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Background. Negated forms have been shown to cause a higher processing cost for language comprehension in the form of higher error rates and longer processing times (Wason, 1959; Wason & Jones, 1963; Just & Carpenter, 1971). Research on prefixal negation (e.g. *unhappy*) suggests that although prefixally-negated forms involve an explicit negator such as *un-*, they are not processed as negated forms and do not involve a processing cost (Hoosain, 1973; Sherman, 1976). This study revisits the processing cost issue. In two Artificial Language Learning (ALL) experiments, we investigate participants' responses to pictorial representations of negated and non-negated meanings. Through pictures we teach them meanings equivalent to:

1. Prefixal negation such as *unhappy* – referred to as "narrow negation"
2. Constituent negation expressed by the negator *not* as in *not happy* – referred to as "broad negation"
3. No negation

In experiment 1, the scope of broad negation (*not happy*) included the meaning of narrow negation (*unhappy*) while in experiment 2, the scope of broad negation covered the middle range of the scale between the two extremes '*happy – unhappy'*. Using artificial language learning eliminated length and frequency differences between the forms that are inherent in natural language.

Methods. Experiment 1 (37 participants) and experiment 2 (28 participants) both consisted of one learning phase and one testing phase. In the learning phase, participants learned three prefixes corresponding to the three forms described above: 1. *ka*: narrow negation, 2. *va*: broad negation, 3. *sa*: empty prefix with no negation. Next, participants learned 8 artificial adjectives that were later used in the testing phase (e.g. *reft*='full'). The testing phase comprised a picture-word verification task in which participants were tested on the combination of the three prefixes and the artificial adjectives previously memorized (e.g. *kareft*, *vareft*, *sareft*).

Results. In experiment 1, increased response times and lower accuracy rates were found for narrow negation compared to non-negated form. Moreover, broad negation resulted in the highest number of errors. However, no differences were found in response times between narrow and broad negations. In experiment 2, further proof of the processing cost of narrow negation in comparison to the non-negated condition was found in the form of lower accuracy rates. No differences were found in the response times across the three forms. In experiment 2, broad negation was no longer more costly than narrow negation.

Conclusion. The experiments showed increased processing times and higher error rates for narrow negation compared to the non-negated condition. This new finding suggests that prefixally-negated meanings are in fact processed as negated meanings and involve a processing cost. Moreover, broad negation was the most costly form to process in experiment 1. However, when its scope was limited to the middle range between the outer poles, broad negation was no longer more difficult than narrow negation. This suggests that broad negation was more costly to process when there was overlap in meaning with the range for narrow negation and this large meaning span makes broad negation more vague and more difficult to process.

References

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Figures:

Experiment 1 **Experiment 2**