tracking set recorded their eye movements. The experimenter's questions either related to the self, a familiar other (e.g. their mother), or an unfamiliar other (the character in the scenario; e.g. "Tell me who is your/your mother's/Marina's favourite celebrity and why?"). The aim of the questions was simply to elicit a short dialogue between participants and the experimenter. The proportion of time spent fixating on the experimenter's eyes, face, body, and the background (the rest of the scene), was used as the dependent variable.

Results revealed that ASD participants spent less time looking at the experimenter's eyes and face, and more time looking around the background, compared to TD participants. Importantly, participants in both groups were comparably sensitive to the degree of similarity between the self and other. Participants spent a greater proportion of time looking at the experimenter's face/eyes when they were talking about themselves, compared to either a familiar other or an unfamiliar other. Conversely, participants spent significantly more time fixating the background when talking about a familiar other or an unfamiliar other, compared to the self. This suggests that despite general group differences in attending to social information, all participants found keeping track of a conversation more cognitively demanding when discussing other people compared to the self. We interpret these differences in terms of gaze aversion used as a means of reducing processing costs of potentially distracting or resource demanding visual social signals, or because of a decreased interest in the conversation topic (Nadig et al., 2010).

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Talk & Poster Abstracts

Day 2
Thursday, August 29th, 2019

Are linguistic expectations for newly learnt words shaped by the social identity of the speakers we learn from? - an ERP study

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Recent research has shown that, when comprehending speech, the information about the speaker's social identity is processed along with the content of the message [1, 2]. Furthermore, we recently showed that speakers' group membership status (i.e., being an in-group or out-group speaker), in tandem with learners' individual in-group bias, determines the level of detail of the speaker-specific information encoded in representations of novel words [3]. Here (N=39), we investigated whether the on-line processing of words is influenced by the group membership of the speakers from whom they were learnt, *after* learning took place. Specifically, we ask, to what extent the expectations that people generate for the newly acquired words are modulated by speakers' group membership, in a two-day EEG experiment. On day 1, participants learned labels for unfamiliar gadgets, pictorially presented. Crucially, in-group speakers (i.e., attending participants' own university) labelled half of the gadgets, and out-group speakers (i.e., attending a different university) labelled the other half. On day 2, we collected participants' EEG signal while they saw speakers and pictorial referents and listened to labels in relation to those referents. Crucially, the label was either *expected*, because it matched with what they learned on day1, or *unexpected*, because it had not been encountered before (see Fig.1 for the trial procedure). Event-related potentials were time-locked to the presentation of the label. Statistical analyses reveal that unexpected vs expected labels elicited a predicted N400 effect, showing that the labels had been learned and lexicalized. However, this N400 effect was not modulated by speakers' group membership status.

These results suggest that, although there is prior evidence that speakers' social identity is encoded in the representations of words, it might not influence subsequent expectations for those words during on-line processing. Overall, these findings specify the role of social information during word learning and language processing and contribute to the understanding of socially situated language processing phenomena.

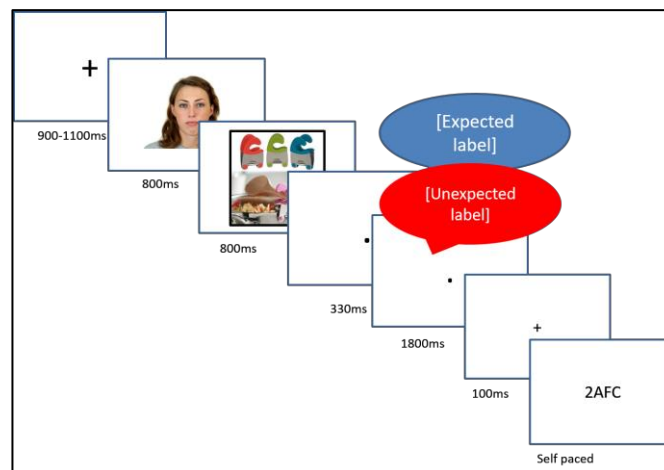


Fig.1: Single trial example. Either the expected or an unexpected label was presented.

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Communicative perspective taking with artificial agents

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University of Toronto

In recent years, there have been significant developments in social robotics. However, there has been little research examining whether the implicit pragmatic and perceptual assumptions that guide human communication also influence human-robot communication. The goal of the present study was to explore the extent to which human listeners assume a robot will engage in the same kind of implicit perceptual reasoning as a human speaker when referring to objects in the here-and-now. We also explored whether humans remember and apply knowledge about the robot's perceptual limitations (an inability to "see colour") as they process speech produced by the robot. Further, we recruited both younger and older adults, allowing us to examine whether perspective taking in this context is influenced by age-related decline in the aging population (e.g., in working memory, inhibitory control, or Theory of Mind abilities; Hasher & Zacks, 1988; Moran et al., 2013; Wingfield et al., 1988).

In a modified Visual World experiment, 36 younger (~20 years) and 36 (~70) older adults followed instructions from a social robot (Furhat model, Fig. 1) to click on one of four objects displayed on a screen located in front of the robot and the participant (Fig. 2). The experiment began with the robot introducing himself and also stating his inability to recognize colours. On critical trials (12 in total), the name of the target item ("blacksmith") had initial overlap with a colour term ("black"). If listeners have difficulty remembering or applying knowledge that the robot cannot discriminate colour, we reasoned that they should show transient fixations to the competitor object, which in principle could be referred to using a phrasal description beginning with a colour term (black flag). Further, to test whether listeners implicitly assume a robot partner would provide a modifier primarily when there is pragmatic motivation (i.e., to differentiate a black flag from another flag), we varied whether the competitor was accompanied by a same-category alternative (yellow flag).

We measured fixations during the first part of the target word to explore listeners' implicit linguistic hypotheses. The results showed that both younger and older adults tended to generate transient fixations to the competitor, suggesting they considered *black flag* as a possible interpretation as sounds in *blacksmith* unfolded. In addition, older adults were more likely than younger adults to fixate the competitor when referential contrast was present (yellow flag)—a pattern found in many past studies of real-time processing in humans.

Together, the results suggest that expectations based on canonical human abilities (colour vision) are difficult to suppress even when the human listener was told about the robot's limitations in this domain. It also appears that older adults are less cautious than younger adults in ascribing human-like pragmatic motivations to a robot partner. This last finding is consistent with the notion of age-related decline (e.g., working memory and inhibition) and with independent evidence from our lab showing older adults' reduced perspective-taking ability when interacting with human partners.



