Pokemon go go go

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Abstract

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Introduction

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In the first three years of life, children undergo a plethora of developmental changes, transitioning from newborn infants who possess a limited understanding of language and categories to toddlers who are able to master a wide range of linguistic and cognitive skills. Despite a wealth of research examining cognitive development, constructing a comprehensive theory of cognitive development remains a formidable challenge. Research in this area generally falls under two categories: observational research and experimental research. The former provides a holistic picture of an individual child's development (e.g. CITE), yet it does not provide any concrete insights into the underlying mechanisms. In contrast, experimental research allows causal tractions on potential mechanisms, but it tends to focus on one single construct and does not reveal the connections between different processes and mechanisms. In this paper, we aim to provide a quantitative synthesis of experimental work across multiple areas of developmental psychology, providing insights into the interrelatedness between psychological constructs. We achieve this goal by consolidating and integrating 23 meta-analyses of cognitive and language development compiled on MetaLab, a community-augmented meta-analysis platform.

Statistical meta-analysis, the technique of aggregating effect sizes across a systematic sample of experiments, has some unique advantages as a source of data about developmental processes in early childhood. First and foremost, it allows researchers to explore questions that are difficult to address with individual studies. One such example is the functional form of developmental curves, or how different psychological processes change over time. Many developmental studies use linear regression models with age as a predictor, but this assumption of linearity may not capture the complexities of developmental processes, especially as they interact with developmental changes in measurement. For example, some cognitive abilities – such as relational reasoning – might follow an inverted-U shape (Carstensen et al., 2019; Walkers, Bridgers, & Gopnik, 2016), while others – like early vocabulary size – show an exponential increase (Frank, Braginsky, Yurovsky, & Marchman, 2021). These non-linear trends can be challenging to identify and interpret with limited data from individual studies, but meta-analytic methods can provide a large amount of data across a broad age range, enabling researchers to evaluate and compare different functional forms of developmental trajectories.

Meta-analysis can also shed light on the relationships between methods and theories. Research methods and theories are fundamentally intertwined, and this is especially true for developmental psychology (Dale, Warlaumont, & Johnson, 2022). Developmental theories are often based on interpretations of experimental results, which are produced by methods that even small changes to the parameters would substantially change the outcomes. One example is the influence of familiarization time. It has been proposed that the amount of exposure infants have prior to the test events can influence infants' direction of preference (i.e. novelty preference or familiarity preference) (Hunter & Ames, 1988). Although the empirical evidence for this theory is mixed, this ambiguity has significant downstream consequences on our understanding of infants' cognitive capabilities (Bergmann & Cristia, 2016). Debates about infants' arithmetic competencies or their evaluations of social agents are often centered around the direction of preferences (Infants arithmetic competencies: Clearfield & Westfahl, 2006; Wakely, Rivera, & Langer, 2000; Wynn, 1992; Evaluation of social agents: Hamlin, Wynn, & Bloom; Salvadori et al., 2015). Due to the time and resources required for developmental studies, it is often difficult to directly evaluate the impact of subtle changes in parameters. Therefore, meta-analytic methods provide a unique opportunity to investigate the effects of methodological factors on research findings.

Last but not least, meta-analytic methods make it possible to compare and connect research findings across research areas. The use of effect size as the fundamental unit of analysis allows for comparisons across different domains and research areas. These comparisons can provide insight into how different processes facilitate learning at different stages of development and can aid in the development of data-driven cognitive development theories (Cao & Lewis, 2021; Lewis et al., 2022). However, a synthesis across multiple domains requires a database of multiple meta-analyses. Towards that aim, MetaLab was established to provide an open database of meta-analyses (CITE). Developmental researchers are invited

to deposit their meta-analysis dataset into MetaLab, and they are encouraged to use the datasets for custom analyses. As of DATE, Metalab contains X effect sizes from 30 different meta-analyses. This resource would allow us to quantitatively synthesize the insights across different research areas in developmental psychology.

The plan for this paper is as follows. We first describe the datasets included in the current synthesis, including our selection criteria and the descriptive statistics associated with our final dataset. We then turn to model comparison, comparing the fits of age models under different functional forms. Next, we present methodological moderators analysis. Four methodological moderators are selected due to their theoretical relevances: behavioral measure type, exposure phase type, stimuli type (audio and visual), and major author effect. Finally, we present a synthesis of the developmental curves across all of the domains considered. We end the paper by discussing the implications and limitations of our current work.

Methods

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Datasets

Analytic Methods

Results

Functional form of developmental curves

Methodological Moderators

Behavioral Measures

Exposure Phase

Stimuli Naturalness

Major author

Synthesis

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Discussion

References