

The impact of COVID-19 on infant development: A special issue of *infancy*

In March 2022, the COVID-19 pandemic entered its third year. There have been over 600 million people infected and over 6 million deaths worldwide (WHO, 2022). In addition to devastating health impacts, the pandemic has also had substantial impacts on cognitive, social, and emotional functioning for individuals across the lifespan. In many countries, educational settings were forced to rapidly adapt to new modes of learning provision with early evidence suggesting a negative impact of remote learning on the educational attainment of school-aged children (Kuhfeld et al., 2020). Adults and children are experiencing higher than usual levels of depression and anxiety (e.g., Duan & Zhu, 2020; Ettman et al., 2020; Orgilés et al., 2020; Yeasmin et al., 2020), likely changing the interactions that happen within families and communities. However, the impact of COVID-19 does not appear static, as many individuals have seen fluctuations in mental health or social impacts over time (Landi et al., 2022; Morales et al., 2022). Thus, it appears that a more nuanced approach is needed to understand when COVID-19 and its associated societal and familial changes do or do not impact functioning.

Although it appears at the moment that infants are less likely to suffer severe health outcomes from COVID-19 infection than older children and adults, the pandemic experience has also changed the lives of our youngest population. Importantly, the nature and extent of the impact of COVID-19 on infants around the globe are still unknown. This special issue is focused on capturing the range of impacts—both positive and negative—of the COVID-19 pandemic on the lives of infants. The 10 papers included vary across developmental domains, including perceptual, cognitive, social, and emotional. They also use a variety of methods, including experimental, parent report, observational, physiological, and ecological momentary assessments. In line with the far-reaching nature of the pandemic, this special issue presents infant data from a variety of countries, including the United States, Canada, France, Switzerland, the United Kingdom, and Israel, providing a broad perspective on how the pandemic has differentially affected infants from a diverse range of backgrounds.

Despite these differences in domain, method, and demographics, some relatively consistent themes emerge across all 10 papers. First, infants appear resilient to many of the direct effects of the pandemic on cognitive and socioemotional development. Second, caregivers varied in their ability to cope with the pressures placed on daily life due to COVID-19. Thus, many of the impacts on infants, particularly with respect to social processes and executive functioning, appear to flow through the caregiver. Third, familial systems evolved in response to these novel stressors, putting into place processes that helped buffer infant-level response. This included the more widespread use of novel technology (e.g., videoconferencing) and the traditional harnessing of caregiving relationships. Here, we summarize the patterns that emerged across the special issue.

A subset of the papers examined the direct effects of the pandemic on infants, such as whether mask-wearing in adults would disrupt infants' learning and other important social skills. However, across studies, there was little evidence that mask wearing impacted infants' cognitive and social development. For example, Sperber et al. (2023) asked whether pandemic exposure over the first year

of life would be related to lower language skills and greater socioemotional problems in a sample of US infants, but no such relations were found. Likewise, Wermelinger et al. (2023) reported that 12- to 15-month-old Swiss infants did not vary in their gaze-following behavior based on whether they were tested before or after the onset of the pandemic.

Two additional studies examined the impact of mask wearing on face processing itself. After presenting samples of 3-, 6-, 9-, and 12-month-old infants tested in France with a masked and unmasked face side by side, Galusca et al. (2023) reported no differences in overall looking time based on masking. Further, they found that 9- and 12-month-old infants (but not 3- and 6-month-old infants) demonstrated a novelty preference for inverted masked faces when presented next to the same face upright, suggesting that these infants recognized that the masked image was indeed a face, consistent with previous research. Likewise, DeBolt and Oakes (2023) reported that when US 6- and 9-month-old infants were familiarized with a masked face, they were able to remember that face in test trials when the face was presented unmasked.

Studies of infants' socioemotional functioning showed a similar lack of a direct impact of the pandemic on development. For example, Shakiba et al. (2023) observed a group of mother-infant dyads in Israel before and after the onset of the pandemic (at 3 and 12 months) and reported no differences in parents' emotional availability to infants after the pandemic. Indeed, Israeli infants showed a developmentally typical increase in social responsiveness and involvement with their caregivers across time points. Further, although MacNeill et al. (2023) reported that pregnant US mothers with greater variation in stress during pregnancy had infants with higher levels of temperamental negative affect early in infancy, this relation was not specific to the pandemic and held for mothers and infants tested both before and after its onset.

