**Advancing Transparency and Openness in Child Development Research:
Opportunities**

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Abstract

Transparency and openness are basic scientific values. They are at the heart of practices that accelerate discovery and broaden access to scientific knowledge. We make the case that transparency and openness are essential values and principles for the enduring influence of child development research and for SRCD's ability to deliver on, sustain, and nurture its mission for the benefit of diverse global stakeholders and constituents. A companion paper (Gilmore et al., 2019) discusses the challenges with realizing SRCD's vision for a science of child development that is open, transparent, robust, impactful, and conducted with the highest standards of integrity. Here, we discuss the opportunities and ways in which the society can set standards and recommendations to ensure the full integration of such transparency and openness for the future of developmental science.

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The Society for Research in Child Development (SRCD) was founded in 1933 to “stimulate and support research, to encourage cooperation among individuals engaged in the scientific study of child development, and to encourage applications of research findings” (SRCD, n.d.). As a mission-driven organization that focuses on research and application, SRCD must adapt and respond to changing scientific norms. A significant change in the scientific landscape in the last decade has been the move toward “open science”: an emphasis on transparency and openness in all aspects of the research process. We make the case that transparency and openness are essential values and principles for the enduring influence of child development research and for SRCD’s ability to deliver on, sustain, and nurture its mission for the benefit of diverse global stakeholders and constituents.

Why transparency and openness? The mission of SRCD—a scientific understanding of child development, enabling applications that improve children’s lives—requires science to be a cumulative enterprise. However, recent demonstrations have cast doubts on the reliability of our body of accumulated knowledge, especially in psychology and the broader behavioral sciences. Repeated failures to replicate important findings (Camerer et al., 2018; Klein et al., 2014; Open Science Collaboration, 2015) have put parts of the scientific record in doubt. The causes of these failures are unknown, but many likely result from post hoc analytic flexibility (Simmons, Nelson, & Simonsohn, 2011) combined with small sample sizes, which together can create a dangerous recipe for a biased literature (Button et al., 2013). These developments have led to interest in transparency regarding data, materials, and research planning (e.g., through study registration or equivalent public posting).

At the same time, scientists recognize that progress can be accelerated by sharing products of research beyond a prose write-up of findings. Sharing and archiving research

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products—from experimental materials to analytic code and video data—means that a greater portion of research efforts can be reused in new investigations (Gilmore & Adolph, 2017; Klein et al., 2018). Reuse enables new progress that is truly cumulative. Thus, a second driver of interest in openness and transparency comes from stakeholders, including funders, institutions, and scholars, who hope to increase research efficiency and accelerate discovery.

As the leading international society of developmental science, SRCD is ideally positioned to advocate for and support values and best practices around scientific transparency and openness. Yet, transparency and openness mean many things to many people—from study preregistration (transparency about research planning) to efforts to support conventionally underrepresented scholars and scholarship in science. And as we discuss below, there is significant uncertainty about many of these practices among SRCD members, especially in the rapidly shifting landscape regarding sharing of data and materials. What should be the society's viewpoint on these issues?

We contend that, beyond scientific obligations, values related to transparency and openness carry substantial practical benefits for researchers (and in some cases, research participants). Therefore, SRCD can and should play a role in crafting policies and standards that foreground these values, while tailoring their specific execution for the child development community. Furthermore, SRCD can provide guidance to members and its broader global community on topics related to values of openness and transparency, including replication, data and materials sharing, and open access.

Benefits of Transparency and Openness

The essence of science rests on the verifiability of its claims (Srivastava, 2019). As the motto of the British Royal Society states, “Nullius in verba” (nothing in words): Scientific claims

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are not taken on authority, but instead are predicated on evidence that is provided (Merton, 1949/1968). Thus, norms of reporting for scientific papers require researchers to disclose data and experimental methods so that other investigators can, in principle, reproduce experiments or calculations. Indeed, such arguments can even be extended to imply that *all* data and materials should be shared, at least when feasible. Beyond this obligation, however, openness carries substantial benefits.

