Processing of morphologically complex words: Evidence from Bengali

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Introduction

Representation and access of morphologically complex words remain controversial issues in research on language processing as there is no universally accepted way of modelling morphological processing (cf. Amenta & Crepaldi 2012 for a review).

A number of different models have been proposed:

- full-listing of all morphologically complex words (e.g. Butterworth, 1983)
- affix stripping (e.g. Taft & Forster, 1975)
- dual access models for regular and irregular complex items (e.g. Pinker & Ullman, 2002)

While much of the experimental data provides evidence for a central role of morphological decomposition in language comprehension, there are aspects of this process which are not yet well understood.

Although there is evidence that morphological decomposition plays a role in language comprehension, questions remain about the differences (if any) in the processing of suffixed words versus prefixed words. It has been shown that suffixed words do not activate each other due to phonological cohort interference (e.g. *governor* does not prime *government*; Marslen-Wilson et al., 1994). However, if morphological decomposition is a must, then there should be no inhibition for suffixed words.

The present research focuses on the question of which factors affect the processing of affixed words during language comprehension.

Factors under investigation are:

- affix position and combination (i.e. suffix or prefix)
- direction of priming (stem → affixed item; affixed item → stem)

Research Questions

- Is the access of the stem via decomposition of prefixes and suffixes equally efficient in morphologically complex words?
- Which type of processing model explains the processing of affixed words most accurately?
- Do we find inhibitory effects for prime-target pairs consisting of two suffixed items (cf. Marslen-Wilson 1994)?

Experimental Design

- Five cross-modal lexical decision tasks with auditory primes and visual targets
- All derivationally complex (semantically transparent) Bengali words

	Exp1	Exp2	Exp3	Exp4	Exp5
Structure	stem ⇔ prefix	stem ⇔ suffix	prefix - prefix	suffix - suffix	prefix ⇔ suffix
Prime	aʃa *'hope'*	dɔea *'compassion'*	dur-din *'bad times'*	bʰag:o-ban *'fortunate'*	ɔ-bitʃar *'injustice'*
Target	dur-aʃa *'without hope'*	dɔealu *'compassion-ate'*	ʃu-din *'happy times'*	bʰag:o-hin *'unlucky'*	bitʃar-ok *'judge'*
Stem			din *'times'*	bʰag:o *'fate'*	bitʃar *'judgement'*

⇔ indicates presentation in both directions

Participants

- 64 adult native speakers of Bengali
- all university students at Jadavpur University and Bethune College, Calcutta, India

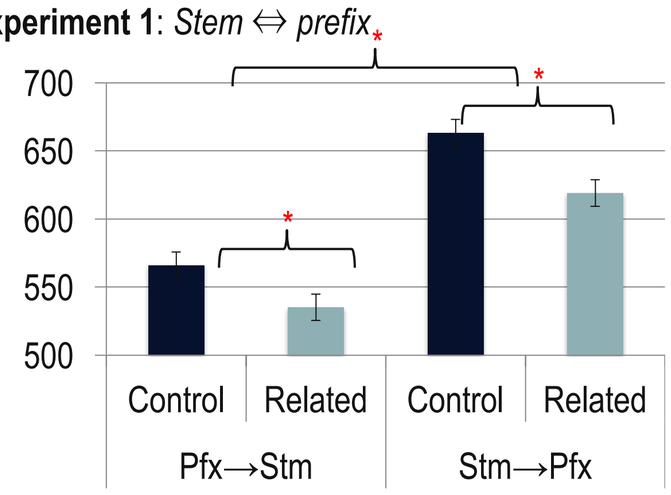
Predictions

Predictions:

- We expect to find evidence for morphological decomposition since it is a fundamental part of language comprehension.
- Prefixed words will be no more difficult to process than suffixed words.
- Prime-target pairs of two semantically-transparent suffixed items should not lead to inhibition.