Figure 1. Furhat robot

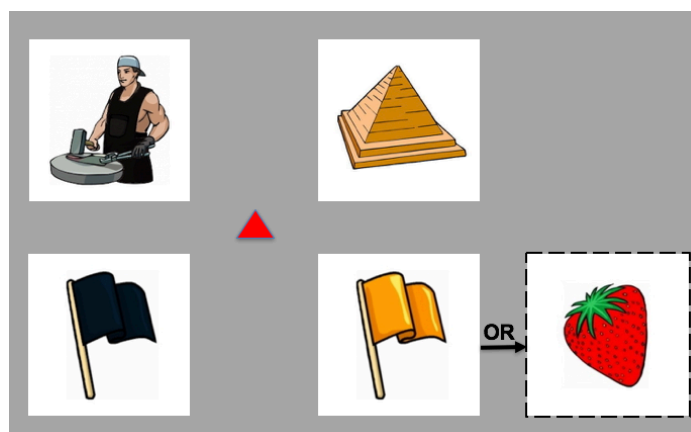


Figure 2. Sample display on critical trial

I spy with my little eye... Common ground information affects reference resolution: Behavioral, ERP, and eye-tracking evidence

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Perspective taking enables the listener to arrive at a meaningful interpretation of what is said (sentence meaning) and what is meant (speaker's meaning) by the speaker (Grice, 1989). In communicative settings, a speaker can refer to a person, an object, or a concept using different forms of referring expressions (e.g., a full noun phrase, a pronoun etc.) to optimize information transfer. Nevertheless, the listener may still have to take the speaker's perspective to successfully decode his/her communicative intention. This requires the calculation of mentally and/or perceptually shared information by both interlocutors, which is often called common ground (CG) information. Many studies have been concerned with the question when CG information is integrated during utterance processing. "Late integration" accounts assume autonomous lexical and syntactic activation while CG (and other contextual and pragmatic information) enter the parsing process only at a later time point (e.g., Keysar et al., 2000; Barr, 2008). "Early integration" accounts assume that all available information sources immediately interact during the parsing process and guide the interpretation of a sentence (e.g., Spivey-Knowlton & Sedivy, 1995; Hanna et al., 2003).

We here further investigated these competing accounts about when CG information affects language comprehension by means of reaction time (RT) measures, accuracy data, event-related potentials (ERPs) (N=27), and eye-tracking (N=27). In a computerized version of the referential communication game (Keysar et al., 2000), CG information had to be integrated while privileged information (i.e., visual information, that was only available to the listener but not to the speaker) had to be suppressed (conflict trials).

Listeners mastered the integration of CG (response accuracy >99%). Yet, slower RTs, and enhanced late positivities in the ERPs in conflict vs. control trials showed that CG integration had its costs, which can be interpreted as reflecting the need for discourse updating and discourse modification (e.g., Burkhardt, 2005). Moreover, eye-tracking data indicated an early anticipation of referents in CG but an inability to suppress looks to the privileged competitor, resulting in later and longer looks to targets in those trials, in which CG information had to be considered. Our data therefore support accounts that foresee an early anticipation of referents to be in CG but a rather late and effortful integration if conflicting information has to be processed.

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Funding: German Research Foundation (Deutsche Forschungsgemeinschaft DFG) SPP 1727 XPrag.de, Project Number 254858842.

Perspective taking in the visual world paradigm

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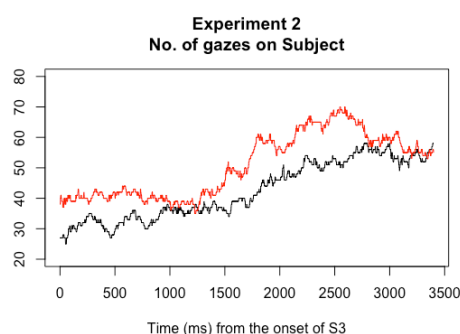
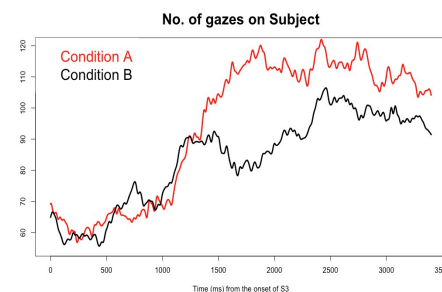
Stefan Hinterwimmer, Bergische Universität Wuppertal

We test the hypothesis that the most prominent referent is more likely to be the perspectival center of a discourse compared to competing referents. We report two eye-tracking experiments (n=40, n=27) in the visual-world paradigm on the processing of perspective taking in narratives. We use free indirect discourse (FID) as the main indicator of a shift in perspective. FID, defined as “mode of narration where we can listen to a protagonist’s thought” (Eckardt, 2014), can only be processed correctly if the reader is able to take the protagonist’s perspective. Characteristics of FID are: interjections, judgmental statements, exclamations, discourse particles, rhetorical questions and a shift in deixis with respect to the discourse referent. For example, in “*Last Friday John wanted to go to a concert. Right before he got to the concert hall he checked his pockets. Oh no, had he really left the tickets at home? Now it was too late!*” the rhetorical question as well as the exclamation can be easily understood as expressing a thought of John because of the interjection *Oh no* and the deictic expression *now*. FID has been a topic of interest for literary scholars as well as linguists, but there is very little empirical research on the processing of FID. Also, lately there has been growing interest on the impact of perspectives in language comprehension, e.g. the interface of Theory of Mind and pragmatics; however, the shift in perspective in narratives has not yet been studied through online experiments.

In our experiments we test processing of perspective taking in FID. Test items (see (1) below) consist of short stories introducing one highly prominent protagonist with a proper name in subject position (R1=*Martin*) and a second minimally prominent referent with an indefinite article in object position (R2=*florist*). In the third sentence we compare an utterance in FID (cond-a) involving at least three indicators — interjection, a deictic expression and a discourse particle, to a sentence of similar content in narrative style (cond-b). Along with R1 and R2 we show pictures of a distractor mentioned in the story and an unmentioned distractor. The hypothesis predicts more gazes on R1 in cond-a compared to cond-b as a result of the change towards R1’s perspective triggered by the FID. As we use several different indicators of FID, we expect the effect to show as the third sentence (S3) unfolds. Figure below shows the number of gazes recorded on R1 from the onset of the critical S3. We modeled the gazes from the onset of S3 using the growth curve analysis. We observed significantly higher number of gazes on R1 in cond-a. As we attempt to investigate the role of prominence lending features of the referents in a series of experiments we improved our critical stimuli so that the length of S3 is almost identical in cond-a and cond-b (see (2) below) and that the syntax as well as the occurrence of indicators for FID is similar throughout cond-a. In our follow-up experiment (n=27), again, we observed a significantly higher number of gazes on R1 in cond-a starting from 1500ms from the onset of S3. In our second experiment, we also find greater variation even before the onset of S3 although recordings were identical. This variance may be due to a smaller sample size in our follow-up experiment.

Our findings suggest that more gazes on the most prominent referent in cond-a are due to the ascription of authorship of the utterance in FID. We regard these results as a proof of concept for further research employing the visual-world paradigm for investigating prominence status and perspective taking in language processing, however, variation in the data will have to be discussed.

- (1) *Martin asked a florist at a stall for a bouquet. The smell of the flowers attracted some wasps.*
[cond-a] *Oh, better stand still now, not to aggravate those beasts.*
[cond-b] *As not to aggravate wasps one better stand still.*
- (2) *Dennis met a hippie at an open-air festival. Suddenly a thunderstorm approached.*
[cond-a] *Oh no, would the concert get canceled now?*
[cond-b] *The concert got canceled for that reason.*



Processing load at turn transitions in dialogue is affected by response planning during comprehension but not by the predictability of the comprehended turn

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Recent models of dialogue processing assume a major role of prediction in comprehending the incoming turn of an interlocutor and in estimating the timing of turn ends (Levinson & Torreira, 2015; Pickering & Garrod, 2007, 2013; Sacks et al., 1974). The model proposed by Pickering and Garrod in particular assumes that, whenever possible, the language production system makes semantic, syntactic, and phonological predictions about the currently comprehended turn. One prediction following from this model is that processing load in dialogue is higher when speech planning and comprehension occur simultaneously. A second, more intricate, prediction is that processing load is also higher when speech planning and prediction concurrently utilize the production system, as compared to planning in the absence of prediction.