Openness Maximizes the Value of Research

Research is costly, in terms of the financial costs of hiring staff, recruiting participants, purchasing equipment, running studies, and so forth and the time that researchers invest in gathering developmental data. One way to ensure that money and time are well spent is to share data, ranging from self-report or observational data in flat files to video of participants. Data sharing allows researchers beyond the original team to tackle new questions and advance scientific discovery by building on existing data. Indeed, data sharing increases the beneficence of research by giving more “bang for the buck”: By sharing and reusing data, researchers maximize participants’ contribution by capitalizing on data that would otherwise be lost to the field (Gilmore, Adolph, Millman & Gordon, 2016).

Data sharing also provides opportunities for science to correct itself by allowing independent review of data analysis (e.g., Hardwick, Caspers, Eickhoff, & Swinnen, 2018). Finding errors in published work is painful, as many researchers know from personal experience. But no scientist should want to live in a world where they are wrong but no one knows it!

Finally, open data sharing supports evidence synthesis through statistical and related meta-analysis methods that evaluate the robustness of findings. Because developmental research often investigates individual differences and the contexts that can shape them, synthesizing

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evidence across studies is especially important. The more available the raw data are for such efforts, the deeper the analysis can go.

Openness Promotes Standardization Across Labs

One major challenge for independent replication efforts is ensuring that the same procedure is followed in the new sample. Otherwise valid replication efforts can come into question because of differences in method or stimuli—differences that are sometimes unavoidable given the inaccessibility of original material (Anderson et al., 2016; Gilbert et al., 2016). Challenges to replication are especially salient in the developmental context, where “uncooperative” participants mean that small procedural or stimulus differences can lead to substantial differences in outcomes. Sharing of research materials can alleviate this issue by allowing researchers who seek to extend previous work to access the exact materials that were used in the original study.

Further, even when researchers are not interested in replication, openness increases standardization across labs in procedures and content. Researchers can share template language, pictures, and videos on ways to obtain participant consent around data sharing and inform participants about different levels of data release (e.g., within lab only, across research labs, to broader audiences). Sharing of procedures and content includes providing access to protocols, materials, stimuli, coding manuals, operational definitions of variables, raw and curated data, and information on the treatment of data (e.g., syntax that defines break points of categorical variables). Such efforts toward data sharing can facilitate study replication and comparison of results across studies.

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Openness Fosters Collaboration

In line with SRCD's inclusivity objectives and goals, data sharing creates opportunities to connect and collaborate with researchers across the world. Several emerging national and international efforts, such as the Many Labs studies (e.g., Klein et al., 2014), the Many Babies project (Frank et al., 2017), the Psychological Science Accelerator (Moshontz, et al. , 2018), and the Play and Learning Across a Year Project (<https://www.play-project.org>), aim to “crowdsource” psychological science. Such initiatives will result in larger and more diverse data sets than any researcher could possibly organize alone. The fact that these data sets are open by design means that they will create—and in some cases, already have created—opportunities for further analysis, data collection, and collaboration.

Success in international data sharing may start with efforts at the country level or through multicountry research partnerships. Undeniably, multicountry studies provide huge benefits in supporting evidence-based policy. Collaborative partnerships among high-income and low-income countries are foundational for building long-term trust. Research partnerships provide equitable access to and use of data sets, beyond the conventional practice of passive data sharing without partnership.

Openness Is the New Normal

There is a further pragmatic reason for researchers to embrace transparency and openness. In recognition of the many tangible benefits of these values, they are increasingly being embraced by institutions. Journals—from *PLOS One* to *Science*—now require data to be shared at the time a paper is accepted. Similarly, public and private funders have intensified expectations for researchers to openly share all information relevant to the execution of a project, including resulting data, to ensure maximal payoffs of scientific investments. In fact, federal

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funding agencies have established policies on data sharing and frequently request “data management plans” in grant proposals. In these plans, investigators must delineate how they will share data upon study completion. In short, the data sharing train has “left the station”—with journals and funders increasingly requiring data sharing as a condition of support.

Concerns About Transparency and Openness

Despite these benefits, sharing—of materials and especially of experimental data—has not been the norm in the behavioral sciences. Indeed, given the checkered history of psychological science regarding respecting the rights of human participants, it is unsurprising that not sharing data is standard practice. At least since the Declaration of Helsinki was adopted in 1964 (World Medical Association, 2018), the privacy of research participants’ data has been of paramount concern, particularly in developmental science, where many participants are drawn from vulnerable populations.¹ But privacy is only one of the potential concerns around transparency and openness.

