The purpose of this study was to develop a reliable instrument that would assess a mother’s knowledge about the sensory development of infants and her self-perceived influence on the development of her child. The assumption justifying the construction of the instrument was that development is influenced by environmental as well as genetic factors. Thus, it was reasoned that the attitudes and knowledge that a mother brings to the maternal role may be of considerable influence to the well-being of her child.

Sensory integrative theory (Ayres, 1979) proposes that the types of sensory stimulation that the infant experiences after birth may enhance the development of the infant’s nervous system. This theory can be interpreted and, perhaps, extended to suggest that one of the critical roles a mother plays is that of the chief provider of sensory stimulation to her infant. Further, it seems that a mother’s knowledge of her child’s sensory capacity and her perception of her ability to influence her infant’s development will affect the environment she provides for her child. It was reasoned that the availability of an assessment that would identify a mother’s degree of knowledge about the sensory development of infants and assess her perceived influence over her infant’s development might stimulate movement by therapists into new practice domains. As an example, a mother who perceived herself as having little influence and who had little knowledge of the sensory capacity of her infant could be provided with programs that would increase her knowledge, provide her with a greater sense of potential influence on the child’s development, and further her ability to create a home environment that fosters sensory integration and development. However, before the instrument can be validly used for this purpose, research will have to be undertaken to demonstrate that the scores on the instrument are predictive of maternal competence or better child development. Although we did not investigate such correlations in this study, we took preliminary steps in instrument development. The present study was designed to determine

1. whether a reliable instrument of this kind could be constructed;
2. whether scores on the questionnaire were normally distributed;
3. to what extent there was a relationship between the two constructs presumed to be measured by the instrument, that is, maternal knowledge about the sensory development of infants and maternal perception of influence on child development;
4. to what extent there was a relationship between demographic variables and performance on the questionnaire.
Review of the Literature

In the 1890s, James believed that the world of the newborn was "a great buzzing confusion." However, current research exists that suggests James may well have misrepresented the actual sensory experience of neonates. It is now accepted that the normal newborn has the capacity to perceive a large range of sensory stimuli in a well-organized manner (Bomstein, Kessen, & Weiskopf, 1976; Burke, 1977; Crook, 1976; Engen & Lipsitt, 1965; Eviatar, Eviatar, & Naray, 1974; Gibson & Walk, 1960; Leventhal & Lipsitt, 1964; Marg, Freeman, Petzman, & Goldstein, 1976; Mitchell & Cambon, 1969; Simner, 1971; Sinclair, 1967). In this study sensory function is defined as the action of the environment upon the organism and the reaction of the organism to the environment (Ayres, 1973). The term infant refers to a child during the first 6 months of life.

Since 1955 a variety of studies have demonstrated that infants within the first few minutes of life are remarkably responsive to visual (Bomstein et al., 1976; Gibson & Walk, 1960; Marg et al., 1976), auditory (Leventhal & Lipsitt, 1964; Simner, 1971), taste (Burke, 1977; Crook, 1976), smell (Engen & Lipsitt, 1965), somatosensory (Sinclair, 1967), and vestibular (Mitchell & Cambon, 1969; Eviatar et al., 1974) stimulation. At the same time, sensory deprivation experiments conducted with animals (Douglas, Clark, Erway, Hubbard, & Wright, 1979; Hirsch & Spinelli, 1970; Hubel & Wiesel, 1965; Van Shuyters & Levitt, 1980) have underlined the importance of early sensory input to optimal development.

The critical role that sensory stimulation plays in fostering development has also been confirmed in studies of institutionalized children. In a classic study, Spitz (1945, 1946) demonstrated that extreme sensory deprivation severely affected children growing up in English institutions where all physical needs were met but important sensory input was lacking. The results of this study, as well as of others (Casler, 1961; Goldfarb, 1943; Provence & Lipton, 1962), suggest that early sensory stimulation in a variety of contexts may play an important role in normal development.

Other studies have focused on the quality of maternal stimulation and its effects on a child's development. Clark-Stewart (1973), Bell (1970), and Yarrow (1964) have found that a child's intellectual development is correlated with the quality of maternal responsiveness. They suggest that increased qualitative stimulation by the mother leads to enhanced intellectual and social performance in later life.

