AOTA Evidence Briefs

Developmental Delay in Young Children

**A product of the American Occupational Therapy Association's Evidence-Based Literature Review Project*

DD #2

Helping mothers adapt to infants of low birthweight may reduce risk of cognitive impairment

Rauh, V. A., Achenbach, T. M., Nurcombe, B., Howell, C. T., & Teti, D. M. (1988). Minimizing adverse effects of low birthweight: Four-year results of an early intervention program. *Child Development*, *59*, 544–553.

Level: IA1a

Randomized controlled trial, 20 or more participants per condition, high internal validity, high external validity

Why research this topic?

Historically, interventions for infants of low birthweight and infants born prematurely evolved relatively independently of long-term studies of development mediated by the mother. Several nonexperimental investigations conducted in the 1970s showed consistent associations between aspects of mother–child interaction and specific outcomes among infants of low birthweight and infants born prematurely. Another theoretical model proposed that high levels of parent confidence and infant social competence would facilitate harmonious social interactions between parent and infant. For the most part, however, these important empirical and theoretical advances were not reflected in preventive interventions until the late 1970s.

What did the researchers do?

In this context, Rauh and her colleagues (1988), variously affiliated with Columbia University (New York City), the University of Vermont (Burlington), Brown University (Providence, RI), and the University of Maryland (College Park), became involved in the Mother-Infant Transaction Program, undertaken to help mothers adjust to the birth and care of infants of low birthweight. The program aimed to improve mothers' adjustment by (1) helping them appreciate their infant's unique behavioral characteristics; (2) sensitizing them to the infant's cues, particularly those that signaled distress, too many stimuli, or readiness for interaction; and (3) teaching them to respond appropriately to those cues to facilitate mutually satisfying interactions. A longer-term goal of the program was to enhance the infant's development. The researchers hypothesized that "confident, knowledgeable, and effective parenting would reduce the risk of developmental disorder or delay" (p. 546).

Between April 1980 and December 1981, the researchers screened all infants whose birthweight was below 2,250 grams (4.92 lbs.), whose **gestational age** (see *Glossary*) was less than 37 weeks, and who had been hospitalized in the intensive care nursery for at least 10 days. They excluded infants resulting from multiple births, showing congenital anomalies or severe neurological defects, or born to single mothers. Of the 86 mothers whose infants met the selection criteria, 78 agreed to participate. The researchers assigned each mother–infant pair to the treatment or the **control group** (see *Glossary*) by tossing a coin. The resulting numbers were 38 and 40, respectively. (The genders of the infants at this early stage of the study were not reported.) At the 48-month follow-up, only 25 and 28 pairs, respectively, remained in the study. Of the infants in the first group, 11 were boys and 14 were girls; of the infants in the second group, 18 were boys and 10 were girls.)

The researchers also recruited a comparison group of infants of normal birthweight and of more than 37 weeks' gestation. These infants came from the newborn nursery. The researchers selected the next normal-birthweight baby born following the birth of each low-birthweight infant in the control group. They approached 48 mothers about participation, and 41 agreed. (At the 48-month follow-up, 28 pairs remained. Of the infants, 13 were boys and 15 were girls.)

The intervention involved 11 sessions of 1 hour each; 7 conducted in the hospital during the week before the infant's discharge and 4 conducted in the home at 3, 14, 30, and 90 days after discharge. A neonatal intensive care nurse conducted the sessions with the infant, the mother, and the father (when available) in a private or semiprivate room. The sessions in the hospital focused on acquainting the mother with the qualities of her child's functioning in different domains, such as his or her potential for self-regulation and interaction, behavioral signs of distress, and predominant states (sleep, wake, etc.). In the home the sessions successively addressed adjusting to care at home, building the mother's repertoire of interactive play experiences, recognizing the child's emerging behavioral style and enhancing the "fit" between mother and child, and reviewing recent changes in the child.

The outcome areas of interest to the researchers were as follows:

- The mother's *self-confidence* (as measured by the Seashore Self-Confidence Rating Paired Comparison Questionnaire); *anxiety* (as measured by the Taylor Manifest Anxiety Scale); *role satisfaction (*as assessed in a semi-structured interview); and *perceptions of the infant's temperament* (as measured by the Carey Infant Temperament Questionnaire)
- The infant's *cognitive development* at the adjusted gestational ages of 6, 12, and 24 months (as measured by the Mental Development Indices of the Bayley Scales of Infant Development); and *cognitive development and adaptive functioning* at 36 and 48 months of age (as measured by the McCarthy Scales of Children's Abilities)

The assessments of the mothers were made at various ages of the infants: self-confidence at 48 months; anxiety at discharge from the hospital and at 4 months; role satisfaction at 6 months; and perceptions of temperament at 6 months. The assessments of the infants were made at 6, 12, 24, 36, and 48 months of age.

What did the researchers find?

- *Treatment effects on mothers.* On the measure of self-confidence at 6 months, the groups showed **significant** (see *Glossary*) overall differences. The mothers of normal-birthweight infants scored significantly higher than mothers of either low-birthweight group. Further, the treatment group mothers scored significantly higher than the low-birthweight control group mothers. Socioeconomic status was not associated with this finding.