To help understand researchers’ concerns, the SRCD Open Science task force (whose work resulted in this pair of articles) collaborated with Cynthia García Coll, at the time lead editor of *Child Development* (*CD*), to administer a survey to 24 first authors of *CD* publications in a 6-month period in 2017.² This exploratory look revealed that as of 2017, 65% of *CD* first authors had some experience posting or sharing data, while 35% had none. The majority (80%) reported that their institutions did not provide any resources (guidance or financial support) for posting or sharing of data, signaling a need for institutional guidance that organizations like SRCD could fill.

The top three concerns about data sharing were jeopardizing trust of participants/communities/consent (84%), institutional review board concerns/approvals (63%),

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and risks of scooping planned research (63%). Echoing the diversity of child development research, scholars familiar with posting or sharing of data described a variety of types of primary quantitative and qualitative data, including biological, clinical, eye tracking, and electroencephalographic data from regions around the world. Early-career scholars were more likely to report prior experience with posting or sharing data and more likely to have concerns regarding jeopardizing trust. These results echo those from a broader survey conducted by Wiley in 2014 (Ferguson, 2014).

A Path Forward

SRCD must strive to create community standards that favor openness—but demand civility—in scientific discourse. The community of SRCD members must also support one another by making available tools and knowledge that can facilitate data sharing and by recognizing the unique challenges that come with studying infants and children, often in their natural environments (who often do not do what they are expected to do, thereby making research data messier than what is typical in other scientific disciplines).

Tools, Practices, and Resources

An intellectual commitment to transparency and openness is not enough to ensure implementation. These values must be translated into researchers' practices. Increasingly, new technical tools make open sharing of research products (data, materials, and registered DOIs) far easier than in the past. Societies like SRCD can facilitate technical progress by supporting resources that facilitate openness, helping to train researchers to use these new tools, and providing guidelines to encourage (or even mandate) their use in society publications.

Planning for sharing in advance—determining what data will be shared and how, where, and in what form it will be shared—can help reduce the costs to investigators, or at least spread

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costs across the entire span of a study (Klein et al., 2018). New platforms have reduced the costs of sharing data, code, and materials. Many researchers are adopting research project management tools (e.g., the Open Science Framework [OSF], GitHub) that provide practical solutions for the organization of ongoing projects and platforms for storing protocols, materials, and data files to be shared with a wider audience. Some tools (e.g., OSF, AsPredicted [<https://aspredicted.org>]) offer researchers a chance to preregister study hypotheses and designs as a way of increasing transparency about the research planning process and providing evidence of scholarly precedence.

One concern that is especially salient to developmental researchers is that the methods sections of journals do not contain sufficient room to describe all the details of a study. Most journals allow researchers to upload supplementary materials to elaborate on information contained in the main document. Sometimes, however, words alone do not suffice, and platforms such as Databrary (<https://www.databrary.org>) can fill the gap by allowing researchers to upload videos as documentation of research procedures, which can be accessed by registered researchers from institutions across the globe (Adolph, Gilmore, & Kennedy, 2017).

Global Equity

Disparities among communities in financial and human resources and infrastructure are the norm. Yet, openness and transparency should not be viewed as magnifying disparities. Rather, a community's ready access to research products (especially data) at the press of a button allows researchers around the globe the chance to ask new questions and analyze data in new ways at minimal cost. Data have already been gathered, so the financial and time investments of such efforts are no longer a concern. On the other hand, sharing of data can entail costs to people without the resources and communities that SRCD must address.

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Indeed, SRCD should take the lead on achieving global equity in honoring open science principles. First, where resources already exist, including repositories of existing data, SRCD can educate communities on data sets that are available and how to access them at no cost. In general, SRCD can foster awareness to counter the lack of resources and institutional infrastructure related to data management, data reuse and discoverability, legal and ethical issues, data citation, efficiency, and cost-effectiveness. The society can do so through its many existing communication mechanisms and by hosting a page on its website devoted to these topics with links. SRCD can also recognize researchers concerns and the real time and resource costs needed for data sharing and can offer adequate incentives to contribute to data infrastructure and produce reusable research data. Sharing resources crosses global lines and represents one approach to strengthening existing and building new research infrastructures. Facilitating mechanisms to incentivize cooperation and access to data for comparative research simultaneously achieves the goals of SRCD's strategic mission and meets the goals of open science.

