

Not-so strategic prediction: N400 effect of predictability regardless of overall predictive validity

Wenjia Zhang (South China Normal University), Wing-Yee Chow (University College London), Bo Liang (South China Normal University), Hsuan-Chih Chen (The Chinese University of Hong Kong) & Suiping Wang (South China Normal University)
zhangwenjia2732@126.com

Much research has demonstrated that comprehenders can generate predictions about upcoming inputs on the fly [1-2]. However, some have argued that comprehenders do not normally engage in predictive processing, and that evidence for prediction was primarily due to artificially prediction-encouraging experimental contexts [3]. A recent study showed that the effect of predictability on comprehenders' self-paced reading times was greatly attenuated when most of the stimuli in the experiment were unpredictable, suggesting that comprehenders may stop predicting when the experimental stimuli had low overall predictive validity [4]. In order to better understand the effects of experimental context on predictive processing, the present study used event-related potentials (ERPs) in two experiments to ask whether changing the overall predictive validity of the experimental stimuli will strengthen (or weaken) predictive processing and, as such, modulate the effect of cloze probability on the N400, a negative-going ERP component peaking at around 400ms after stimulus onset. We found that predictive validity did not modulate the effect of cloze probability on the N400 response at all and propose that comprehenders engage in predictive processing even when the experimental context does not encourage prediction.

We manipulated the overall predictive validity of the stimuli within a block by using one of two types of filler sentences (highly constraining sentences with a predictable vs. incongruous ending) with a 1:1 target-to-filler ratio. All experimental sentences were highly constraining and the predictability of the target words was manipulated between experiments, such that they were the most predictable words (mean cloze = 82%) in Experiment 1 and had 0% cloze in Experiment 2. If comprehenders are more likely to predict (or predict more strongly) when the overall predictive validity of the stimuli is high, then they should have stronger expectations for the predictable target word when the fillers were predictable than when they were incongruous. Based on view that the N400 response to a word is reduced when that word's semantic representation is pre-activated and can be accessed more easily, we would expect a smaller N400 response in the predictable filler condition than in the incongruous filler condition when the target word is predictable (Exp 1) but not when the target word is not predictable (Exp 2).

This prediction was not confirmed by the results. In fact, we found that the N400 response to predictable targets was numerically *larger* in the predictable filler condition than in the incongruous filler condition (Exp 1; n=18); the same pattern was observed for unpredictable targets (Exp 2; n=18). Further, we asked whether the effect of target word predictability was modulated by filler sentence type by analysing the data from both experiments together. Results revealed significant main effects of both factors on the size of the N400, but crucially, the effect of target word predictability was identical between the predictable filler and incongruous filler conditions. We take these findings to suggest that while the processes indexed by the N400 are sensitive to the overall predictive validity of the stimuli, the effect of predictability on such processes (i.e., the

N400 effect) did not become stronger (or weaker) when the experimental context contained a higher (or lower) proportion of predictable sentences. Taken together, the present findings suggest that prediction is routinely involved in real-time language comprehension.

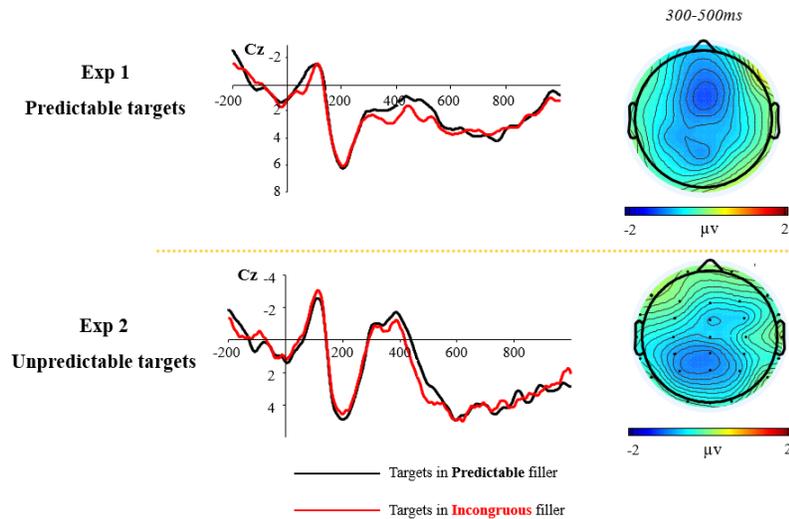


Figure 1. Grand average waveforms and topographic distribution of N400 effect in individual experiment.

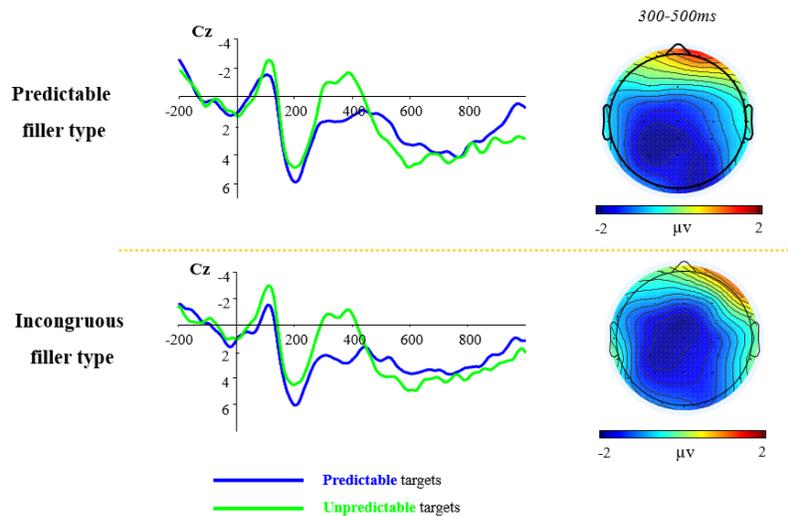


Figure 2. Grand average waveforms and topographic distribution of the N400 predictability effect in each filler type.

References

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