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Individual differences in silent reading fluency are associated with musicality and speech perception abilities.

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Introduction: Individuals' sensitivity to musical and speech rhythms (i.e., stress; timing) are known to be related (e.g., Hausen et al., 2013). While speech rhythm sensitivity plays an important role in reading development (Critten et al., 2021), musicality's role in reading is less understood. While evidence suggests that musical engagement improves reading skills in children (Kraus et al., 2014), it is not clear how pre-existing individual differences in musicality and reading abilities inform these results. For example, using an individual differences approach, a recent review (Nayak, Coleman, et al., in prep) finds that relationships between musical and speech-language traits are widely associated in children and adults. In this study, we explored associations between individual differences in silent reading fluency, speech rhythm sensitivity, and two aspects of musicality (music engagement; musical rhythm sensitivity).

Methods: 18-75 year old adults (N = 35; 27 females, 8 males; age(mean) = 37.77) participated. The silent reading fluency measure comprised two timed conditions: single words and words in sentence context (Kalindi et al., 2015). In each condition, participants marked word boundaries in strings of letters. In the musical rhythm discrimination measure (Ullén et al., 2014), participants distinguished whether pairs of rhythmic sequences were identical or different. Participants' speech rhythm sensitivity was measured using a lexical stress perception test (Nayak et al., submitted), in which participants identified the stressed syllable in spoken words, e.g., "LI-bra-ry." Participants additionally answered a self-report questionnaire about their musical engagement.

Results: Analyses were conducted on total scores across both conditions of the silent reading fluency test. Bivariate Pearson correlation tests showed that higher silent reading fluency scores significantly correlated with higher speech rhythm perception scores ($r = 0.51$, $p = .0093$), and with higher musical engagement scores ($r = 0.37$, $p = .027$). In contrast, silent reading scores were not correlated with musical rhythm perception scores.

Discussion: Associations between silent reading and speech rhythm perception replicate findings that speech rhythm perception is important for reading development. Further, associations between silent reading and musical engagement extend previous studies outlining associations between musicality and reading-related abilities (Nayak et al., in prep.) Further, consistent with these previous studies, our study shows that individual differences in specific aspects of musicality (e.g., musical engagement) may be associated with reading abilities, while other aspects (e.g., musical rhythm discrimination) may be less relevant for specific speeded reading behaviors (e.g., silent reading fluency). Future studies into the biology of prosody, musicality, and reading traits can illuminate the mechanisms of these behavioral relationships.

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