We present evidence from task-evoked pupillary responses, an index of processing load (Beatty, 1982), in a dialogic, task-oriented visual world experiment to test these predictions. Participants took unscripted turns with a confederate describing what objects were displayed on their screens. In each trial, the confederate described what objects she saw on her display. Participants had to follow which objects on their display had already been named by the confederate in order to only list which additional objects they saw. Using different syntactic structures in the confederate turns, we manipulated (a) the possibility of planning a response in overlap with the incoming turn and (b) the predictability of that turn's ending. We statistically controlled for the incoming turn's duration, the next turn's complexity, and effects of structural priming in linear mixed effects regressions. As evident from analyses of eye-movements and voice onsets participants planned their next turn during comprehension whenever possible. Participants also took their turns after shorter gaps compared to when planning in silence after the incoming turn (Barthel et al., 2016). Mean and peak amplitudes in pupil dilations were significantly higher in planning-during-comprehension conditions than in planning-in-silence conditions ($ps < .01$) and pupillary responses reached their peak amplitude significantly later in the planning-during-comprehension conditions ($p < .001$). These effects show that planning in overlap leads to increased processing load as compared to planning in silence after the incoming turn. Notably, predictability of the incoming turn's end did not affect pupillary responses during response planning, whether participants were planning during comprehension or in silence (all $ps > .2$). The absence of prediction effects suggests that processing load does not increase (nor decrease) when prediction is engaged concurrently with sentence comprehension and speech planning.

Taken together, these results indicate that language processing in dialogue is not optimized for minimizing processing load at turn transitions but for meeting the socially motivated time pressures of turn taking (Sacks et al., 1974). Our findings also raise the question whether comprehending and predicting the incoming turn and speech planning really make use of the same processing resources (Pickering & Garrod, 2007, 2013).

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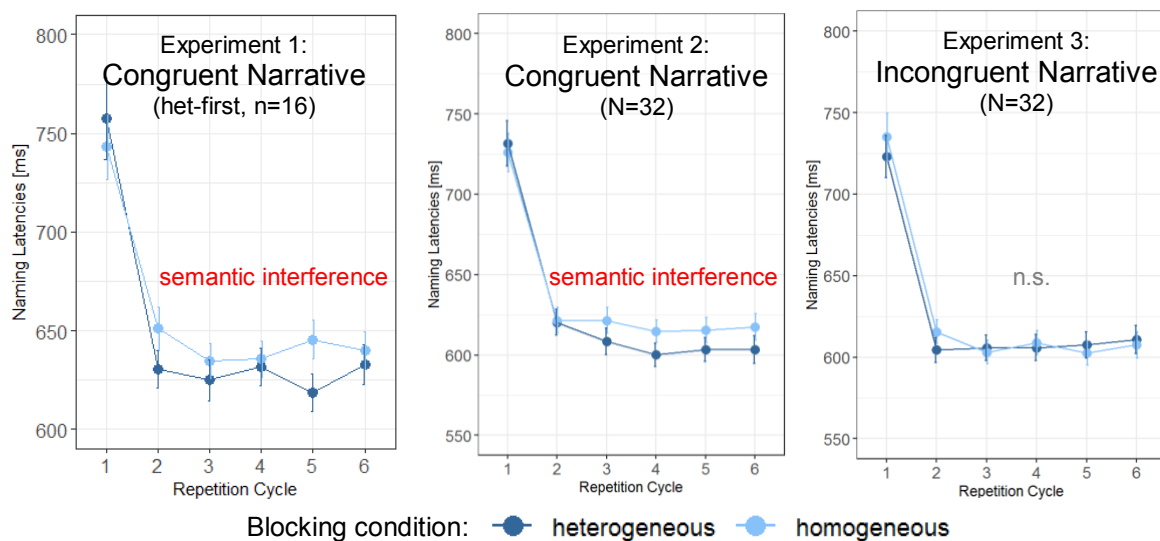
Aligned Situation Model Modulates Lexical-Semantic Processing during Speaking

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In dialogue, interlocutors come to align their global representations, or so-called situation models, of the topic under discussion (e.g., Clark & Brennan, 1991; cf. Interactive Alignment Model, Pickering & Garrod, 2004). Here we investigate what consequences an established situation model may have for lexical access during subsequent speech production. Specifically, we investigate whether a situation model introduced by a task partner can reveal semantic relationships between objects that would, without this situation model, be perceived as semantically unrelated. Such transient semantic network activation (e.g. Abdel Rahman & Melinger, 2011) could express itself as increased naming latencies in a blocked-cyclic naming paradigm when naming objects related to the established situation model. In three experiments, participants watched pre-recorded videos of presumed task partners narrating real-life events. After each video, they repeatedly named pictures that were either thematically related (homogeneous blocks) or unrelated (heterogeneous blocks) to the narrative. A linear mixed effects model was run to examine whether participants showed ad hoc semantic interference from the second cycle onward. In Experiment 1 (N=32), participants only showed interference effects when they named homogeneous blocks after naming heterogeneous blocks. With the identical materials and procedure, Experiment 2 (N=32) showed the expected semantic interference regardless of block order; besides, the block-order-sensitive semantic interference in the first experiment was also replicated. Experiment 3 (N=32) demonstrated that semantic interference was absent (in neither block order) when partners narrated events that were incongruent with the homogeneous blocks. Together our experiments indicate that speakers activate transient semantic networks based on semantic information shared by their interaction partners that shape lexical selection during language production.



Graph 1: Effect of thematic context congruency on semantic interference. Note that the left graph illustrates only a subset of the data from participants who always named heterogeneous blocks directly after watching videos.

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New evidence on the recent-event inspection preference: verb and contextual biases

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Prior research has observed that participants preferred to inspect the target of a recently-seen (vs. future) action event even when sentence tense (i.e. future: ‘The experimenter sugars soon’...) and either short-term (within-experiment) frequency or an actor’s gaze biased attention towards the target of the future event. Because theories of rapid and incremental integration of linguistic context in a visual world paradigm would predict anticipation of the future event, we conducted two eye-tracking studies (N=24 each) to see whether the preference holds when several other aspects of the stimuli and presentation establish an additional bias against the recent event target.

As in prior research, participants initially inspected an action event on every trial. As a first modification, the ensuing sentence was preceded by stills showing an actor referred to as ‘experimenter’ in the stimuli (face greyed out here only, to preserve anonymity, Fig. 1) with one of 12 different emotional facial expressions. This was done to draw attention from the recent-event object back towards the actor. During the third still, the spoken sentence was played. As a further modification, the verbs in the present experiments referred to actions implausible to be performed again on the same object (e.g., when the recent action event had been to turn on a computer, turning the same computer on again would not be that likely; verb: *aktivieren*, ‘turn on’). This change should encourage participants further to shift attention from the recent action target to another object that could be a plausible future action target. Finally, we included context sentences for the second experiment only (see Fig. 1(B): the actor was not greyed out in the study). Each context biased towards the future event via semantic plausibility (e.g., being on an airplane biases towards a laptop rather than desktop display as the target of an event). The experiment contained no filler items.

Results: In both studies the eye-movements (Figs. 2A & B) indicated a continuing preference for the recent event target (dotted and solid thin lines are above zero during the verb), replicating prior results despite verb-based and linguistic contextual biases. Interestingly, this preference held even though there was a strong tendency to look at the experimenter’s (actor’s) face at the beginning of each trial, which arguably occurred due to the preceding change of facial expression. The results suggest that verb and contextual biases are not accorded sufficient importance during comprehension to override the recent-event preference.