Mothers' attitudes concerning development, which have been shown to vary, may influence the kinds of activities and experiences they provide in the home for their infants. Studies have shown that lack of parental belief in the child's capacities is apt to limit the development of innate abilities and potentials (Martin, 1975; Parsons, Adler, & Kaczala, 1982). A study by Minuchin, Montalvo, Guerney, Rosman, and Shumer (1976) revealed that working class mothers tended to see themselves as powerless in affecting their child's development. Additionally, Ninio (1979) demonstrated that mothers from lower class backgrounds believe that basic cognitive skills develop at a considerably later age than the age at which mothers from a higher class background believe these skills develop. It may be that activities that promote this development are provided by the former group at a later age than by the latter group.

The studies reviewed suggest that at least two factors are of primary importance for effective mothering: (a) the mother's knowledge of child development and (b) the quantity and quality of sensory stimulation provided by the mother. Because these two factors are likely to have a lasting influence on the child's later development, we developed and piloted the instrument discussed here.

Method

Subjects. Fifty-five subjects constituted the sample that was drawn from the obstetric departments of two hospitals in Los Angeles County. Subjects were selected on the basis of the following criteria:

1. Mothers had to have had no previous children (to eliminate possible effects of knowledge gained through previous child rearing).
2. Both mothers and infants had to be in good health as certified by their attending physician.
3. Mothers had to be able to read and write in either English, Spanish, or Chinese.
4. The infants had to be between 2 and 3 days old.

Of the subjects selected, 28 were Hispanic Americans, nine were Caucasian Americans, nine were black Americans, and nine were Asian Americans. Mothers' ages ranged from 15 to 37 years (average, 23.8 years). Years of education ranged from 3 to 24 years (average, 11.1 years).

Instrumentation. Items for the Mothers' Sensory Developmental Expectation Questionnaire (MSDEQ) were constructed and content was validated by the first author (Parush, 1983). The MSDEQ is divided into two parts: a cognitive and an affective domain. The cognitive domain was designed to assess the mother's knowledge of the infant's sensory developmental capacity. This section consisted of 30 multiple-choice questions. The section on the affective do-
Table 1
Table of Specification

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Application</th>
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<tr>
<td>Vision</td>
<td>Audition</td>
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main was designed to assess the mother's perception of her influence on her child's development. This section was designed as a Likert scale: Mothers rated the 23 statements given on a 5-point scale ranging from strongly agree to strongly disagree. Steps for developing the MSDEQ were based on Benson and Clark's (1982) flowchart for instrument development.

Content validity for the cognitive domain was established by having six occupational therapists not otherwise involved in the study simultaneously assign each item to one of seven categories of sensation as well as to one of the two categories of knowledge and application (see Table 1). Content validity of the affective domain was assessed by having these six therapists rate the items in terms of whether they suggested a nature or nurture perspective on development. An item for which there was not at least 65% agreement was discarded. In the cognitive domain, of the 30 items that were included on the questionnaire, 16 had 100% agreement, 9 had 83.3% agreement, and 5 had 66.6% agreement. In the affective domain, all items retained had 100% agreement. Additionally, content validity for each item in the cognitive domain was established by referencing of correct answers (see Parush, 1983).

In addition, feedback about the questionnaire from five women who were representative of the target population was used to conduct a qualitative evaluation of the MSDEQ. As a result, the wording of certain items was revised, and the questionnaire was translated into Spanish and Chinese to allow for assessment of subjects not fluent in English.

The questionnaire yields two scores. For the cognitive domain a single score is obtained by summing the number of correct responses. For the affective domain, a single score is calculated by adding up the point values of the ratings on the Likert scale as selected by the respondent. Table 2 contains sample questions from the two parts of the questionnaire.

Procedure. Mothers meeting the selection criteria were invited to participate in the study during their postpartum hospital stay. All of the mother's approached by the researcher (N = 74) agreed to participate. The MSDEQ was answered independently by each mother immediately after the informed consent was signed. However, 8 mothers did not complete the questionnaire, 5 did not leave it at the nurses' station for the investigator to collect, and 6 received assistance in answering the questions. Questionnaires that were answered with help (e.g., from relatives) or that were not fully completed were eliminated from subsequent analysis.

Results

Data obtained from the remaining 55 questionnaires were analyzed to determine (a) the reliability of the instrument, (b) whether the two sets of scores obtained were normally distributed, (c) the extent to which scores on each part of the questionnaire were related, and (d) whether scores on the questionnaire were related to demographic characteristics of the subjects.