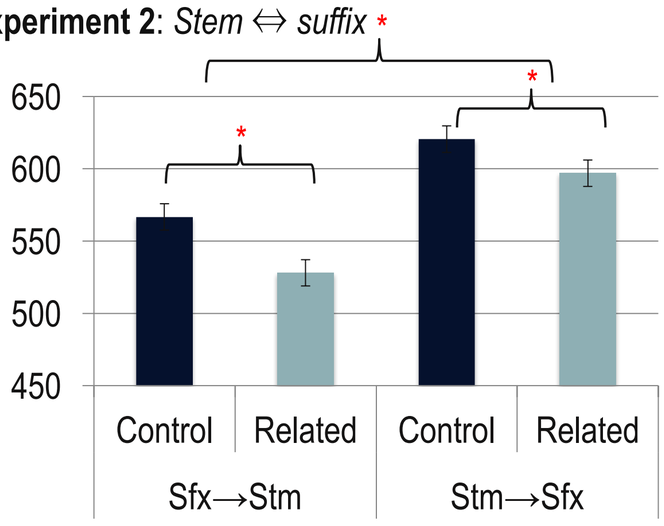
Results

Experiment 1: *Stem ⇔ prefix*



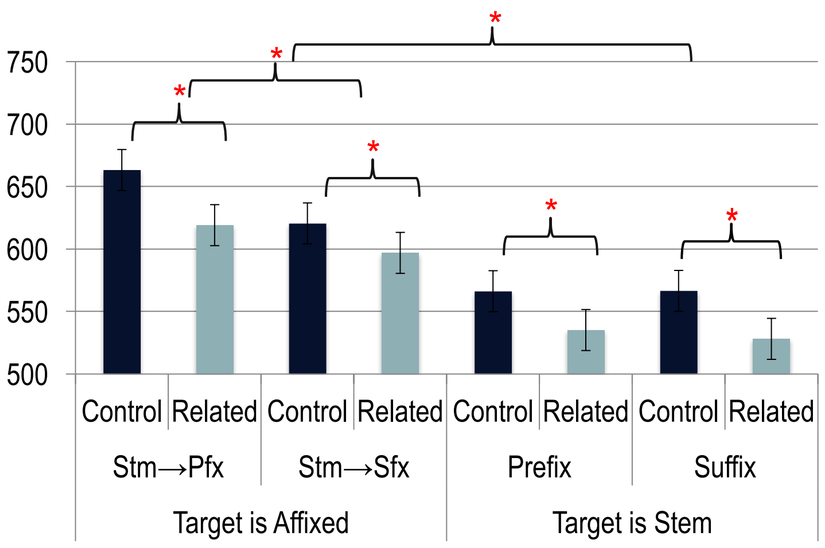
- Main effect of relatedness $p < .001$
- Main effect of direction, $p < .001$
- No interaction

Experiment 2: *Stem ⇔ suffix*



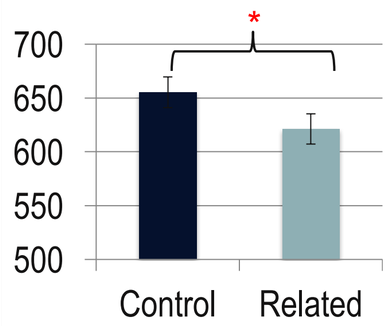
- Main effect of relatedness $p < .001$
- Main effect of direction, $p < .001$
- No interaction

Experiments 1 & 2: *Prefix/suffix ⇔ stem*



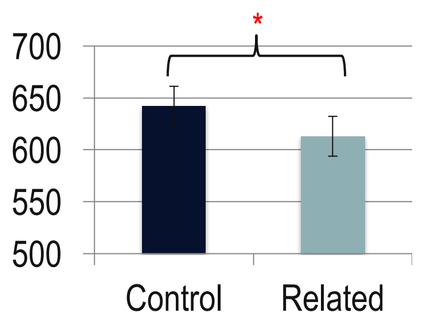
- Main effect of relatedness $p < .001$
- Significant interaction between *condition* and *target*, p =.034
- Main effect of relatedness $p < .001$
- No interaction