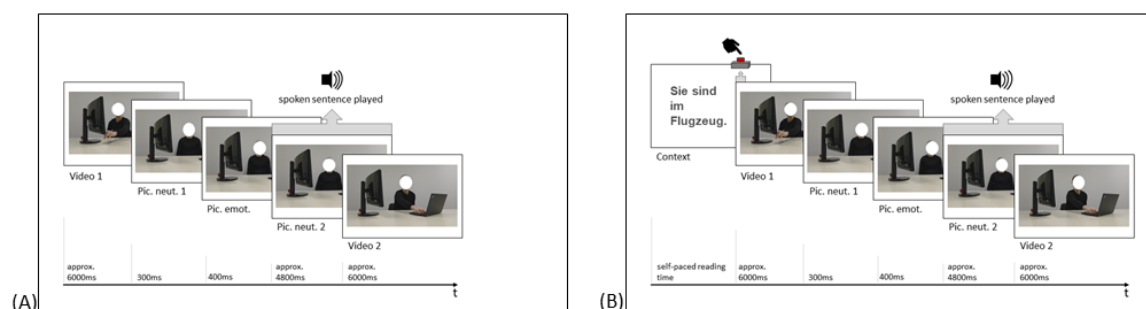


Figure 1: Schematic course of example trial in Experiment 1 (A) and in Experiment 2 (B)

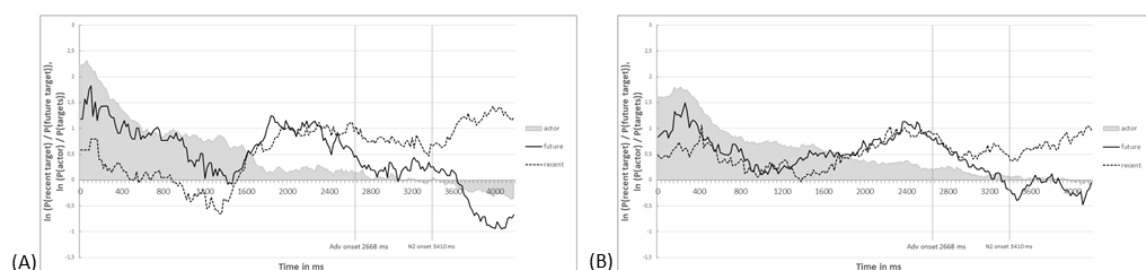


Figure 2: Time course graph for Experiment 1 (A) and for Experiment 2 (B); n-log ratios per condition of P(recent event target) / P(future event target) & n-log ratio of P(actor) / P(sum of targets)

Effects of lexical aspect on event comprehension and scene perception: An Eye-Tracking study on the non-aspect language German

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Temporal information about the duration of events, as encoded in aspectual markers, is important in the construction of mental representation of events. In English, grammaticalized imperfective (*She was playing*) and perfective aspect (*She played*) focus on the dynamic ongoing and static completed state of events respectively. Perhaps as a result, processing the location of an action (seen as event background, cf., Ferretti et al., 2007) is facilitated by imperfective (vs. perfective) aspect. The processing of action-related instruments, by contrast, seems facilitated by perfective (vs. imperfective) aspect (Ferretti et al., 2001; encouraging a goal-driven, end-state perspective, cf., Madden & Zwaan, 2003).

Aspect in English is conveyed per the verb phrase. Compared with English, aspect in German is not realized grammatically and via verbs but expressed lexically per temporal adverbs among others. Would lexical elements such as adverbs in German – much like verb morphosyntax does in English – rapidly shift comprehenders' attention to location (background) compared with instrument (goal-driven) event information?

A visual-world eye-tracking study investigated whether lexical aspect in a non-aspect language rapidly facilitates processing of event-related location and instrument information and to what extent these effects resemble grammatical aspect effects in English. If they do, we should see more fixations to the location (vs. instrument) picture during or after processing imperfective (vs. perfective) aspect markers and vice versa. German adults ($N=64$, 18-31 years) heard sentences ($N=32$) with imperfective¹ or perfective² (see e.g., sentence a)) aspect and a location or instrument prepositional phrase (PP) while inspecting four images: a verb-related instrument & location plus two distractors. We recorded eye-gaze during comprehension plus reaction times & accuracy in a post-trial task (click on the picture which matched the sentence).

a) *Das Mädchen spielte ¹gerade_{Adv} / ²kürzlich_{Adv} mit dem Ball_{LOC_PP} / auf dem Spielplatz_{INST_PP}.*
 Lit. trans.: The girl played ¹currently_{Adv} / ²recently_{Adv} with the ball_{LOC_PP}/on the playground_{INST_PP}.

Eye-gaze results: Sign. main effects of preposition (PP) type (instrument vs. location, $p < 0.1$) and of aspect ($p < 0.5$) emerged in the PP region: Participants fixated the instrument more when hearing the instrument PP and vice versa. Moreover, they fixated the instrument more when hearing a perfective (vs. imperfective) and the location more when hearing an imperfective (vs. perfective) aspect marker (Fig. 1). The **accuracy data** revealed a main effect of PP type ($p < 0.1$): participants were sign. more accurate after having heard an instrument PP (vs. location PP, Fig. 2). No other effects (e.g., in response times) reached significance.

Discussion: Results replicate and extend previous word – word priming and EEG findings (cf. Ferretti et al., 2007, 2011). German lexical aspect markers seem to enrich location/instrument representations while processing visual and linguistic location/instrument information. Interestingly, the accuracy data (and to some extent the gaze data, Fig. 1) suggests that German participants' representations might overall be stronger for instruments (vs. locations).

Aspect Effect - PP Region (sign.)

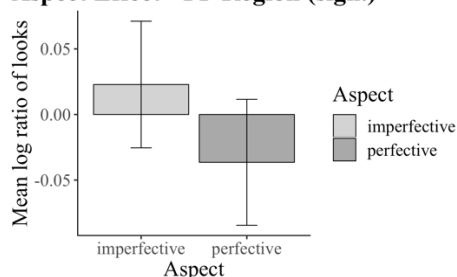


Figure 1: Mean log ratio of looks to instrument (neg. values) and location picture (pos. values) by aspect during the PP region. Error bars = 95% confidence intervals.

PP type Effect - Accuracy (sign.)

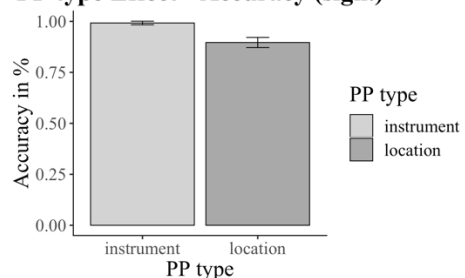


Figure 2: Accuracy in percent for the PP type effect. Error bars = 95% confidence intervals.

Effects of eye gaze cues on novel L2 morphosyntactic pattern learning: Eye-tracking study

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In recent years, increased interest has been shown in research investigating how different types of exposure contributes to acquiring of novel morphosyntactic pattern (e.g., Andringa & Curcic, 2015; Brooks, Kwoka, & Kempe, 2016; Indrarathne & Kormos, 2017; McDonough, Trofimovich, Dao, & Abashidze 2018). However, this research is mostly based on experiments exposing learners to either text or static “clipart” images during learning, not incorporating eye gaze cues into dynamic visual events illustrating/cuing the meaning of novel utterances. The aim of this study was therefore to extend this research by examining the learning of novel structures through eye gaze cues into dynamic visual displays.

