

Breastfeeding and adult intelligence

Authors' reply

Colin Cooper argues that the positive association between breastfeeding and adult intelligence might be due to residual confounding by maternal intelligence quotient (IQ).¹ This is indeed an important issue in high-income countries, but not in low-income or middle-income settings. Although we did not measure maternal IQ in 1982, we found no associations between breastfeeding duration and strong correlates for IQ, including schooling and family wealth;² in our cohort participants, the correlation coefficient between IQ and years of schooling was 0.64. Had maternal IQ been a confounder in our study, our adjustment for proxy variables (maternal and paternal education, family income, and household assets) would weaken the association between breastfeeding and IQ, rather than strengthen it, as described in our paper. Furthermore, findings from a meta-analysis³ showed that, even in studies that controlled for maternal IQ, breastfeeding was associated with increased IQ (mean pooled difference 2.19, 95% CI 0.89–3.50).³ Finally, the only randomised study on this issue (the PROBIT trial)⁴ reported a 7.5-point increase in IQ among Belarusian children born in maternity hospitals in which breastfeeding was promoted.⁴

Zeljka Buturovic and Suzana Ignatovic argue that factors related to the child can also confound the association. Adjustment for the child's sex, birthweight, and gestational age did not affect our results. We did not measure the "baby's ability and willingness to nurse", which they suggest would lead to reverse causation—that is, infants who learn to suckle more quickly would breastfeed for longer. This is a novel hypothesis in our view, but it would not explain the results from the PROBIT trial,⁴ nor would it make much sense in

evolutionary terms since extended breastfeeding was universal in early mankind and lack of breastfeeding would greatly increase the risk of death. We hope that this hypothesis can be tested in future studies by obtaining detailed information on suckling intensity, although it might be necessary to wait for another 30 years to verify whether this variable can explain findings such as ours.

Buturovic and Ignatovic rightly point out that present-day formula is different from the type of milk received by Brazilian infants born in the early 1980s, particularly because long-chain polyunsaturated fatty acids have been added to modern products. Nevertheless, modern biology is constantly uncovering new properties of breastmilk. In addition to the effect on myelination, these properties include the presence of stem cells, exosomes, epigenetic programming, and changes in the microbiome.^{5–9} These mechanisms might lead to further insights on how breastmilk leads to improved health and development, and make it difficult, if not impossible, for formula to mimic the effects of a live substance.

Ossie Ferdinand Uzoigwe suggests that we should also have considered parity and birth intervals as confounding variables. In our cohort, mothers who breastfed for longer had larger families, rather than smaller families, as in many low-income settings. Additionally, higher parity was associated with lower IQ, and therefore parity was a negative confounder. Indeed, the IQ difference between the extreme breastfeeding categories increased slightly to 3.87 points when adjusted for parity. We also restricted the analyses to singletons and the effect size was maintained (3.45 IQ points). Regarding the birth interval following the index participant, very similar effect sizes were noted among those who had a younger sibling born within 3 years (effect 3.61 points) and those who did not (3.92 points).

We declare no competing interests.

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