Individual Differences in Word Knowledge and Working Memory Capacity Modulate Verb Bias Effects

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Previous research has established that individuals use probabilistic information regarding how frequently a verb appears in syntactic structures (i.e., verb bias) to anticipate the upcoming resolution of locally ambiguous sentences (e.g. Garnsey et al., 1997). However, it remains unclear whether the use of verb bias is dependent on other cognitive abilities. Word knowledge (WK; Traxler & Tooley, 2007) and working memory capacity (WMC; Long & Prat, 2008) have been found to affect ambiguity resolution in the context of verb bias manipulations, but recent work suggests that individual differences affect offline, but not online, syntactic processing (James et al., 2018).

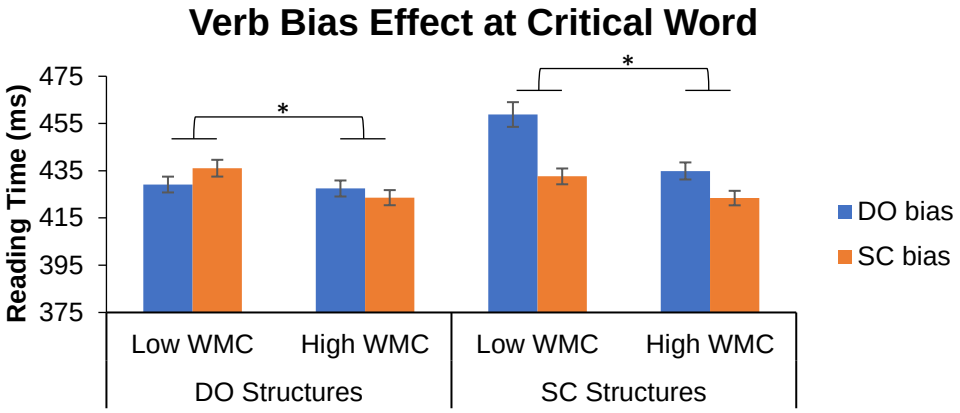
In the current study, we examined whether WK and WMC modulate how individuals process locally ambiguous sentences with syntactic structures that are consistent or inconsistent with verb bias. We predicted that WK would influence verb bias sensitivity and WMC would affect the ability to recover from violated expectations. We used 960 direct object (DO) / sentential complement (SC) ambiguous sentences (240 sentence sets). Sentence sets were created by manipulating verb bias and resolving the sentences with either a DO or SC structure (e.g. “The nurse heard/believed the patient who lied to her” or “The nurse heard/believed the patient was lying to her”). Verb bias was determined using existing norms (Garnsey et al., 1997; Gahl et al., 2004), as well as a norming experiment involving 80 subjects. DO and SC resolutions were closely matched on lexical characteristics and semantic content.

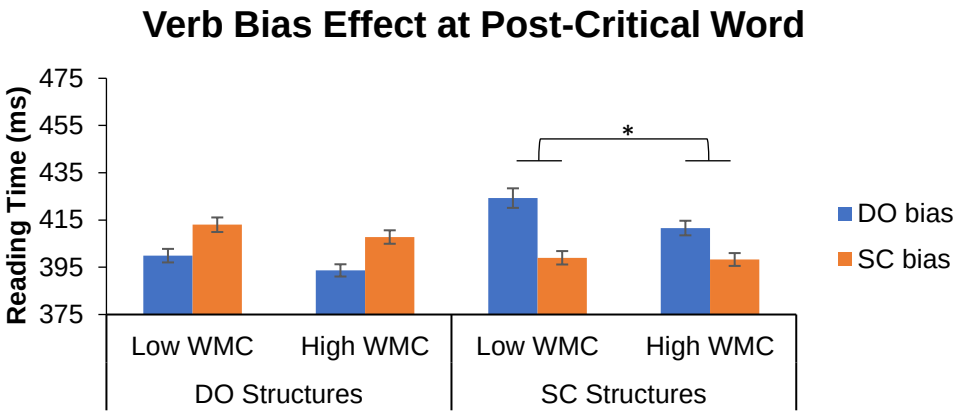
Participants (N=120) completed a self-paced reading task and made a yes/no acceptability judgement after each sentence. Each participant read 120 experimental sentences and 90 filler sentences (to increase syntactic variability and provide violations for the acceptability task). In addition, participants completed the operation and reading span tasks to assess their WMC and the vocabulary section of the Nelson Denny to assess their WK.

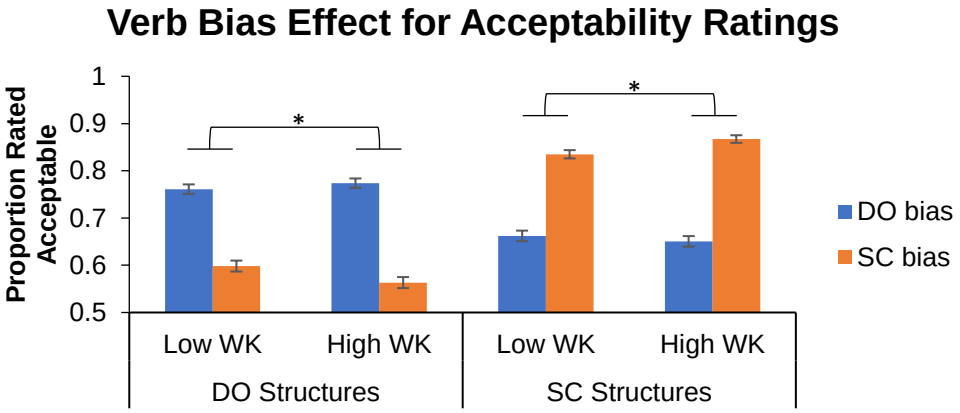
Mixed effects hierarchical models were conducted to examine if and when WK and WMC predicted individual differences in syntactic processing as a function of the verb bias manipulation. At both the critical disambiguating word and the post-critical word, WMC modulated the interaction between bias and resolution. For SC resolutions, inconsistency (DO bias with SC resolution) slowed reading times (RTs) at both the critical and post-critical words and the inconsistency effect decreased as WMC increased. For DO resolutions, the interaction between bias and WMC was significant at the critical, but not the post-critical, word. At the critical word, inconsistency slowed RTs only among low WMC participants. At the post-critical word, inconsistency slowed RTs regardless of WMC. For the acceptability ratings, sentences were rated less acceptable when verb bias was inconsistent with the sentence structure; this effect was larger for individuals with greater WK.

The results replicate previous findings that verb bias influences expectations for how a sentence will be resolved. Moreover, the results indicate that verb bias effects are modulated by both language specific and domain general cognitive abilities. Greater WMC enabled individuals to recover more quickly when expectations were violated. In addition, the acceptability ratings revealed that individuals with greater WK were more sensitive to the consistency between bias and structure. Collectively, the results demonstrate a relation between cognitive and linguistic factors, and highlight the importance of examining the contribution of individual differences to language processing.

Note: Bias, WMC, and WK groups are median-split for illustrative purposes, but were included as continuous factors in the analysis.







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