University students ($N = 72$), all speakers of Germanic or Romance languages, carried out a construction learning task, followed by tests. The target structures involved a completed (bich-**ma** kocn-**ul** gogoit, “boy kissed girl”) versus ongoing (bich-**su** kocnn-**ar** gogoit, “boy is kissing girl”) events in Georgian, marked on the noun (subject) and the verb. Participants first learned six Georgian nouns and three verbs by associating them with relevant toy characters (e.g., rabbit) and actions (e.g., chase). They then were exposed to 36 training videos performed by a person holding a toy character in each hand (see Figure 1). Half of the participants ($N = 36$) saw the person gazed at the subject character. In the immediate and generalization tests, participants heard 24 sentences featuring correct and incorrect combinations of target morphemes and selected the action image of a completed or ongoing event as their response. Participants’ eye movements were recorded as they listened to an utterance describing the event, while viewing the static image of the last video frame.

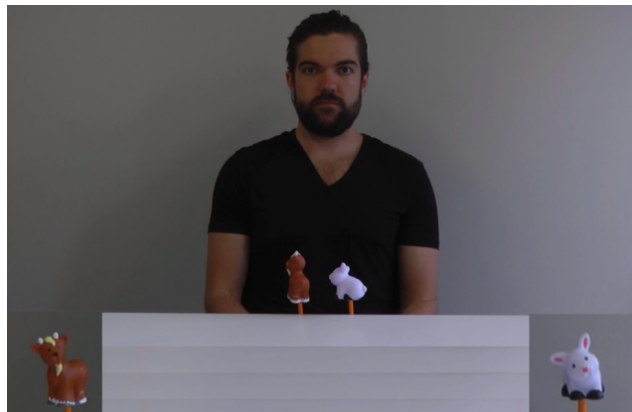


Figure 1. The last frame of an ongoing action

Bocver-su devn-ar txit [Rabbit is chasing goat]

Results indicated that learners who received the eye gaze cues scored significantly higher on the immediate test and relied on the verb cues more than on the noun cues. Analysis of eye-movement data indicated that the gaze cues elicited longer looks to the correct images. Findings are discussed in relation to visual cues and novel morphosyntactic pattern learning.

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Comparison or Categorization? Differences in Attributive and Relational Metaphors Processing

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Two main modern views on metaphor comprehension can be called categorization position (see Glucksberg & Keysar, 1990) and Structure-Mapping Theory (see Gentner et al., 2001). Both approaches consider the categorization aspect in metaphor comprehension (the assignment of the target term to a category represented by the base term). However, there are attributive metaphors (AM) (e.g., “Sun is an orange”) that presumably do not require categorization for comprehension and can be processed by finding commonalities between the target and the base. Processing of relational metaphors (RM) (e.g., “Mind is a kitchen”) requires the categorization stage as the comprehension cannot be reduced to finding shared features of the target and the base. The aim of the research is to explore the applicability of modern models to explaining processing mechanisms of two types of metaphors.

Hypothesis. Modern approaches are not applicable to AM if 1) they take less time for processing than RM regardless of novelty as comparison processes are claimed to be easier than categorization (see Bowdle & Gentner, 2005); 2) literal synonym of metaphor base term does not interfere with AM processing.

Stimuli. 19 highly comprehensible “*adjective (base term) – noun (target term)*” metaphors in Russian were selected for the experiment: 4 novel AM (e.g. “sunny lemon”), 4 familiar AM (“chocolate tan”), 4 novel RM (“leaky conversation”) and 7 familiar RM (“dirty thoughts”). Three types of word-stimuli were put in correspondence to each metaphor: figurative word-stimulus, which represented metaphorical meaning of the base; literal stimulus, which represented literal meaning of the base; and distractor, whose meaning was distant from any of base meanings. Additionally, 19 literal phrases (LP) were selected as control condition.

Procedure. First, participants (67 students) were presented with phrase on the computer screen. Then the word-stimulus appeared instead. Participants used arrows to answer the question “Can this word substitute the adjective in the metaphor without altering its meaning?” Following answers were considered true: 1) “yes” to figurative stimuli for metaphors; 2) “yes” to literal stimuli for literal phrases; 3) “no” in all other cases.

Results. Our findings are more likely to suggest that the presence of categorization process in AM comprehension cannot be rejected as both types of metaphors show the same patterns of processing. However, some findings contradict both our hypotheses and modern approaches. Results show that AM and LP are processed slower than RM, though only the difference between LP and RM is significant (novel RM: $W=722$, $p=.034$; familiar RM: $W=510$, $p<.001$). This corresponds with the fact that high semantic density and concreteness of both target and base terms (which is more peculiar to AM and LP than to RM) complicates metaphor processing due to the difficulty of rejecting nonapplicable activated meanings which might be similar to applicable ones (Al-Azary & Buchanan, 2017).

Conclusion. Categorization in both attributive and relational metaphors processing can be affected by semantic variables that should be necessarily taken into consideration.

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Adults across the lifespan benefit from visual contexts in second language learning

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This research was inspired by visual context effects on real-time language processing (Knoeferle et al., 2005; Tanenhaus et al., 1995) as well as on language learning (Koehne et al., 2015; MacDonald et al., 2017; Yu et al., 2011) and by language transfer in language learning (Jiang, 2002; Jiang, 2004). We investigated whether German (the first language – L1) adults experience facilitation in learning Vietnamese (the second language – L2) verb-noun phrases in contexts that varied in transfer (L1/L2 features in verb mapping: similar vs. dissimilar) and visual context (event photos present vs. absent) corresponding to four learning conditions (present-similar; absent-similar; present-different; absent-different). German native speakers (N=32, L1=German, no L2 < age 6; ages 18-31, no prior knowledge of Vietnamese) participated in a learning study (henceforth: 'exp2¹'). There were three main parts in the experiment (Part1: Learning & post-learning trial testing; Part 2: Relearning all items; Part 3: A delayed-testing only with new event pictures). For each training trial, participants listened to two nouns and two complete verb-noun phrases: The nouns occurred together with a photograph of its referent (e.g., sách/ book & bàn/ table), displayed on a computer screen. In the event-present conditions only, each verb-noun phrase was further accompanied by an event photograph (e.g., đọc-sách/ 'read-book' & lau-bàn/ 'clean-table') during training. For each testing trial, participants performed a binary forced-choice photograph selection task to test L2 learning, while they listened to a full verb-noun phrase (e.g., đọc-sách/ 'read-book') before inspecting two event photographs (e.g., đọc-sách/ 'read-book' or chọn-sách/ 'choose-book') and selected the matching one out of these two photographs. We measured their accuracy and reaction time in vocabulary learning, then analyzed data with linear mixed effect models for reaction time and generalized linear mixed model for accuracy. We found significant effects of event depictions in L2 learning success in exp2 because participants were faster and more accurate in both testing parts when event photographs were provided compared to without events. However, there was no significant effect of language transfer on L2 learning success (RTs, accuracy).

Based on the results of exp2, we designed a replication study (exp2R) and carried out two further experiments (exp3 and exp4) with other age groups (from 32 to 45 years; from 46 to 65 years). We wanted to know whether effects would be replicated in another young adult group and extended in two older learners' age groups. German native speakers participated in three experiments with the identical experimental design (N=32/experiment, L1=German, no L2 < age 6; ages 18-31 in exp2R, 32-45 in exp3, and 46-65 in exp4; no prior knowledge of Vietnamese). Results: Participants in all age groups benefited from visual depictions (they were more accurate and responded faster in testing when the event photographs were present versus absent). Thus, visual context effects on L2 learning were not only replicated with the same age group (18-31 years old) but also were extended in other older age groups. However, we did not find any significant effect of language transfer on L2 learning success.

