

Nutrition plays a vital role in brain development, especially in the early years of childhood. Additionally, more trials combining nutrition and cognitive stimulation are needed to better understand their joint impact. Similarly, interventions using B vitamins, iodized salt, or DHA supplements did not yield statistically significant effects at the group level, although one study noted that children with higher blood DHA levels performed better on vocabulary and comprehension tasks. This systematic review investigates how various nutritional interventions affect the cognitive abilities of preschool-aged children, using data from randomized controlled trials (RCTs) conducted after the year 2000. While well-nourished children still gained minor advantages, particularly from fish intake, the most significant cognitive improvements were seen in undernourished children receiving multi-nutrient support. Long-term impacts of these interventions remain unclear, and there's a lack of studies exploring the effect of overall diet diversity (e.g., incorporating more fruits and vegetables) on cognition. A study in India revealed that preschool quality played a significant role: children in lower-quality preschool environments showed cognitive gains from MMN supplementation, while those in better-resourced settings did not. A similar trial in Norway found better results in processing speed and motor coordination for children who consumed herring and mackerel—especially among those who consistently followed the dietary protocol. In this case, Indonesian children who received both a fortified milk supplement and cognitive engagement activities exhibited greater gains in overall IQ and fewer attention-related problems than children in the control group. To gather relevant studies, researchers performed a comprehensive search across several scientific databases, including PubMed and Cochrane Library. The review included trials that involved children aged 2 to 6 years and measured cognitive development outcomes following dietary interventions. These interventions ranged from single-nutrient supplements to fortified foods and food-based programs such as fish consumption. This diversity offered valuable insight into how socioeconomic context influences the effectiveness of nutrition on cognitive development. In summary, providing essential nutrients during the preschool years can meaningfully support children's cognitive growth, especially for those at risk of malnutrition. After applying strict inclusion criteria, 12 RCTs were selected for analysis. Guava, despite improving iron absorption due to its high vitamin C content, did not lead to cognitive improvements. Three studies explored the impact of combining several essential nutrients into meals or snacks. In South Africa, fortified maize porridge helped enhance reasoning and problem-solving skills in undernourished children. The review concluded that the children who benefited most from nutritional interventions were those facing nutritional deficiencies or living in disadvantaged environments. Policymakers and caregivers should consider extending nutritional support beyond infancy into early childhood to help maximize developmental potential. While most nutrition-focused policies emphasize the first 1000 days of life, the period that follows is often overlooked despite its importance. Half of these studies were carried out in high-income countries like Germany and Norway, while the other half took place in low- and middle-income countries such as India, Ethiopia, and South Africa. A separate trial in Guinea-Bissau provided a nutrient-rich paste to children; those under the age of four saw improved working memory, suggesting age-specific benefits. The review also included food-based interventions, particularly those involving fatty fish like salmon and mackerel. Among the five studies that fell under this category, only iron supplementation showed a clear cognitive benefit, and only

for children who were iron-deficient. These were studied mostly in European countries with generally well-nourished children. Only one study combined nutrition with psychosocial stimulation, showing promising results. The preschool phase—ages 2 to 6—is a critical window during which children's cognitive and behavioral skills grow rapidly. One key category examined in the review was single-nutrient supplementation. Another major focus was multiple micronutrient (MMN) fortification. In Germany, children who ate salmon three times a week showed improvements in nonverbal intelligence when compared to those who ate meat.