Experiment 3: *Prefix - prefix*



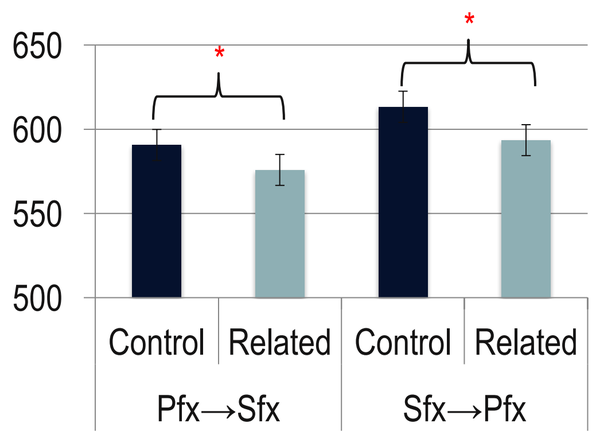
- Main effect of relatedness $p < .001$

Experiment 4: *Suffix - suffix*

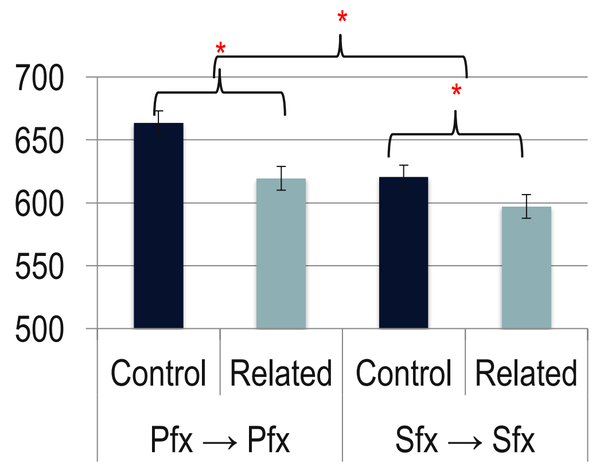


- Main effect of relatedness $p < .001$

Experiment 5: *Prefix ⇔ suffix*



- Main effect of relatedness $p < .001$
- Main effect of direction, $p < .001$
- No interaction



- Main effect of relatedness $p < .001$
- Significant interaction between *condition* and *target*, p=.036

Discussion

a) Overall the data provides substantial evidence for morphological decomposition.

b) Stems as targets: both prefixed and suffixed primes trigger similar degree of facilitation (Exps 1 & 2)

c) Contrary to the lack of priming found for suffixed words in English, Bengali suffixed items prime each other to the same degree as corresponding prefixed items in a blocked design (Exps 3 & 4)

d) Affixed forms as targets: significantly greater facilitation of prefixed targets compared to suffixed forms (Exp 5, Table 2)

- ➢ prefixed words provide the necessary information (i.e. which prefix is used) early but in suffixed targets this information is delayed (i.e. a later uniqueness point)

e) Suffixed targets result in significantly faster response latencies across all conditions.

- ➢ may be attributed to the simultaneous activation of both phonological and morphological cohorts
- ➢ for prefixed targets only the morphological cohort is activated initially

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Selected References

Amenta, S., & Crepaldi, D. (2012). Morphological processing as we know it: an analytical review of morphological effects in visual word identification. *Frontiers in Psychology*. doi: 10.3389/fpsyg.2012.00232. **Butterworth, B.** (1983). Lexical representation. In B. Butterworth (ed.), *Language Production*, London: Academic Press, pp. 257-294. London: Academic Press. **Marslen-Wilson, W., Tyler, L., Waksler, R. & Older, L.** (1994). Morphology and meaning in the English mental lexicon. *Psychological Review*, 101(1), 3-33. **Pinker, S. & Ullman, M. T.** (2002). The past and future of the past tense. *Trends in Cognitive Science*, 6: 456-463. **Taft, M. & Forster, K. I.** (1975). Lexical storage and retrieval of prefixed words. *Journal of Verbal Learning and Verbal Behavior*, 14, 638-647.

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