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¹ Exp2 had been developed from the original experiment (exp1). There were two identical parts (learning & post-learning trial testing) in exp1. In testing, participants inspected two object pictures before hearing a verb sound, then they selected an object picture matching with the verb sound to complete a verb-noun phrase. We found no effects of factors in exp1.

Gap lengths for polar answers convey meanings independent of question bias

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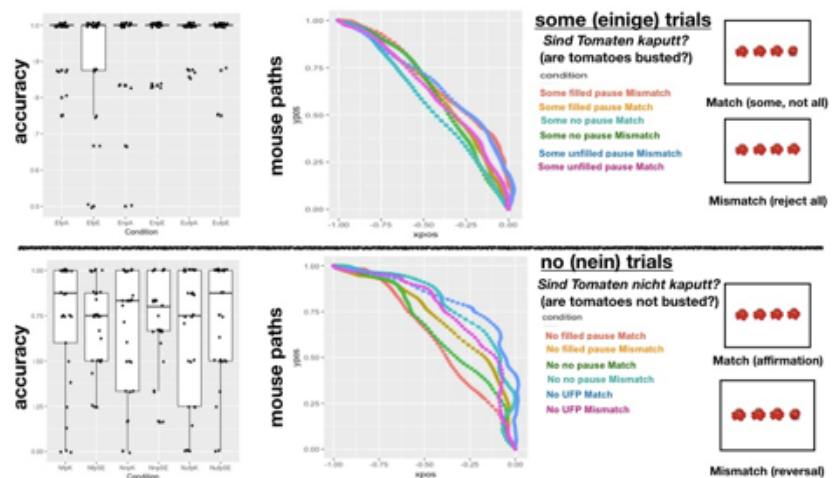
Introduction. Gap length, i.e. unfilled pauses, has been treated as a measure of predictive processing [5]. This treatment of gaps as symptoms is similar to that of filled pauses such as *um* or *uh* [1,2,3]. However, gaps can take on additional meanings. Consider the following:

- (1) a. Sam: Hey, can you come to my party tonight?
 b. Ben: **No I can't #** vs.No, I cant
- (2) a. Sam: Hey, do you think that it is about time to shave my head?
 b. Ben: No, you have plenty of hair. vs.**No, you have plenty of hair. #**

The source of these inferences has been argued to arise from question bias: speakers should *maximize agreement*, i.e. questions should be tailored towards agreement [9]. Because of this preference for agreement, disconfirmations should be delayed relative to affirmations [6]. Such biases have been examined almost uniquely for *polar answers to polar questions*, though speaker often answer (30-40%) polar questions with non-polar answers [8]. In two mouse-tracking experiments, we investigate (1) how biases influence ambiguous polar responses and (2) if biases for polar responses map onto non-polar responses.

Method. Thirty native German speakers collaborated with a confederate on an interactive picture-matching task (*wizard of oz paradigm*). Participants simultaneously saw an image depicting an answer and heard a confederate's response, which either *matched* the picture or not (*mismatch*). The experiment had a 2 x 3 Latin-squared design with answer type (*einige* (some) vs. *nein* (no)) and pause type (*no pause* (NP), *filled pause* (FP), *unfilled pause* (UFP)) as factors. All trials were embedded under different contexts and participants read a question with a positive antecedent ("Are the tomatoes crushed?") for *einige* (some) trials or a negative antecedent ("Are the tomatoes not crushed?") for *nein* trials ("no" can either *affirm* negative antecedents or *reverse* them [10][11]).

Results E1. The response data for *Nein* (no) trials showed much more variation, although differences across pause types were not statistically significant ($p > .36$). Participants' mouse paths were more direct to targets than for matched trials with NPs and FPs than for unmatched trials, but this was the opposite for UFPs, $t=2.92$, $p < .02$. Participants had more direct answers to target for *einige* (some) matched trials vs. mismatched trials for NPs



(replicating delay for SIs), though this effect went away for both FPs and UFPs, $t=4.6$ $p < .001$. **Discussion.** The findings from Experiment 1 show that listeners did not map question biases for polar answer to non-polar answers, suggesting that in unfilled pauses preceding non-polar answers are interpreted similar to filled pauses. This was not the case for no-responses: listeners were quicker to select affirmations (match trials) for the no-pause and filled pause conditions and were delayed with unfilled pauses. The opposite effect appeared for reversals (mismatch trials): participants were delayed at the with no pause and filled pauses, but were relatively quicker for with unfilled pauses.

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Talk & Poster Abstracts

Day 3

Friday, August 30th, 2019

Eye-movement control in the Visual World Paradigm

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The presumably widely shared, although not often explicitly articulated assumption behind the use of the Visual World paradigm is that participants tend to automatically look at the object that undergoes linguistic processing at the current moment. The assumption is based on close correspondence in time between the onset of the reference to the object/action and fixations to its depiction. However, close correspondence in time does not necessarily imply automaticity, and lack of automaticity would affect the interpretation of experimental results: if language-mediated eye-movements are not automatic, then the absence of fixations on the object cannot be seen as absence of linguistic processing of the corresponding word.

We conducted two experiments (with 80 participants each) that tested the automaticity of language-mediated eye movements by probing whether they could be canceled by volitional control. Each experiment had two between-subjects conditions: in the *eye-movement control* condition, participants were asked to not look at the object that is currently being referred to. In the *free viewing* condition, participants had a classical ‘look and listen’ task. Both experiments included in each condition the same 32 short stories, each with 10 critical words – nouns and pronouns – referring to the images on the screen. Experiment 1 had no additional task, while in Experiment 2 participants had to answer yes/no comprehension questions after each story to ensure that they processed the linguistic input.

The analysis of the aggregated data from both experiments showed two main effects: execution of an incoming saccade to the referred image was less likely in the eye-movement control conditions ($\text{prob}(\beta < 0) \approx 1$) and less likely when comprehension questions were asked ($\text{prob}(\beta < 0) \approx 1$). Although participants exhibited some degree of volitional control over their eye movements, it was far from full: the probability of executing an incoming saccade in the eye-movement control condition decreased from 55% to 13% without questions, and from 40% to 10% with comprehension questions. At the same time, participants’ abilities to suppress saccades to the referred images varied greatly: in the first experiment, 4 out of 40, and in the second experiment, 10 out of 40 individuals in the eye-movement control condition were estimated to fixate the referred images in less than 5% of cases.

Our results align with the conclusions drawn by Mishra et al. (2013): language-mediated eye-movements constitute a semi-automated process that can be controlled to some degree irrespective of comprehension questions. However, the demonstrated degree of volitional control suggests that we cannot interpret the absence of fixations as evidence for the absence of linguistic processing.

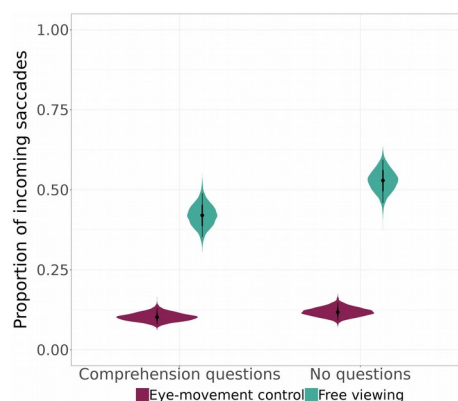


Figure 1: Estimated probabilities of fixating the referred images across experimental conditions; black lines represent credible intervals: thick – 66%, thin – 95% CrI.

