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early developments Frank Porter Graham Child Development Center

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*Child Health: The role of nutrition in virus mutation;
Sleep behaviors and later learning*

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Research Spotlight

“Health is not merely the absence of illness, but a positive sense of well-being.”

—World Health Organization

Lullabye and good-night

Study finds links between sleep behaviors and later learning and development



Photos by Jane Barlow

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Research into the health of children has been a significant component of the Frank Porter Graham Child Development Center since it was founded 30 years ago.

Hand in hand with the Center’s Abecedarian Project of the early 1970s was a continuous study of the health of children attending FPG’s child care center. Early researchers began monitoring otitis media and respiratory tract infections and their effect on learning. Data on pulmonary function, lung growth, and vaccine evaluations were collected. FPG also began helping train family nurse practitioners who were attending the University of North Carolina at Chapel Hill.

IN THE 1980s, FPG INVESTIGATORS studied the effects of second-hand cigarette smoke on children and discovered that children who lived with smokers had more lower-respiratory tract infections and more incidents of otitis media with effusion. Center research showed that viruses, such as colds and flus, can disable a child's natural defense system against earaches and other bacterial infections. During that time, FPG also helped in the opening of a number of educational child care centers around the nation for premature children.

Studying sleep in preterm infants

Work in many of these areas continues today. For example, Diane Holditch-Davis of the UNC-CH School of Nursing and an FPG fellow, has a number of ongoing



projects involving premature infants. One of her recent studies found that preterm infants who were given a one-and-a-half-hour nap four times a day, with their beds covered and undisturbed, gained more weight and showed a more rapid decline in the incidence of apnea than infants receiving standard nursing care. By the end of a three-week period, the experimental infants weighed an average of 1,600 grams

versus an average of 1,419 grams for infants in the control group.

Neonatal nurses have long suggested that the stimulation received in the intermediate care unit is inappropriate for the development of convalescent premature infants. In the Holditch-Davis study, infants who were given one-and-a-half-hour naps four times a day slept more than infants who received standard nursing care.

“Thus, a simple modification of nursing care that involved minimum increases in nursing time had an impact not only on the sleeping and waking of preterm infants, but also on the incidence of apnea and rate of weight gain. Since a simple modification of nursing care had relatively large effects, practicing nurses need to carefully evaluate nursing care to determine whether all aspects are needed and effective,” wrote the authors of the study published in *Neonatal Network* 16(8), pp. 35–43, last year.

Holditch-Davis' recent work has focused not only on ways to improve nursing care for premature infants, but also on ways to better assess the health of preterm infants. Here are summaries of several projects in which she has been involved:

Sleeping, waking measures

This study compared electroencephalograms (EEG) and behavioral measures



...those who showed more rapid active sleep development had the highest mean IQ and significantly better language, fine motor, and observational play scores [at three years of age] than children in other clusters.

of sleeping and waking in premature infants to identify differences between these measures that might be indicators of neurological development. Infants selected for the study were at high risk for developmental problems because of birthweight less than 1,500 grams, mechanical breathing or both. The similarities and differences between behavioral and EEG scoring were examined to determine the minute-by-minute agreement.

Results indicate that differences between EEG and behavioral observation do, in fact, reflect the immaturity of the infant's brain. "With additional study, it may be possible to use the developmental patterns of these disagreements to identify infants at risk for neurological problems," Holditch-Davis said.

Sleep-wake behaviors

Can the developmental status of three-year-olds, born prematurely, be predicted from the development of sleep-wake behaviors during the preterm period?

