I would if I could but I can't: Different types of non-prototypical Actor arguments are processed in a qualitatively similar manner

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Introduction

Language is a uniquely human ability and also one of the most complex human cognitive skills. It thus appears plausible to assume that there is an intimate relationship between the structure of human language(s) and basic characteristics of human neurobiology / neurocognition.

One possible way of shedding further light on this relationship is to draw conclusions about possible "universals" of language by identifying cross-linguistically recurring patterns of language processing. These universals can be considered potential candidates for links between language and cognition / neurobiology.

A potential universal of language processing that has been identified in this way is the endeavour towards unambiguous identification of the "actor", i.e. the participant primarily responsible for the state of affairs described (Bornkessel-Schlesewsky & Schlesewsky, 2009).

The aim of the present study was to provide a more fine-grained characterisation of linguistic actorhood and its neurocognitive ramifications by examining the role of "volitionality" as a key feature of prototypical actors.

Actorhood and Volitionality: A Cross-linguistic View

In English, states of affairs such as (1) and (2) are encoded in a grammatically identical manner. Prima facie, this appears to suggest that linguistic structure is primarily attuned to encoding causality or the "starting point" of an event (MacWhinney, 1977): the protagonist, *the old man*, is treated identically whether he volitionally causes the event (example 1) or experiences it (example 2). In many other languages, by contrast, non-volitionality of an actor can be grammatically encoded, for example via dative case marking as in example (3) from Tamil:

(1) The old man kidnapped Mary.

(2) The old man loved Mary.

(3) **ஷங்கருக்கு** **குருவைத்** **தெரியும்.**
Shankar~u'-kku' Guru~v-ai~th ther-iy-um.
$[Shankar]_{DAT.An}$ $[Guru]_{ACC.An}$ $[know]_{Future\text{-}3singular\text{-}Neuter}$
'Shankar knows Guru'.

Similar structures occur in a range of other languages, e.g. Hindi, Japanese, Icelandic, and Russian. This recurring pattern suggests that volitionality may be a key feature in the definition of linguistic actors, since non-volitional actors are consistently flagged with additional morphological marking.

Previous Neurocognitive Findings

Previous studies examining the processing of non-volitional actors have focused on inanimate actors. In this regard, it has been demonstrated for several languages (including German, English, Chinese and Tamil) that inanimate actors engender an N400 effect in terms of event-related brain potentials (ERPs) and that this effect can be reduced neither to lexical differences between animates and inanimates nor to the infrequency of inanimate Actors (for an overview, see Bornkessel-Schlesewsky & Schlesewsky, 2009).

However, inanimate actors are not only non-volitional but also lack other prototypical actor properties such as sentience and the capability for autonomous movement (Primus, 1999). Previous findings on inanimate actors are thus not suited to isolating the individual actor characteristic(s) that are particularly important for the cognitive definition of a prototypical actor.

The present study

The aim of the present study was to isolate the neurophysiological response to non-volitional actors and to compare it to that for inanimate actors. To this end, we examined the processing of "dative subject" constructions in Tamil (cf. example 3).

Participants listened to question-answer pairs such as those in Table 1. The context questions ensured that dative arguments would be interpreted as actors rather than as indirect objects. All sentence types were also presented in a neutral context.

The critical dialogues were interspersed with a range of fillers including intransitive sentences, transitive sentences with a dropped subject and sentences with dative indirect objects.

Participants:
30 right-handed, native speakers of Tamil from India, mostly students living in Germany at the time of the experiment.

Materials:

- 72 sets of the conditions in Table 1, subdivided into two lists of 288 sentences each (36 per condition)
- Each list was interspersed with 576 filler sentences and presented in two experimental sessions
- Questions and answers were recorded by a male and female native speaker of Tamil, respectively

Procedure:

- Auditory presentation of question-answer dialogues via loudspeakers
- After each dialogue, participants answered a comprehension question

EEG Recording and Preprocessing:

- 25 AgAgCl-electrodes placed according to the International 10-20 system (ground: AFz; reference: left mastoid, re-referenced to linked mastoids offline)
- EEG data were filtered with 0.3-20 Hz bandpass (offline) in order to remove slow signal drifts