  On the measure of role satisfaction, the groups showed **no significant** (see *Glossary*) overall differences. However, the treatment group mothers again scored significantly higher than the control low-birthweight group mothers. Socioeconomic status was associated with this finding.

  On the measure of perceptions of infants' temperament, overall group differences were significant. The treatment group mothers perceived their infants to be significantly less difficult than the low-birthweight control group mothers perceived their infants to be. Socioeconomic status was not associated with this finding.

  There were no significant group differences on the measure of maternal anxiety.
- *Treatment effects on children.* On the measure of cognitive development at 6, 12, and 24 months' gestational age, the two low-birthweight groups showed no significant differences. On the measures at 36 and 48 months, however, significant differences were present, favoring the treatment group, although all mean scores were within ± 1 standard deviations of the mean. Further, comparison of the low-birthweight treatment group and the normal-birthweight group showed a gap of 6.3 points between them at 6 months on the Bayley Scales but only 0.4 points on the McCarthy Scales at 48 months. Socioeconomic status was a covariate in all computation.

What do the findings mean?

- The findings support the use of such an intervention program with low-birthweight infants. It had positive effects on the mothers' initial adjustment and, in the long term, on the children's cognitive development. The finding that, at 48 months' gestational age, the low-birthweight infants in the treatment group achieved scores nearly identical to those of the normal-birthweight group suggests that the intervention reduced the risk of cognitive impairment in the treatment group.

- The findings should boost confidence in funding early intervention programs for low-birthweight infants based on the model followed in this study. Helping mothers adapt to their children in ways that promote mutually satisfying interactions appears to pay off in mothers who are more confident, knowledgeable, and effective and children who are less at risk for cognitive impairment.

What are the study's limitations?

- Subjects are all from one hospital.
- Cohort is from 1980–1981.
- There was a between-group difference for socioeconomic status.
- Infants born to single mothers were excluded; more female subjects were in treatment group.
- Unclear what the control group received; not discussed in article.
- Must request manual for full protocol detail from the authors.
- At 36 and 48 months, the outcome measure switched to McCarthy Scales.
- Intervention only accounted for 9.8% of the variance on the 48-month McCarthy Scales score.
- For all three analyzed groups, the Bayley scores and the McCarthy scores were within 1 standard deviation of mean (clinical significance questioned).
- One NICU nurse did treatment and maternal assessment; no **blindness** (see *Glossary*) or interrater reliability was established.

Glossary

blinded/blinding—Blinding refers to the practice of keeping members of the research study unaware of which group a participant is assigned to (treatment or control) in the study. Single blinding usually refers to keeping study participants unaware of whether they are receiving the experimental or the sham treatment. Double blinding usually refers to keeping the participants and those who are administering the treatment unaware of who is receiving the experimental and who is receiving the sham treatments. In some cases, where it is impossible to blind those administering treatment, the individuals who are administering the outcome measures can be blinded to group status.

Studies in which blinding does not occur can have significant biases. When the participants know that they are receiving the experimental treatment, they often get better because they think they ought to (this is often referred to as the placebo effect). When researchers know that a participant is receiving the experimental treatment, they often subconsciously favor those participants when evaluating them on outcome measures. For instance, when timing a participant in the treatment group, researchers may unknowingly stop the watch a little faster or slower so the treatment participant seems to do better.

control group—a group that received special attention similar to that which the treatment group received, but did not receive the treatment.

gestational age—age from conception, rather than from birth.

significance (or significant)—a statistical term; this refers to the probability that the results obtained in the study are not due to chance, but to some other factor (such as the treatment of interest). A significant result is one that is likely to be generalizable to populations outside the study.

Significance should not be confused with clinical effect. A study can be statistically significant without having a very large clinical effect on the sample. For example, a study that examines the effect of a treatment on a client's ability to walk may report that the participants in the treatment group were able to walk significantly longer distances than the control. However, if you read the study you may find that the treatment group was able to walk, on average, 6 feet, whereas the control group was able to walk, on average, 5 feet. Although the outcome may be statistically significant, a clinician may not feel that a 1-foot increase will make his or her client functional.

■ Terminology used in this document is based on two systems of classification current at the time the evidence-based literature reviews were completed: *Uniform Terminology for Occupational Therapy Practice—Third Edition* (AOTA, 1994) and *International Classification of Functioning, Disability and Health (ICIDH-2)* (World Health Organization [WHO], 1999). More recently, the *Uniform Terminology* document was replaced by *Occupational Therapy Practice Framework: Domain and Process* (AOTA, 2002), and modifications to *ICIDH-2* were finalized in the *International Classification of Functioning, Disability and Health* (WHO, 2001).

This work is based on the evidence-based literature review completed by L. Diane Parham, PhD, OTR, FAOTA, and Nancy Bagatell, MA, OTR, with contributions from Christine R. Berg, PhD, OTR/L, and Patricia D. LaVesser, PhD, OTR/L.

For more information about the Evidence-Based Literature Review Project, contact the Practice Department at the American Occupational Therapy Association, 301-652-6611, x 2040.

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