Another look at the online processing of scalar inferences: an investigation of conflicting findings from visual-world eye-tracking studies

Chao Sun (Humboldt-Universität zu Berlin) & Richard Breheny (University College London)

The pragmatic enrichment from *some* to ‘some but not all’ is a representative example of so-called scalar inference (SI). For instance, in an utterance ‘I ate some of the cookies’, the quantifier *some*, whose semantic meaning is ‘some and possibly all’, usually receives a pragmatic interpretation ‘some but not all’. In real-time language comprehension, the question is that whether there is a temporal priority of semantic processing over pragmatic processing. Previous psycholinguistic studies that compared the time course of interpretation for *pragmatic some* and *literal all* have returned mixed results. In particular, a delayed *pragmatic some* has been found in some studies but not in others. We explain these conflicting findings in terms of factors which are independent of incremental semantic/pragmatic interpretation. Two offline studies demonstrated that there is a low-level association between linguistic expression and relative set size of the visual target. We asked participants to indicate on a slider scale which image fits better with a statement containing a quantifier (fig.1). There was no clear solution of the task. However, we found that, participants expect the referent of *all*, which is an unpartitioned set of objects, to be the relatively large cardinality set in the visual display. In a series of visual-world eye-tracking studies, we showed that such association influences participants’ eye movements in online comprehension. In one of the visual-world studies, participants viewed a visual display (fig.2) while listening to an instruction of the form “Click on the [girl/boy] that has [determiner] of [name’s] [noun]”, [determiner] is one of *some*, *all*, *two*, *three*. The residues of partitioned sets were in the centre. We found that, after hearing *all*, the target bias increased faster when the target was a larger set compared to when it was a smaller set. More importantly, here we introduce a new measure for investigating the time course of scalar inference – looks to the residue set. Growth curve analysis revealed a U-shape parabolic change in fixation probability on the residue set in the *all* and *some* but not in the *number* condition. This allows us to reason about the time course question based on the difference in verification procedures between numbers and quantifiers. Results from our visual-world studies suggest that deriving the pragmatic interpretation is not delayed relative to the semantic interpretation.

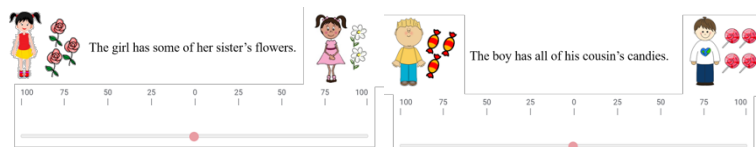


Figure 1: Examples for experimental items used in offline studies

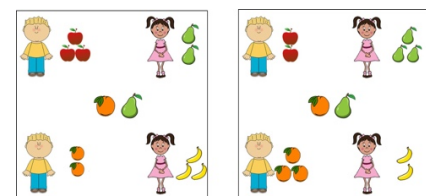


Figure 2: Both images can be paired with ‘Click on the boy that has all of Susan’s apples’ or ‘Click on the girl that has some of Susan’s pears’. In addition, the left image can be paired with ‘Click on the girl that two of Susan’s pears’ and the right image can be paired with ‘Click on the girl that has three of Susan’s pears’.

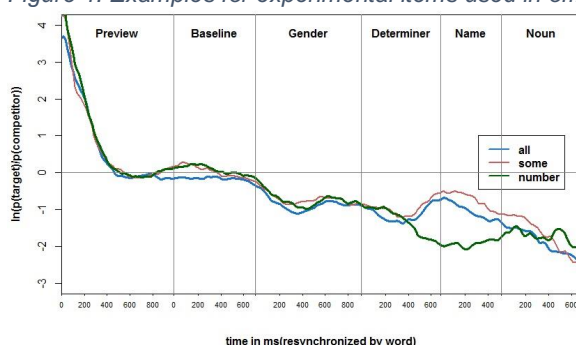


Figure 3: Fixation probabilities (empirical logit transformation) on the residue set by determiner type from the instruction onset to the instruction offset.

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Prediction of orthographic information during listening comprehension

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People often pre-activate meaning of a predictable word during listening (Altmann & Kamide, 1999), but current prediction models are underspecified as to whether people also pre-activate orthographic form, and if so, how pre-activation of orthography and phonology interacts. Upon hearing a word, people seem to access its orthographic form automatically (Frost & Ziegler, 2007), so people may pre-activate the orthographic form during listening. On the other hand, some prediction models (e.g., Pickering & Gambi, 2018) propose that people use their language production system for prediction and pre-activate representations of a predictable word like they do so in production. In speech production, people do not seem to access a word's orthographic form automatically (Alario, Perre, Castel, & Ziegler, 2007), so people may not pre-activate orthographic form during listening.

We tested orthographic pre-activation in a visual world eye-tracking study using Japanese to dissociate orthographic effects and phonological effects. In Japanese logograph (kanji), it is possible to create word pairs that are orthographically related but not phonologically related. Native Japanese speakers ($N=57$) heard sentences that contained a predictable word (cloze probability $M=87\%$), and viewed a scene depicting 4 objects. Their task was to click on a mentioned object or the background (when none of the objects was mentioned). The scene contained a critical object, which represented either the predictable word (e.g., 魚 /sakana/; fish), its orthographic competitor (e.g., 角 /tuno/; horn), its phonological competitor (e.g., 桜 /sakura/; cherry blossom), or an unrelated word (e.g., 本 /hon/; book), together with 3 distractor objects. If participants pre-activate orthographic form of the predictable word, they should be more likely to fixate orthographic competitor objects over unrelated objects before the predictable word could be processed.

Figure 1 plots the model fit of a mixed-effects model. It tested an effect of condition and its interaction from the scene onset +200 ms to the target word onset +200 ms (200ms lag: estimate for saccade initiation) with linear and quadratic time (using orthogonal polynomials) as it fit the observed time-course data well. Target and orthographic competitor objects attracted more overall looks, $ps < .05$, and had a clearer peak, $ps < .01$, than unrelated objects. Phonological competitor and unrelated objects attracted similar amount of looks.

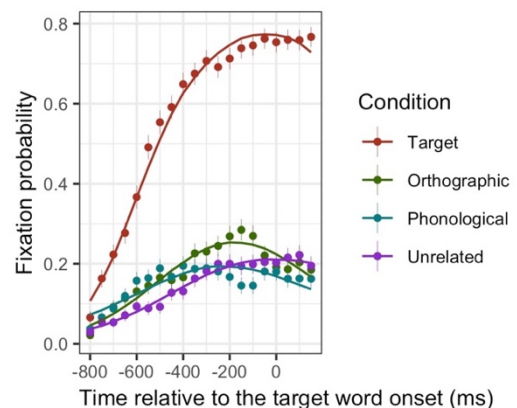


Figure 1: Fixation probability and model fit

The orthographic competitor effect suggests that people pre-activated orthographic form of predictable words during listening, in contrast to (no) orthographic activation in speech production. The lack of phonological competitor effect suggests that pre-activation of orthographic form may not spread activation to its associated phonological form or vice versa, in contrast to interactive activation in speech recognition. The findings may suggest that prediction involves mechanisms based on both production and non-production (e.g., priming) systems.