Table1: Example sentences for the critical conditions in the present study

	Neutral Context for all sentence types	**சொல்லவந்ததை சுருக்கமாக சொல்!** Solla-vandh-adh-ai surukkam-a:ga sol! $[Say\text{-}come\text{-}that]_{ACC.In}$ $[brief]_{ADV}$ $[tell]_{Imperative\text{-}2singular}$ 'Say what you wanted to briefly'!
Actor Type	**Order: Actor-First**	**Order: Actor-Second**
Non-volitional Animate (Dative)	**யாருக்கு யாரைத் தெரியும்?** Ya:r~u'-kku' ya:r-ai~th ther-iy-um? $[Who]_{DAT.An}$ $[who]_{ACC.An}$ $[know]_{Future\text{-}3singular\text{-}Neuter}$ 'Who knows whom'? **ஷங்கருக்கு குருவைத் தெரியும்.** Shankar~u'-kku' Guru~v-ai~th ther-iy-um. $[Shankar]_{DAT.An}$ $[Guru]_{ACC.An}$ $[know]_{Future\text{-}3singular\text{-}Neuter}$ 'Shankar knows Guru'.	**யாரை யாருக்குத் தெரியும்?** Ya:r-ai Ya:r~u'-kku'~th ther-i~y-um? $[Who]_{ACC.An}$ $[who]_{DAT.An}$ $[know]_{Future\text{-}3singular\text{-}Neuter}$ 'Who knows whom'? **குருவை ஷங்கருக்குத் தெரியும்.** Guru~v-ai Shankar~u'-kku'~th ther-i~y-um? $[Guru]_{ACC.An}$ $[Shankar]_{DAT.An}$ $[know]_{Future\text{-}3singular\text{-}Neuter}$ 'Shankar knows Guru'.
Inanimate (Nominative)	**எது யாரை எழுப்பியது?** Edhu' ya:r-ai ezhupp-i~y-adhu'? $[What]_{NOM.In}$ $[who]_{ACC.An}$ $[wake\text{-}up]_{Past\text{-}3singular\text{-}Neuter}$ 'What woke up whom'? **வெளிச்சம் குருவை எழுப்பியது.** Vel.ichcham Guru~v-ai ezhupp-i~y-adhu'. $[Brightness]_{NOM.In}$ $[Guru]_{ACC.An}$ $[wake\text{-}up]_{Past\text{-}3singular\text{-}Neuter}$ 'Brightness woke Guru up'.	**யாரை எது எழுப்பியது?** Ya:r-ai edhu' ezhupp-i~y-adhu'? $[Who]_{ACC.An}$ $[what]_{NOM.In}$ $[wake\text{-}up]_{Past\text{-}3singular\text{-}Neuter}$ 'What woke up whom'? **குருவை வெளிச்சம் எழுப்பியது.** Guru~v-ai vel.ichcham ezhupp-i~y-adhu'. $[Guru]_{ACC.An}$ $[brightness]_{NOM.In}$ $[wake\text{-}up]_{Past\text{-}3singular\text{-}Neuter}$ 'Brightness woke Guru up'.

Results

When a dative-marked noun was unambiguously designated as a non-volitional actor by the context, it engendered a broadly distributed negativity (N400) followed by a late positivity in comparison to when the acoustically identical target sentence was presented in a non-specific context (Figure 1). Notably, this effect only occurred for dative-initial sentences.

Inanimate actors engendered a qualitatively similar negativity (Figure 2), though for a non-specific vs. specific context. This effect was only observable for inanimate nominatives in the second position, i.e. for inanimate nominatives preceded by an accusative.

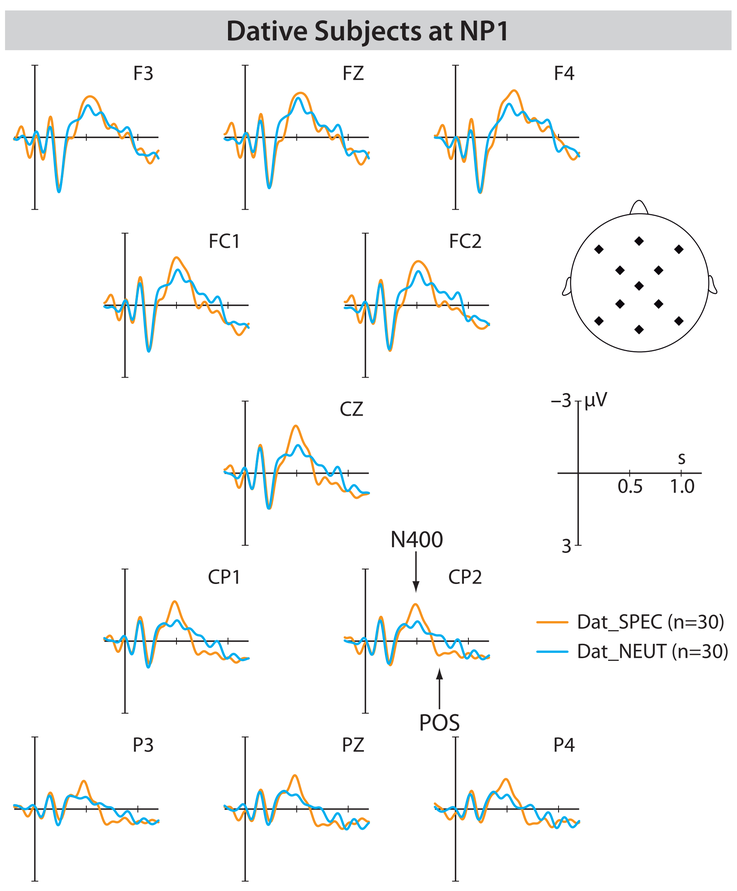

Figure 1: Grand average ERPs timelocked to the onset of an animate non-volitional actor ("dative subject"; onset at the vertical bar) in sentence-initial position for specific (SPEC) vs. non-specific (NEUT) contexts. Negativity is plotted upwards.

