

COMMENTARY

The challenges of improving infant research methods

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Abstract

All analysis-based suggestions for improving infant research are limited by the quality and quantity of data that infant research methods can produce. In this commentary, I expand on Byers-Heinlein et al. (2022)'s call for methodological innovation by discussing in more detail how we as a field can improve and encourage the improvement of our methods.

KEYWORDS

infancy, measurement, methods, open science, replicability

Any analytical solution to improving the reliability of infant research, through better analyses or more careful examination of the data, inevitably faces a limitation in the quality and quantity of data that a given paradigm can produce. It is clear that Byers-Heinlein et al. (2022) are aware of this limitation, and indeed the third and fourth solutions they offer focus specifically on issues related to the methods themselves. However, the challenges and obstacles we as a field and as scientists must address in order to actually support methodological innovation are not enumerated or addressed. My goal in this commentary is to consider *how* we might achieve the laudable goals Byers-Heinlein et al. have put forward for methodological innovation.¹

Improving infant behavioural methods will require three things: first, careful and empirically-supported examinations of existing methods; second, broad publication and distribution of best practices with a deliberate eye towards practical implementation; and third, careful consideration of the tools that go into best practices to ensure that they can be implemented broadly. I will discuss each one briefly, and then turn to an unavoidable shared factor: All three things require support in the form of funding, publication, and career advancement opportunities, and we must work as a field and as individuals in order to ensure that such support is present.

Byers-Heinlein et al. (2022) mention Houston et al. (2007) and Santolin et al. (2021) as papers that have empirically investigated questions about the methods we use. These metascience papers cover permutations of ratios of a novel to familiar stimuli in a language discrimination task and the role of previous research experience in a head-turn preference procedure. These systematic examinations of the effects of the methods themselves are something we as a field should endeavour to do much more often. One area that has recently been highlighted as needing further attention is an empirical investigation of the role of different types of stimulus presentation. For example, a recent investigation of infants' understanding of screen-based versus physical stimuli (Revenu & Csibra, 2020) is, to my knowledge, one of the first of its kind, despite both types of stimulus presentation being used for decades. Other

recent work has raised questions about the use of puppets or otherwise simplified stimuli versus more ecologically valid paradigms (Packer & Moreno-Dulcy, 2022; Kominsky et al., *in press*). The questions raised in this recent discussion are certainly empirical in nature, but to my knowledge, there has not yet been even one study directly contrasting, with otherwise identical methods, the use of animated versus puppet versus realistic stimuli in an infant paradigm. And there is a need for many such studies because the best practices might vary depending on what the focus of the research is. For example, one notable review of the shape bias literature examined the impact of different methodological choices on reported results (Kucker et al., 2019), but would the advice from this literature about the impact of labelling and warm-up trials generalize to, for example, work on causal learning (e.g., Sobel & Kirkham, 2006; Walker & Gopnik, 2014)? What is ultimately needed is an investigation of how different methodological choices affect studies, and as more research of this type is done, the formulation of a more complete set of principles that can guide methodological decisions in novel domains, or improved methods in existing areas of study.

The novel paradigms that might develop from these systematic investigations only benefit the field if they are broadly adopted. The first step of that is ensuring this kind of work is published and widely distributed: We as a field need to make an effort to deliberately share best practices in an open and accessible form. This does not simply mean publishing papers *using* these methods, but actual dedicated methods papers that describe what different methods are suitable for investigating a topic, the logic behind the decisions in these methods, how to implement them, and with publicly accessible repositories of examples and tools (e.g., Kominsky et al., 2021). Naturally, this goal requires journals in which such work can be published. There are some dedicated methods journals in psychology writ large, such as *Psychological Methods* and more recently *Methods in Psychology* (which launched in late 2018), and field-general methods journals that include psychology and cognitive science, like the *Journal of Visualized Experiments* (which publishes video articles demonstrating techniques across many scientific fields). For infant research specifically, as of spring 2022, a handful of journals that regularly publish infant work have added methods articles to their list of acceptable submission types, obviously including the present journal, but also *Infant Behaviour & Development*, the *International Journal of Behavioural Development*, *Cognitive Development*, and *Developmental Cognitive Neuroscience*. A few additional journals allow such articles either in special circumstances or in dedicated collections, including *Developmental Psychology* and the *Journal of Cognition and Development*. However, many journals, notably both the flagship journals of the Society for Research in Child Development (*Child Development*) and the International Congress of Infant Studies (*Infancy*), have not yet formally created any such category of submission.

Successful dissemination of best practices also requires that those practices be easy for other researchers to implement, and use easily accessible tools. There are some limitations to this in infant work, of course. Presentation environments and physical stimuli cannot be readily shared, though certainly detailed instructions on how to create them (including precise descriptions of commercially-available materials and detailed assembly guides) can and should be. Similarly, it is difficult to share exact presentation procedures for live stimuli other than sharing videos of the performances as part of a repository. For screen-based and other software tools, there are more options, but availability, accessibility, and usability are still factors that need to be deliberately considered. This is an area in which the field has recently undergone some advancement. For studies that require live infant looking-time coding, such as habituation paradigms, Habit2 (Oakes et al., 2019) and PyHab (Kominsky, 2019) are both free and have (relatively) easy-to-use graphical experiment-design interfaces, as well as extensive documentation. Both also store experiment information in a form that is easily shared to a repository so that others can reproduce the same study with ease. For studies that do not require live coding, studies conducted remotely on Lookit (Scott & Schulz, 2017) consist of a set of simple text and stimulus files that are easily shared, and the platform itself is open-source, though using it requires an institutional research agreement that can be costly. For coding data offline, Datavyu (Databrary Team, 2014) is a similarly flexible, free, and open-source solution for frame-by-frame gaze coding, and is easily integrated into the Databrary repository built by the same team (<https://nyu.databrary.org/>). If methodological innovation creates a need for novel software tools, they too must aim to be free and accessible in order to be broadly adopted and support more reproducible and replicable studies. Furthermore, if such tools are open-source they are more transparent,

more flexible, and more future-proof: Even if the original developers can no longer maintain them, others can continue updating and improving them.

Finally, Byers-Heinlein et al. (2022) note ‘researchers will need to conduct more studies on infant methodology, and the field at large will need to value and support such efforts’ (p. 18). I fully agree with this statement, but also want to highlight what it means to ‘value and support’ methods development. To truly support methodological innovation and development, what’s needed is a holistic approach, wherein funders and institutions expressly support and encourage these projects (Robson et al., 2021). While ‘funders’ and ‘institutions’ are abstract, much is in the hands of us and our colleagues across psychology and cognitive science. When we are asked to review funding proposals, we should seek to elevate those that concern themselves not just with a question, but with the means to answer both it and many other questions. When we sit on advancement or selection committees, we should consider the development and publication of methodological tools and techniques to be valuable contributions to the field, even outside of infant research, and even if they cannot be published in the highest-impact journals. Similarly, we must encourage the academic societies that represent our field to prioritize and encourage methodological innovation (as a simple starting point, adding methods-focused submissions to *Child Development* and *Infancy* would be a reasonable goal). If the field of infant research is serious about taking Byers-Heinlein et al. (2022)’s advice about how to improve infant research, we cannot sit idly and wait for the conditions to arise that will support such innovations, we must endeavour to bring about those conditions ourselves.

ENDNOTE

¹ To constrain the scope of this commentary I will be focusing on innovation in behavioural methods, but different considerations might apply to infant neuroimaging.

PEER REVIEW

The peer review history for this article is available at <https://publons.com/publon/10.1002/icd.2332>.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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