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Percepts, concepts, and knowledge states in real-time referential comprehension

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To what degree is perceptual information prioritized as listeners compute reference in the visual here-and-now? Previous Visual World experiments using *visually misleading objects* have shown listeners will strongly weight their knowledge of an object's true identity even when it is at odds with its appearance. E.g., a candle that looks like a lightbulb (novelty store item) will function as a lexical competitor for the target CANDY to the same extent as a real candle, so long as the listener knows the competitor's true nature (Mozuraitis, 2015). In fact, conceptual knowledge can overshadow perceptual information even when the former is largely irrelevant, such as dialogue scenarios where a listener knows the speaker is naive about visually-misleading object's true identity (and as such could not possibly refer to it in terms of its true identity, Mozuraitis et al., 2015). Here, we use *contrastive reference* (Sedivy et al., 1999) to explore how listeners manage perceptual and conceptual conflict in a context with different processing demands. In **Expt 1**, listeners followed instructions referring to one of four real objects located in individual shelf compartments (see Fig 1). On critical trials, the target (small screw) and a size-contrasting alternative (big screw) formed a contrast set, and one of these items served as the target (e.g., *Tap the small screw*, note that fillers neutralized any contingencies in critical trials). In the **One Contrast** condition, the remaining two display objects were distinct from one another conceptually and perceptually (big candle, small lightbulb).

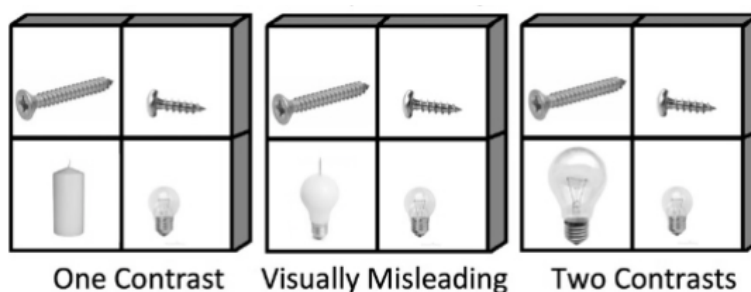


Figure 1: Example conditions for Experiment 1

Here we observed rapid saccades to the target (measured from ADJ onset), indicating listeners recognized that *small* was being used to refer to an object within the only contrast set that was visually available. In the **Two Contrasts** condition, the remaining two display objects formed a contrast set (big and small lightbulb). Here, listeners were slower at target identification because the display now contained two candidates for "*small [X]*", requiring disambiguation by the noun. In the **Visually-Misleading** (VM) condition, the remaining two display objects were perceptually similar but belonged to different categories (small lightbulb and a large wax candle resembling a lightbulb). This condition was like the Two Contrasts condition in perceptual terms but was conceptually congruent to the One Contrast condition (because listeners were earlier made aware of all objects' identity, albeit without linguistic labelling.) In this condition, target latencies matched the Two Contrasts condition, suggesting perceptual information was being prioritized (i.e., as if the candle and lightbulb formed a contrast set). In **Expt 2**, the same conditions were used except the VM condition was modified so that it was conceptually congruent to the Two Contrasts condition (e.g., a small candle and a big candle that resembled a lightbulb) but was perceptual similar to the One Contrast condition. Again, listeners prioritized perceptual information, with the VM condition now resembling the One Contrasts condition. These patterns contrast with Mozuraitis et al. (2015), where listeners were indifferent to visually-misleading objects' appearance and instead prioritized their true nature. We suggest the current results reflect the processing demands entailed by establishing contrast in real time. Specifically, an unfolding contrastive expression requires listeners to rapidly compute or confirm the existence of relevant contrast sets, for which surface level-perceptual features may be the most accessible cues.

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Visual and linguistic processes in situated language comprehension

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 Saarland University

According to Grice's Maxims of Quantity (Grice 1975), speakers' utterances should include the minimal amount of information necessary, as redundancy may engage listeners in unintended pragmatic inferencing. It is, however, unclear whether redundancy hinders comprehension or not (e.g., Engelhardt et al. 2011, Tourtouri et al. 2015). We investigated the influence of over-specification on situated comprehension. Additionally, we evaluated the predictions of the Entropy Reduction Hypothesis (Hale 2006) in the visual world, examining whether the amount of entropy reduction on a word is associated with difficulty of processing that word, and may be able to explain a potential preference for over-specification.

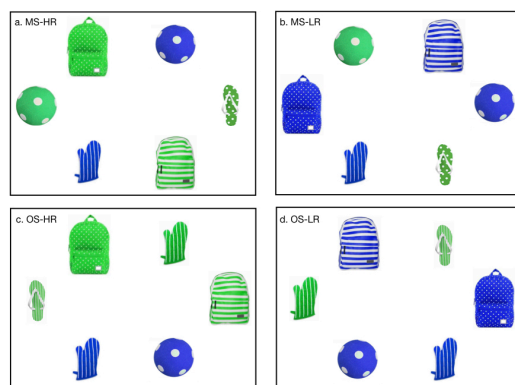


Figure 1. Sample visual stimuli of a Colour item.

In an EEG (Exp.1, N=32) and an eye-tracking (Exp.2, N=24) experiment, we presented participants with either of four versions of a visual display (Fig.1), paired with a single audio instruction, like 'Find the blue ball', in German. We manipulated (a) the Entropy Reduction rate: the adjective (Colour or Pattern) reduced entropy either at a high rate (1.58 bits in Fig.1a & c; High Reduction, HR) or at a low rate (0.58 bits in Fig.1b & d; Low Reduction, LR), leaving a smaller (1 bit) or larger (2 bits) amount of entropy, respectively, to be eliminated at the noun, and (b) the Specificity of the referring expression: when a shape competitor was present (Fig.1a & b) the

expression was minimally-specified (MS), while it was over-specified (OS) when the target was singleton (Fig.1c & d). For comparability, in both experiments we also measured the Index of Cognitive Activity (ICA), a direct measure of cognitive workload, based on the small and rapid pupil dilations that are associated with higher cognitive effort (Marshall 2002). Participants' task was to identify which side of the display (left or right) the target referent was on. In order to minimise eye movements in Exp.1, participants fixated a cross in the centre of the screen while the instruction was heard.

While in Exp.1 there were no effects on the ICA, in Exp.2 ICA values were lower for LR vs. HR on the adjective and for HR vs. LR on the noun, as predicted by the Entropy Reduction Hypothesis. Additionally in Exp.1, HR resulted in an attenuated N400 on the noun compared to LR, indicating that lexical access on the noun was facilitated after a high reduction of entropy on the adjective. Regarding Specificity, the effects differed for the kind of adjective: In Pattern items, there was a larger N400 on the noun for OS vs. MS, while in Colour items no difference was observed. These results indicate that lexical access on the noun was hindered after a redundant pattern, but not after a redundant colour adjective. In both Colour and Pattern items, however, OS elicited a larger P600 on the noun, indicating that integration on the noun was hindered for both kinds of adjectives (cf. Brouwer et al. 2012). Furthermore, in Exp.2 we found that after hearing the adjective listeners were more likely to fixate the object that bore the mentioned feature and was part of a contrast pair (cf. the ball in Fig.1a & b, and the mitt in Fig.1c & d) in the HR compared to the LR condition, but only with pattern adjectives. In line with the Gricean approach, this finding suggests that pattern adjectives were more likely to be interpreted contrastively, when fewer matching objects were available (cf. HR vs. LR). Interestingly, however, ICA values were lower on the noun in the OS compared to the MS condition in both Colour and Pattern items. Taken together, our results indicate that even though over-specification may hinder language comprehension (cf. neurophysiological and visual attention measures), as listeners' expectations about the target referent were misguided by the redundant (pattern) adjective, visual search was facilitated by the redundancy of the encoding, regardless of the kind of redundant adjective used (cf. ICA).