Supporting, Not Undermining, Career Trajectories

Surveyed authors expressed concerns about having their research scooped or not benefiting directly from sharing their hard-earned data. In reality, although researchers often express anxiety regarding scooping, very few cases have been documented (Laine, 2017). One way to decrease the perceived costs and strengthen the benefits of data sharing is to require “repayment” in the currency of our trade—citations. By requiring that scholars who use others' data, materials, or analysis code cite the source, contributors are ensured that they will receive academic credit for their contributions. Most recognized data repositories (including the OSF and Databrary) provide persistent identifiers (DOIs) for shared materials, thus encouraging more

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widespread citation of research components, not just papers. SRCD should clarify citation policies for data and resources in the society's publications to mitigate these risks.

Another method for addressing concerns about scooping is to consider embargo periods, during which primary data collectors have exclusive rights to analyze or publish the data they have collected. SRCD can help shape consensus on the duration of such embargos. In other fields, embargo periods vary from as short as only until publication up to 36 months after publication (e.g., OpenNeuro [<https://openneuro.org/faq>]) or to the end of a granting period. Consensus may be trickier to achieve in developmental research, as longitudinal data sets are cumulative. However, reaching consensus on acceptable exclusive-use embargo periods *for each wave of data* will reassure developmental researchers that they have first dibs on the data they have collected.

Moreover, most recommended data repositories allow access controls over both the date of release and the individuals for whom release is visible. Thus, encouraging researchers to upload data to repositories—even if the data initially remain private—can simplify the process of data openness and transparency over the long haul.

Finally, because transparency and openness are not yet norms in child development research, some researchers fear that adopting more open practices before community standards change will make early adopters a target of criticism or particular scrutiny. These concerns should be addressed through SRCD's leadership and continued dialogue among developmental scientists about ways to work together to advance the goals of openness and transparency.

Offering Standards to Guide Metadata

The values around openness and transparency extend to providing how-to tips on obtaining participant consent for data sharing and tips on preparing data to facilitate easy

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interpretation by researchers using the uploaded data. SRCD can post existing templates for participant consent on its website. Data repository experts, in consultation with Institutional Review Boards (IRBs) and legal teams, have already drafted templates to ensure consistency in how researchers ask participants for permission to share data, including identifiable data in videos. This consistency protects participants, promotes better understanding among researchers about what can and cannot be reused, and eases the burden of the IRB review process for data sharing. Once data are shareable, SRCD can help researchers develop and communicate standards to guide the production and public availability of metadata (e.g., essential demographics, settings, tasks, and materials), their ideal data formats, and ways to promote and use these standards consistently.

Concluding Thoughts

Transparency and openness are basic scientific values. They are at the heart of practices that accelerate discovery and broaden access to scientific knowledge. Challenges persist around embracing these values—especially in developmental research, with its messier data, broader range of methods, and heightened privacy concerns. This contributes to anxiety about adopting transparent and open practices. As the leading organization for developmental scientists, SRCD has a responsibility to mitigate these challenges and to address the concerns of the broader community in a timely yet careful manner. By crafting policies and standards for scientific communication and by using its resources to inform and educate its members, the society can set standards and recommendations to ensure the full integration of transparency and openness for the future of developmental science.

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Footnotes

¹ Another interpretation of this ethical obligation to participants, however, is that researchers should *maximize* the value of the data by sharing it, at least provided that we can balance the ethics and privacy risks effectively (Brakewood & Poldrack, 2013).

² We randomly sampled 34 lead authors from the pool of 90, differentially stratified by region (United States/Canada, Europe, other). The sampling plan allowed us to work within our resources while ensuring representation. The survey was administered online from August 25 to September 15. From a pool of 32 valid emails, 24 authors participated (75% response rate). Respondents were split between early-career scholars (in graduate school/less than 7 years post PhD) and senior scholars. Overall, 75% reported using primary quantitative data in their recent *CD* manuscript, 25% used primary qualitative data, and 20% used video or audio data.