While evidence of the impact of the pandemic on infants, with regard to these variables, was minimal in these papers, the same was not true for caregivers. For example, Sperber et al. (2023) found that the more US mothers reported disruptive life events related to COVID-19, the more they experienced anxiety, depression, and stress when their infants were 12 months old and anxiety and depression when their infants were 24 months old. Likewise, Reinelt et al. (2023) found that among a sample of high-SES mothers from Switzerland, those who had a maladaptive response to the pandemic also experienced a decrease in overall well-being.

Despite the lack of direct effects of the pandemic on infants, there was some evidence of an indirect effect on infants through their caregivers. For example, Reinelt et al. (2023) reported that maternal distancing from infants during the pandemic was related to infant regulatory problems. Similarly, Hendry et al. (2023) reported that UK mothers who experienced sustained mental distress during the pandemic also reported that their infants experienced higher externalizing and internalizing problems as well as difficulties with executive function. However, in this study, infants who spent more time engaging in enriching activities with their caregivers showed more developed executive functioning and social competence 6 months later, suggesting that engaging with enriching activities with caregivers might have provided a buffer for negative child outcomes during the pandemic.

Other buffering effects were also reported. For example, Roche et al. (2023) examined infants' video chats with their grandparents while families were distanced from each other in the United States and Canada during the pandemic. They reported that the more sensitive grandparents were to their grandchildren, the more the infants expressed the positive affect. Based on these results, the authors conclude that the effects of COVID-19 disruptions to socioemotional development for infants may be buffered by video chat interactions, especially interactions where the speakers are sensitive to the infants' bids for engagement. Further, contrary to the authors' expectations, Rattaz et al. (2023) reported that Swiss infants tested pre-pandemic had lower vagal tone during triadic interactions with both their mothers and fathers than did infants tested post-pandemic. Thus, infants who likely

experienced more time with both their mother and father due to COVID lockdowns were better able to regulate their emotions when compared to infants tested pre-pandemic, who might have been more likely to be overwhelmed by novel triadic interactions.

As a group, these findings speak to the adaptability and resilience of families during the COVID-19 pandemic. Humans are highly adaptive. Because of their lack of experience and readiness to learn, infants might have been especially flexible in coping with their environments during this stressful time. Indeed, the patterns seen here may reflect broader notions of experience expectant and experience-dependent learning (Greenough et al., 2002). We know that infants respond to a wide variety of environments, cultures, and daily experiences and—except at extreme levels of deprivation or maltreatment—there are remarkable levels of overlap in developmental functioning and outcomes (Karasik et al., 2010; McLaughlin et al., 2017).

However, it is important to note that while the current set of papers reports few short-term impacts of the pandemic on infant development, we still know very little regarding the pandemic's impacts in the long term. Given that most of the negative impacts reported here are on caregivers, the implication is that potential resources and intervention strategies might be best targeted at protecting caregivers' mental health. As many of the authors point out, caregiver mental health problems are associated with a myriad of problems for children over the course of development, including putting children at risk for developing mental health problems themselves. Further, the impact of the pandemic is neither evenly distributed nor equally deep. The relatively high-SES samples presented here were presumably insulated from some of the economic and health impacts of COVID-19. It may be that children experiencing broader disruptions to daily life—including the loss of parents, financial difficulty, or food insecurity—will show impacts that are more disruptive and longer lasting. Thus, while the findings presented here can make us somewhat optimistic about infants' resilience during the pandemic, it is possible that we will need to study the long-term impact of the pandemic on development for years to come.

Vanessa LoBue¹
Koraly Pérez-Edgar²
Natasha Kirkham³
Jane Herbert⁴

¹Rutgers University, Newark, New Jersey, USA

²The Pennsylvania State University, Pennsylvania, Pennsylvania, USA

³University of London—Birbeck, London, UK

⁴University of Wollongong, Wollongong, New South Wales, Australia

Correspondence

Vanessa LoBue, Rutgers University, 101 Warren Street, Suite 301, Newark, NJ 07102, USA.

Email: vlobue@psychology.rutgers.edu

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