Effectiveness of Part C Early Intervention Physical, Occupational, and Speech Therapy Services for Preterm or Low Birth Weight Infants in Wisconsin, United States

Beth M. McManus, PT, MPH, ScD; Adam C. Carle, PhD; Julie Poehlmann, PhD

From the Department of Health Systems, Management & Policy, Colorado School of Public Health, Children's Outcomes Research Group, Children's Hospital Colorado, Aurora, Colo (Dr. McManus); Department of Pediatrics, University of Cincinnati School of Medicine, James M. Anderson Center for Health Systems Excellence, Cincinnati Children's Medical Center, and Department of Psychology, University of Cincinnati College of Arts and Sciences, Cincinnati, Ohio (Dr Carle); and Department of Human Development and Family Studies, and Waisman Center, University of Wisconsin-Madison, Madison, Wis (Dr Poehlmann)
Address correspondence to Beth M. McManus, PT, MPH, ScD, Department of Health Systems, Management & Policy, Colorado School of Public Health, Children's Outcomes Research Group, Children's Hospital Colorado, 13001 E. 17th Place, MS B117, Aurora, Colorado 80045 (e-mail: beth.mcmanus@ucdenver.edu).
Received for publication July 18, 2011; accepted November 22, 2011.

ABSTRACT

OBJECTIVE: To determine the effectiveness of policy-driven therapy (ie, Part C early intervention [EI]) in the context of varying maternal supports among preterm infants in Wisconsin.
METHODS: A longitudinal study of mother–infant dyads recruited from 3 newborn intensive care units in southeastern Wisconsin. Participation in EI-based therapy was collected at 36 months via parent-report. Cognitive function was measured at 16 months by use of the Bayley Scales of Infant Development (Mental Developmental Index), 2nd edition and at 24 and 36 months postterm via use of the Stanford-Binet Intelligence scale, 5th edition. Maternal support was measured at 4 months with the Maternal Support Scale. Propensity score matching was used to reduce selection bias. Latent growth models of matched pairs estimated the effect of EI therapy on cognitive function trajectories. Ordinary least squares regression estimated the differential effect of EI therapy on cognitive function at 16, 24, and 36 months postterm for mothers reporting more maternal supports.
RESULTS: Of the 128 infants, 41 received EI therapy and, of those, 32 (78%) were successfully matched with controls. The results of the matched analysis (n = 64) reveal that 1) receipt of therapy is inversely associated with cognitive function baseline ($P = .04$) and positively associated with trajectories ($P = .03$), 2) the number of maternal supports is positively associated with cognitive function for families receiving Part C early intervention, at 16 months ($P = .05$), 24 months ($P < .01$), and 36 months ($P = .05$) postterm.
CONCLUSIONS: Participation in EI therapy may be associated with more optimal cognitive function trajectories. Among preterm children whose mothers have more supports, receiving therapy appears particularly beneficial.

KEYWORDS: cognitive function; part C early intervention; preterm birth

ACADEMIC PEDIATRICS 2012;12:96–103

WHAT'S NEW

Early intervention therapy may be associated with improved cognitive function trajectories in a sample of preterm (<35 weeks) and low birth weight (<2500 g) infants. Also, bolstering the presence of more maternal supports may strengthen the effectiveness of early intervention therapy.

INTRODUCTION

IN THE UNITED STATES, more than 1 in 10 infants are born preterm (<37 weeks) each year.[1] The long-term consequences of preterm birth are of public health concern and include neurodevelopmental difficulties such as poor cognitive function.[2,3] To mitigate neurodevelopmental risk, many preterm infants receive therapeutic services. Receipt of therapy is efficacious in improving cognitive function among clinical samples of preterm infants.[4] However, its effectiveness when programs are brought to scale in a policy-relevant context is less understood. The primary source of policy-governed therapy for preterm infants is Part C of the Individuals with Disabilities Education Act.[5] Empirically testing the effect of Part C early intervention services (hereafter called early intervention) is complicated by variability in program characteristics[6] and differences in observed and unobserved characteristics of children enrolled and not enrolled.

To mitigate methodological challenges, an analytic approach could restrict analyses to a relatively small geographical area (ie, to minimize state program differences), select a sample of infants with a specific diagnosis (eg, preterm birth), and use statistical methods to reduce child differences between treatment groups.