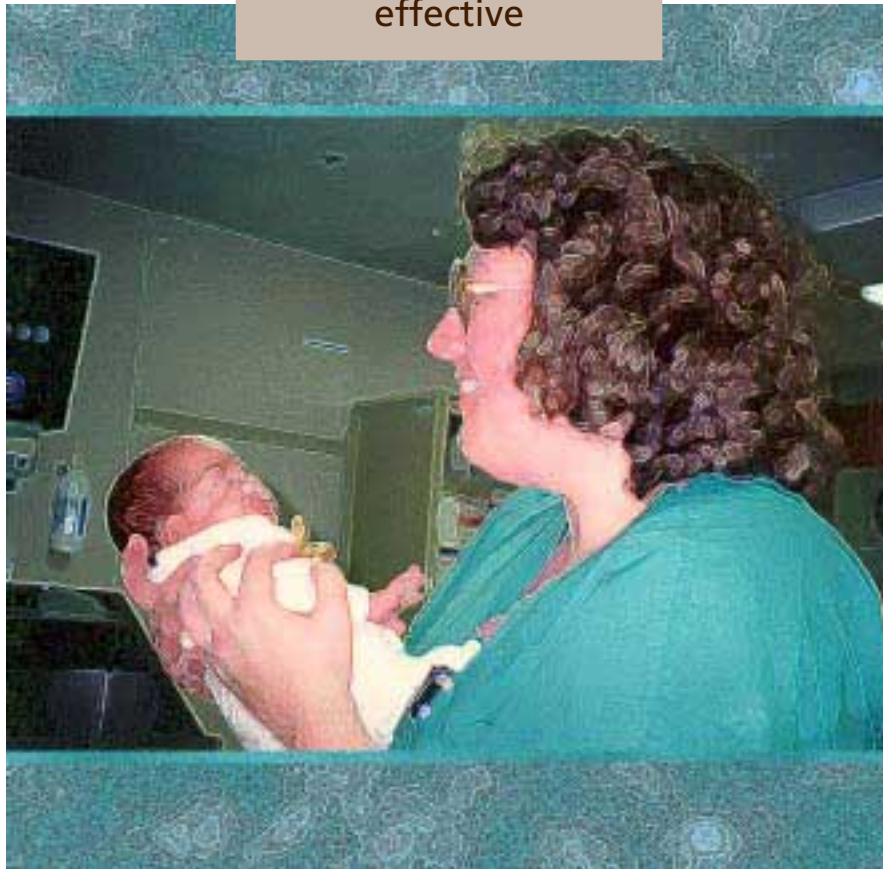
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This study of 51 children who were followed for three years found that those who showed more rapid active sleep development had the highest mean IQ and significantly better language, fine motor, and observational play scores than children in other clusters.

Irritability

Many clinicians believe that infants with chronic lung disease show more irritability and react more negatively to care than other preterm infants. This study examined sleep-wake states and behaviors in a group of infants with chronic lung disease and a

Since a simple modification of nursing care had relatively large effects, practicing nurses need to carefully evaluate nursing care to determine whether all aspects are needed and effective



group without the disease. Infants were also checked when alone and when they were with nurses.

The study found few differences between the groups. Sleep-wake states did not differ. "...there is no evidence that 32- to 36-week preterm infants with chronic lung disease are more irritable or react more negatively to care than other preterm infants," said Holditch-Davis.

For further information

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Studies focus on ways to better assess preterm infant health

Assessing health risks earlier

Ongoing research includes a look at measures of biological risk. Here are summaries of several ongoing research projects at FPG involving infants' health.

Fragile Infants

FPG Fellow Margaret S. Miles is principal investigator of the study "Parental Role Attainment with Medically Fragile Infants." (A medically fragile infant has a serious life-threatening health problem within the first two months as the result of prematurity, a serious birth defect, or severe chronic disease.) The goal of the study is to identify key factors affecting the response of parents, especially those who are high-risk, so that appropriate interventions to support parental role attainment can be developed. Co-principal investigator is Diane Holditch-Davis at UNC-CH's School of Nursing and co-investigators are Peg Burchinal and Barbara Goldman, both at FPG. This study is examining these questions:

- How do parental involvement, identity, and competence with medically fragile infants develop and change over time and across settings, and what are the relationships among parental involvement, identity, and competence?
- How do characteristics of the infant and the infant's illness influence parental involvement?
- How do fathers differ from mothers in parental involvement and what factors influence the development and maintenance of their parental roles?
- What aspects of parental involvement influence the quality of the mother-child relationship at 12 and 15 months?

Taking part in the study are 85 medically fragile infants and their parents, who are being followed until the infants reach 15–18 months.

Risk assessment

The study, "Assessment of Biological and Social Risk in Preterm Infants," is examining four measures of biological risk—sleeping and waking state development, dysmature electroencephalogram (EEG) patterns, neurological insults, and visual attention. Diane Holditch-Davis and her team are examining:

- The effectiveness of these measures in predicting 12- and 24-month health and developmental outcomes
- The relationship between these measures
- The interaction of biological risk measures with measures of social risk in predicting 12- and 24-month developmental and health outcomes
- The identification of predictors of developmental and health outcomes

In this study, 150 high-risk preterm infants from two hospitals are being recruited as soon as their medical conditions are no longer critical. They are being followed for two years past term. "If predictors can be used clinically to identify infants in need of

intervention, then early intervention resources could be targeted to those most likely to benefit from them," said Holditch-Davis.

Support Intervention

In another study, "A Nursing Support Intervention with Mothers of Preterm Infants," Holditch-Davis and Miles are examining a support intervention for mothers of high-risk infants after hospital discharge. Four questions are posed:

- Is a supportive intervention for mothers of preterm infants at risk for chronic health problems feasible?
- Will the intervention affect the use of services, maternal psychological well-being, and quality of social environment?
- Six months after term, will these mothers have fewer and less intense unresolved issues from their child's experiences in the neonatal intermediate care unit than mothers without this intervention?
- What specific activities will be performed by the intervention nurses?

Forty subjects have been enrolled in the program, and the intervention is being delivered when the infants have been home for at least two weeks.

For further information

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