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Modelling the dynamics of integrating context into perception: in good and in poor readers

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Abstract: Individuals implicitly learn the statistics of environmental stimuli. We used "contraction bias", the tendency to perceive stimuli closer to the estimated mean of similar previous stimuli, to characterize the dynamics of these implicit inference processes. Using a simple auditory discrimination task we found that listeners build a rich representation of the distribution of past stimuli, and yet over represent very recent events. This combined pattern allows both learning of the stable environment, and flexibility to fast changes.

We further characterized populations who have difficulties in acquiring specific expertise, i.e. specific developmental disorders, focusing on reading (dyslexia) and non-verbal communication (high functioning ASD, autism spectrum, individuals) disability, respectively. We found that the pattern of their perceptual inference differs from controls'. Both underweight previous events. However, dyslexics' implicit memory decays fast and they underweight earlier events, whereas ASD individuals underweight recent events. This pattern parallels, and perhaps underlies, their strengths and weaknesses.