Is the Measure the Message: The BSID and Nutritional Interventions

This issue of *Pediatrics* contains a meta-analysis by Qawasmi et al¹ that is an evaluation of the effects of long-chain polyunsaturated fatty acid (LCPUFA) supplementation of infant formula on what is claimed to be measures of “infant cognition.” The analysis is based on performance of different dietary groups on the Bayley Scales of Infant Development (BSID) at ages up to 18 months. The authors conclude that LCPUFA supplementation provides no benefit for either term or preterm infants. There are now at least 4 meta-analyses or systematic reviews on this topic published in the past 7 years.^{2–4} All include only (or mainly) studies that have measured the BSID, and all reach a similar conclusion.

We do not disagree with the conclusion that the BSID is generally unaffected by LCPUFA supplementation; however, we are concerned with the nature of the outcome measure used to anchor this and other meta-analyses. The BSID is a global test designed to identify developmental delay. Its role and place within the field of developmental science is relatively well established. The BSID is, to be charitable, only modestly related to school-age cognitive development (ie, the outcome that is most meaningful to investigators in this field). The BSID is a global measure of developmental status in infancy that assesses and aggregates the timely attainment of relatively crude milestones in infancy and early childhood. It is based on assumptions of a model of general intelligence that assumes that the more rapid attainment of such milestones reflects higher intellectual ability.⁵ Indeed, a recent study found that the BSID was not predictive of IQ of term infants at age 6 years.⁶

More targeted tests of attention based on constructs of information processing have been shown to correlate more highly with cognitive function later in childhood.^{5,7,8} Unfortunately, more targeted measures of specific cognitive functions have only recently begun to be used by pediatricians who have conducted the clinical trials of nutritional supplementation or in evaluating the effects of other early specific exposures to environmental contaminants.^{9–11} As noted above, although the BSID may have been conceptualized initially as an index of “infant intelligence,” it is most useful as an assessment for developmental delay in pediatric and educational settings. Indeed, another article in this issue¹² properly refers to the BSID as reflecting developmental status, although even there the measure documented only slight differences between breastfed and non-breastfed infants (ie, groups known to differ substantially in cognitive outcomes). Simply, the BSID is not an adequate indicant of specific cognitive skills that may be differentially affected by interventions or exposures, nutritional or otherwise, and so its use to evaluate the construct of infant cognition is seriously deficient in the context of recent advances in developmental science. Indeed, more specific measures of early cognitive function have recently been reported to show positive effects of LCPUFA

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ABBREVIATIONS

BSID—Bayley Scales of Infant Development

LCPUFA—long-chain polyunsaturated fatty acid

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supplementation,¹³ and a report from our laboratory that is currently in preparation¹⁴ shows sensitivity of measures other than the BSID at 18 months to be sensitive to specific and general outcome measures, out to age 6.

Aside from the BSID being insensitive to the effects of early nutritional interventions, it is also possible that the choice to assess at 18 months may not be the optimal age at which to observe differences of interest. Eighteen months

is an age of considerable reorganization in early development and may be too volatile to anchor major conclusions about the effectiveness of a nutritional intervention.

In summary, although we do not disagree with the authors' conclusion that the BSID is generally unresponsive to LCPUFA supplementation, we disagree that a finding of no effect by using the BSID is sufficient evidence to conclude that LCPUFAs convey no benefit to

infant cognitive development. It is a challenge for researchers in the field to expand their repertoire of developmental tests and to consider planning studies with the power to test children enrolled in these studies at older ages. We also hope that the continued education of the pediatric community in the area of developmental behavioral science will foster a better understanding of the subtleties of measuring and interpreting developmental outcomes.

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