Kuder-Richardson's formula (Mehrens & Lehmann, 1973) was used to establish the reliability of the cognitive domain after the data collection. A reliability of .80 was calculated; this indicated that the questions in the cognitive domain measured the subject's knowledge consistently. Coefficient alpha (Cronbach, 1951) computations were used to establish the reliability of the affective domain. A reliability coefficient of .76 was obtained; this suggested that statements in this domain consistently measured the subject's perceived influence on child development.

To determine whether the scores were normally distributed, we plotted data on a graph using the BMDP5D program (Dixon & Brown, 1982). Results indicated that the scores approximated a normal distribution.

Table 2
Sample Questions from the Mothers' Sensory Developmental Expectation Questionnaire (MSDEQ)

| PART I |  | PART II |
|--------|  |---------|
| 1. At what age does a baby begin to see? 1. By feeding my child and changing his or her diapers, I will provide the child's basic needs. 2. Are infants aware of their environment? 3. Do you think it is important for babies to be rocked? 4. Can your child become spoiled if he or she is picked up and held too much? |
| 2. I feel that I have a lot of influence on my child's development. 3. Children become good students as a result of environmental experiences. 4. Being a successful parent depends on luck and on having a well-matured child. |
American mothers, a mean of 15.2; and Asian American mothers showed a mean of 16.6; black American mothers showed a mean subscale score of 26.0 whereas the mean subscale score for Hispanic Americans was 10.3; for black Americans, 9.1; and for Asian Americans, 10.3.

Discussion

The findings of this study provide evidence that the items on the questionnaire are internally consistent. A data analysis of the relationship between scores on the two subscales demonstrated moderately high correlations between mothers' knowledge of the sensory capacity of the newborn and their perception of the degree of influence they had over the development of their child. In fact, nearly 41% of the variance in one subscale was shared with the other. This result suggests that although the two traits measured on the questionnaire are closely related, they are not identical. A reasonable interpretation of the results is that the more knowledge a mother possesses about the sensory capacity of her child, the more empowered she feels to influence her child's development or vice versa.

A low, but significant correlation was found between maternal age and perceived influence on development, but this variable was not significantly associated with the mother's knowledge of sensory capacity. Since only 12% of the variance in mothers' perceived influence was accounted for by age, it appears that, although increasing age may contribute to a mother's increased belief in her influence upon her infant's development, it does not do so appreciably.

The relationship between years of education and scores on the MSDEQ revealed that the more formal education a mother had had, the more knowledgeable she was concerning the sensory capacity of the newborn and the more she perceived herself as influential over her child's development. It is possible that mental processes required for accomplishment in formal education are also needed to acquire knowledge about the sensory capacity of a newborn baby. An alternative explanation is that educational courses provided mothers with knowledge about child development that, in turn, enabled them to perceive themselves as influential over their child's develop-
opment. However, since increased education was demonstrated to be positively correlated with increased age, it could be that the relationship detected is partially explained by increased participation in life experiences that come with maternal maturity. A final finding of interest was that on both sections of the MSDEQ, Caucasian mothers had statistically significantly higher scores than did mothers of other ethnic groups. It thus appears that a combination of demographic factors may contribute to both perceived influence and knowledge of infant development. Not surprisingly, the most informed mothers and those who perceived themselves to be most empowered had had more education.

With respect to instrument validity, the results of this study must be considered preliminary. Further studies are necessary to determine the extent to which scores on this instrument are able to predict such factors as infant IQ, maternal role behaviors, future academic achievement of the infants, and status of sensory processing. That a mother can affect the environment of her child is well accepted. The extent to which her specific knowledge about the sensory capacity of her newborn and her perceived influence on her infant’s development predicts later developmental factors is largely unknown. The MSDEQ has been shown in this study to be of sufficient psychometric soundness to allow researchers to begin to investigate research questions in this area.

Summary

The primary purpose of this study was to explore the reliability and other characteristics of an instrument designed to assess both a mother’s knowledge of the sensory capacity of the newborn and a mother’s perception of her influence on child development. Through the use of the MSDEQ, the investigators were able to identify the relationships between knowledge, perceived influence, and the demographic characteristics of the subjects. It is envisioned that with further research, this questionnaire may eventually be shown to possess sufficient predictive validity to be used by occupational therapists as a part of a screening interview for identifying mothers who may be at risk for failure to provide optimal sensory experiences for their children.

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A copy of the questionnaire may be obtained from Florence A. Clark, PhD, OTR, FAOTA, Department of Occupational Therapy, University of Southern California, 12953 Erickson, Bldg. 30, Downey, California 90242.

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