Although many preterm infants demonstrate later cognitive delays, there is tremendous variability in difficulties[7] thought to stem from interactions between biological risk (eg, preterm birth) and protective factors (eg, family supports).[8–11] Indeed, family supports are strongly correlated with infant cognitive function. To this end, it has been suggested[11] that early intervention services

promote resilience by providing or bolstering existing family supports (eg, assistance with finances, information, child care or provision of emotional support), all of which may contribute to better infant cognitive function.[11] Thus, it is plausible that the effectiveness of early intervention services is modified in the face of varying maternal supports. Moreover, time points during the first 36 months postterm may exist in which the syngeristic effects of early intervention therapy and quantity of maternal supports may prove particularly beneficial. To our knowledge, this has not been empirically tested. The purpose of this study is to examine 1) the effect of receiving early intervention therapy on infants' cognitive function trajectories, and 2) the differential effect at different time points (ie, 16, 24, and 36 months postterm) on cognitive function of early intervention therapy for children with greater levels of maternal support in a sample of preterm infants in southeastern Wisconsin, USA.

Understanding the effectiveness of early childhood policy governed programming is of particular importance during this time of financial crisis when many early-intervention programs may not be sustainable.[12] Moreover, identifying potentially modifiable resilience factors by which child policy−governed interventions might successfully promote preterm infants' developmental trajectories is critical for tailoring interventions for vulnerable families.

METHODS

SAMPLE

The study sample was derived from a larger longitudinal study (described previously[13]), which included 181 preterm (<37 weeks) and low birth weight (<2,500 grams) infants hospitalized in 1 of 3 Wisconsin neonatal intensive care units from 2002 through 2005. Families were invited to participate in the study if: 1) infants were born at 35 weeks' gestation or less or weighed less than 2500 g at birth, 2) infants had no known congenital malformations or prenatal drug exposure, 3) mothers were at least 17 years of age, 4) mothers could read English, and 5) mothers self-identified as the infant's primary caregiver. Of the recruited 186 mother-infant pairs, 181 (97%) participated. Demographic characteristics of the study sample were generally comparable with the general Wisconsin population. For example, between 2002 and 2005, 25% of WI adults had a bachelor's degree compared with 31% of mothers in the study sample. During 2002 to 2005, between 10% and 14% of families lived in poverty compared with 19% of the study sample. Approximately 88% of families living in WI between 2002 and 5005 were white, non-Hispanic compared with 84% of the study sample. Caregivers participated in in-person interviews and infants were evaluated at the university developmental clinic (with the exception of hospital discharge) at 6 time points: before discharge from the neonatal intensive care unit, 4 months, 9 months, 16 months, 24 months, and 36 months postterm. There was a 17% attrition rate[14] between hospital discharge and 36 months of age. Although this attrition rate is similar to previous studies[15] with similar populations, mothers lost to follow-up were more likely to be of lower education and nonwhite. The present analysis is drawn from a subsample of 128 families who had complete data on the covariates of interest (described below in Predictors of Early Intervention Participation.). These 128 families did not differ significantly from the original 181 on postnatal depressive symptom scores, socio-demographic characteristics, or neonatal risk factors.

OUTCOME MEASURE

Children's cognitive function was measured at 3 time points: 16 months, 24 months, and 36 months postterm. At 16 months, the Bayley Scales of Infant Development, 2nd edition,[16] Mental Developmental Index (MDI) was used. In the MDI, items are scored dichotomously (1 = able to complete or 0 = not able to complete) and summary scores are compared with a standardized distribution (mean =100 and SD = 15). Appropriate for infants 1 to 42 months of age, the MDI has excellent reliability (α = .91), average stability coefficients of at least .80 across age groups, and moderate-to-high concurrent validity (r = .59–.79).[17] At 24 and 36 months corrected age, the Abbreviated Battery IQ scale (ABIQ) of the Stanford-Binet Intelligence Scale, 5th edition,[18] was used to measure cognitive function. The Stanford-Binet is a widely used measure of cognitive function, appropriate for children older than the age of 2. A summary score is compared with a standardized distribution (mean = 100 and SD = 15). The ABIQ has excellent reliability (α = .95 to .98) and moderate-to high concurrent and criterion validity.[18] The age appropriateness of the cognitive function assessments in this study varied, which necessitated inclusion of different scales (ie, Bayley and ABIQ) across time to measure cognitive function. However, each is widely used in the child neurodevelopmental literature and the combined use of the Bayley and ABIQ is consistent with a large, randomized controlled study of preterm and low birthweight infants,[16] which allows for comparability.

MEASUREMENT OF EARLY INTERVENTION PARTICIPATION

We included a parent report measure of receipt of "any" early intervention services. At the 36-month interview, parents were asked whether their child received physical, occupational, or speech therapy services through early intervention at any time between birth and 36 months.

PREDICTORS OF EARLY INTERVENTION PARTICIPATION

In previous research,[19–21] authors suggest mixed results with regard to the influence of family sociodemographic characteristics on early intervention participation. However, we hypothesized that in this sample, lower family income and minority race may confer risk of early intervention access difficulties and we therefore include several measures reflecting infant and family sociodemographics. Child's race and ethnicity was categorized as white non-Hispanic or not (because of small numbers within minority subgroups). Yearly family income was collected in US$. Maternal education was collected in years.