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Building blocks of cognition: replicating Marcus et al. (1999) and Kovács & Mehler (2009)

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Marcus et al. (1999)

Familiarization phase: sound stream following ABA or ABB pattern
Test phase: head turn paradigm with consistent and inconsistent trials
Results showed shorter looking times for inconsistent trials
Evidence that 7-month old infants (N = 16) can learn algebraic rules

Kovács & Mehler (2009)

Infants see a visual stimulus occur in one of two boxes on the screen
A predicting auditory stimulus precedes the appearence of the visual stimulus
Presentation side and syllable structure change after 9 trials
Bilinguals (N = 20) anticipated the reward during post-switch trials

Research question

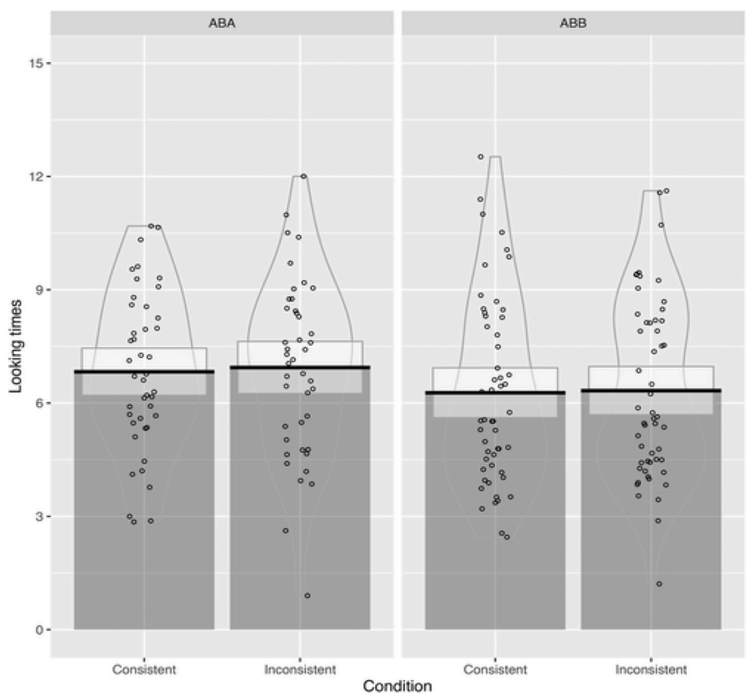
Can we replicate the results of these two studies using the exact same materials across four babylabs in the Netherlands (Amsterdam, Leiden, Nijmegen, Utrecht)?

Replicating Marcus et al.

Method

Exact same stimuli as the original
Conducted in 4 labs
96 infants (46 girls, 50 boys)
214 days old (SD = 9 days, min–max = 196–228 days)
58 monolingual children, 38 multilingual children

Results



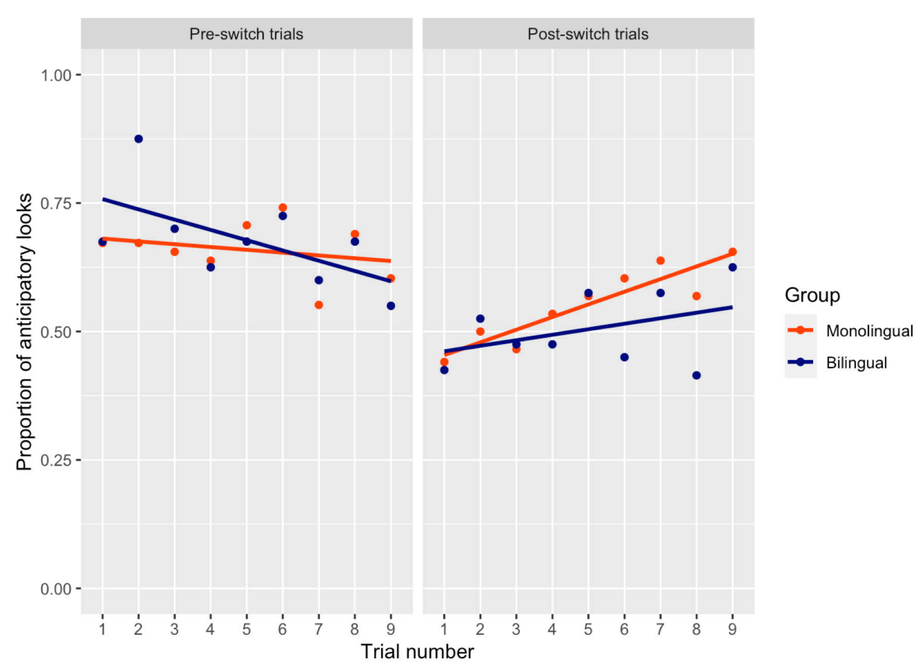
No difference between consistent and inconsistent trials
Original ANOVAs: no significant main effect (F(1,94) = 0.155, p = 0.695)
Bayesian analysis: more likely no learning effect than that there is a learning effect (est = 0.08, 95% CCI [−0.69, 0.84], BF01 = 3.08)

Replicating Kovács & Mehler

Method

Exact same stimuli as the original + 18 association trials
Conducted in 4 labs
58 monolingual children:
232 days old (SD = 8 days, min-max = 214-245 days; 26 girls, 32 boys)
40 bilingual children:
227 days old (SD = 9 days, min-max = 208-246 days; 20 girls, 20 boys)

Results



Original ANOVAs: significant effects for block (pre: F(2, 192) = 3.703, p = .026; post: F(2, 192) = 3.547, p = .034)
Bayesian analysis: switching effect not likely (est = -0.00, 95% CCI [-0.18, 0.16], BF01 = 11.24)
Additional cluster based analyses showed no switching either

Conclusions

We did not replicate the findings of the original studies, calling into question the robustness of the claims that
1) infants can learn algebraic rules, and
2) bilingual infants have enhanced cognitive abilities

The use of novel analysis techniques (Bayesian analyses, mixed effects modeling and cluster based permutation analyses) allowed us to draw better-informed conclusions

These replication efforts stress the importance of exact replications in the field of developmental science in multiple labs (Bergmann et al., 2018; The ManyBabies Consortium, 2020)

References
Bergmann, C., Tsuji, S., Piccinini, P. E., Lewis, M. L., Braginsky, M., Frank, M. C., & Cristia, A. (2018). Promoting replicability in developmental research through meta-analyses: Insights from language acquisition research. Child Development, 89(6), 1996– 2009. https://doi.org/10.1111/cdev.13079
Kovács, A.M., & Mehler, J. (2009). Cognitive gains in 7-month-old bilingual infants. PNAS, 106(16): 6556-6560. https://doi.org/10.1073/pnas.0811323106
The ManyBabies Consortium. (2020). Quantifying sources of variability in infancy research using the infant-directed-speech preference. Advances in Methods and Practices in Psychological Science, 3(1), 24– 52. https://doi.org/10.1177/2515245919900809.
Marcus, G. F., Vijayan, S., Bandi Rao, S., & Vishton, P. M. (1999). Rule learning by seven-month-old infants. Science, 283(5398), 77– 80. https://doi.org/10.1126/science.283.5398.77.
See https://doi.org/10.1111/desc.13244 for the full paper of our Marcus et al. (1999) replication

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