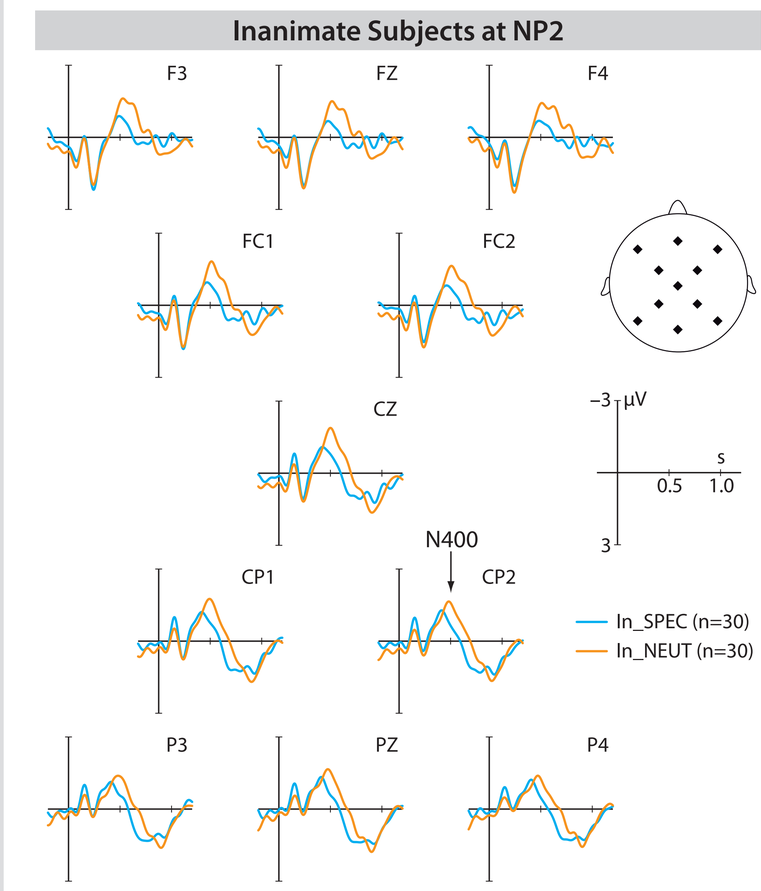

Figure 2: Grand average ERPs timelocked to the onset of an inanimate actor (onset at the vertical bar) in NP2 position for specific (SPEC) vs. non-specific (NEUT) contexts. Negativity is plotted upwards.

In contrast to the results for non-volitional (dative) and inanimate (nominative) actors, ERPs to dative indirect objects and animate nominatives were not modulated by context, thus attesting to the fact that the effects in our critical conditions did not simply result from the comparison of target sentences in a specific and a non-specific context.

Discussion

Non-volitional animate actors (dative subjects) engendered an N400 - late positivity pattern when they occurred as the clause-initial argument in a target sentence following a specific context question. This result attests to the language comprehension system's reluctance to analyse an animate dative as a non-volitional actor (dative subject) as such an interpretation appears to require both contextual and word order support. (Dative subjects typically occur in the clause-initial position). This is in line with the proposal that animate actors are preferentially interpreted as volitional agents via a pragmatic inference (Holisky, 1987).

The assumption that, in addition to realising non-prototypical actors, the dative subjects in our experiment conflicted with a pragmatic preference is supported by the observation of a late positivity. These effects have been associated with pragmatic enrichment, e.g. as required in situations of reference transfer such as *The ham sandwich over in the corner wants another coffee* (Schumacher, to appear).

Inanimate actors engendered a qualitatively similar negativity effect (N400) to non-volitional actors. This effect was observable in a non-specific vs. a specific context, i.e. when the inanimacy of the actor argument was not known in advance, and when the inanimate nominative argument was unambiguously identifiable as an actor because it was preceded by an accusative.

Conclusion

Our findings suggest that volitionality plays a central role in the definition of a prototypical actor. Non-volitional animate actors engendered a qualitatively similar negativity effect (N400) to inanimate actors, thereby indicating that the language processing system's response to inanimate actors is conditioned by their lack of volitionality as opposed to their incapacity for autonomous movement or sentience. The additional late positivity observed for non-volitional animate actors likely reflects a pragmatic preference for animate actors to be interpreted as volitional.

The neural language comprehension system thus appears to be attuned to volitionality as a key feature of actorhood: non-volitional actors are penalised and, conversely, animate event participants are preferentially interpreted as volitional (i.e. responsible for their actions).

References

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