No evidence of word-level uncertainty in younger and older adults in self-paced reading
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Noisy-channel models of sentence processing:
• Readers may maintain uncertainty about word identity, and refine beliefs on the basis of subsequent information (Levy, 2008).

Key evidence from Levy et al., 2009:

a) The coach smiled at the player thrown the frisbee by the opposing player.
b) The coach smiled at the player tossed the frisbee by the opposing player.
c) The coach smiled toward the player thrown the frisbee by the opposing player.
d) The coach smiled toward the player tossed the frisbee by the opposing player.

• Tossed is higher probability in context in which at is replaced with as.
• Readers alter their beliefs about identity of at upon encountering tossed but not thrown. Thus, they experience processing difficulty.
• Toward is less confusable with other words; neither verb alters beliefs about this preposition’s identity.
• Levy et al. tracked eye-movements on these sentences, finding participants regressed more from and had longer go-past times on verb in b) than other conditions.
• Suggests readers went back to check “at” when it became contextually unlikely.
• Also, comprehension was lower in b) than other conditions.

Ageing and vision
• As people age their visual acuity declines (Owsley, 2011), and with it their ability to process high-spatial frequencies (e.g. Jordan, McGowan, & Paterson, 2014).
• Could lead to increased uncertainty about word identity.
• May lead to increased difficulty reading sentences like b.
• We tested this possibility in a self-paced reading study.

Method
• Self-paced reading study administered via Gorilla.sc.
• 60 younger adults (aged 18-25); 60 older adults (aged 65+).
• 24 items, intermixed with 72 fillers.
• Sentences presented in five regions:
  • The coach smiled at the player tossed the frisbee by the opposing team.
  • Comprehension question after each sentence.

Analysis & Results
• Bayesian mixed models to estimate effect of variables on a) log-transformed Reading Time at tossed/thrown, and b) comprehension rates.
• Predictor variables: Preposition Form, Verb Type, Age Group, and all possible interactions.
• Reading times:
  • Main effects of age (b=-0.42, CrI[-0.51,-0.32], p(b < 0) = 1) and verb ambiguity (b=-0.08, CrI[-0.12,-0.03], p(b < 0) = 1).
  • No interaction between preposition form and verb ambiguity (b = 0.00, CrI[-0.06,0.07], p(b > 0) = 0.56); null effect confirmed by Bayes Factor (BF₀₁ = 17).

• Comprehension rates:
  • Evidence for all effects was equivocal, such that there was no evidence for an influence of age (b=-0.26, CrI[-0.71,0.20], p(b<0) = 0.87), verb type (b=0.27, CrI[-0.11,0.64], p(b>0) = 0.92), preposition (b=0.16, CrI[-0.20,0.52], p(b>0) = 0.81), or the critical interaction between verb and preposition (b = 0.21, CrI[-0.42,0.83], p(b>0) = 0.75; BF₀₁ = 3.25).

Discussion
• Failed to replicate evidence of word-level uncertainty first observed by Levy et al. (2009), despite a large sample of 120 participants.
• Levy et al. had only 40 participants with 24 items.
• It could be that the effect is non-replicable.
• Replication failure could be due to methodological factors.
• No regressive eye-movements in self-paced reading.
• Best way for participants to check uncertainty?
• Does not explain lack of effect in comprehension performance.
• Large scale replication using eye-tracking may be needed.
• Standard age differences observed in online population of older adults.

References