

Modality bias in learning: The roles of processing speed, short-term memory, and linguistic experience

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Humans acquire new knowledge every day through listening to podcasts, the radio, or reading. When asked explicitly, most individuals express a preference for learning in either the auditory or written modality. The notion of “learning styles”, however, has been hotly debated since its inception [1], and the efficacy of tailoring instruction to learning styles has been largely refuted [2]. Researchers are therefore increasingly studying the mechanisms underlying such biases. Here, we targeted individual variability in domain-general skills and linguistic experience and examined how they are associated with learning biases. 153 native German participants were presented with eight unfamiliar topics—four presented as written texts and four auditorily, with topics rotated across modalities. Presentation was blocked by modality and block order counterbalanced. Each text was ~600 words long, corresponding to a spoken duration of ~4:45 minutes. To equate exposure, written texts were presented for the same duration as their spoken counterparts. Participants memorized as many facts as possible. Next, they completed eight tests from the IDLaS battery [3], assessing (1) auditory and (2) visual processing speed, (3) short-term memory, and (4) linguistic experience. In a multiple-choice test, they were subsequently tested on facts retained from the exposure phase, with questions presented in and blocked by the same modality as the topics.

Accuracy was higher for written compared to spoken topics, for positively worded questions, and for questions focusing on names rather than numbers/dates. Participants with faster visual processing speed, larger short-term memory (marginal), and more linguistic experience performed better overall. Positively worded questions were more likely to be answered correctly when the topic had been written rather than spoken. Additionally, participants with lower auditory processing speed performed better on written than spoken texts. Finally, individuals with more extensive linguistic experience more often responded correctly to questions focusing on names rather than numbers. Our data demonstrate that modality-related learning biases depend on individual cognitive abilities and task characteristics. Written texts improved fact retention overall, particularly for positively worded questions. Linguistic experience specifically enhanced retention of name-related content, likely by enabling contextual encoding. These findings challenge static “learning styles” and instead support a dynamic, ability-based framework in which modality biases arise from interactions between individual processing profiles and task demands. This view offers a more nuanced account of variability in fact acquisition and refines theoretical accounts of learning.

References

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Figure 1

Descriptive overview of the results and visualization of the three significant interactions.

