This study investigated whether sensory history questionnaires differentiated between developmentally delayed children with and without tactile defensiveness and, in addition, which individual items were most discriminative. Interviews were conducted with 20 mothers of developmentally delayed children regarding their children's past and present behavioral responses to tactile and other sensory stimuli. The group of mothers with tactually defensive children reported a significantly greater number of positive responses to items previously determined to be indicative of tactile defensiveness than did the mothers of children without tactile defensiveness. An individual item analysis identified 11 items as discriminating most clearly between a group of children with tactile defensiveness and a group without tactile defensiveness. Some preliminary behavioral trends and implications for the use of sensory history questionnaires in parent counseling and in planning appropriate treatment programs are presented.
Tactile defensiveness is hypothesized to be an integrative deficit in tactile perception resulting in an aversive response or hypersensitivity to touch. It is a subjective perception consisting of feelings of physical discomfort or emotional stress, or both, and a desire to escape the situation when certain types of tactile stimulation are experienced (1). Although this increased sensitivity to tactile stimuli has been observed in a wide variety of clinical populations, including mentally retarded and developmentally delayed children, it has been described primarily in learning-disabled children. Occasionally, an over-responsiveness to auditory, olfactory, and visual stimuli is also seen (2).

The identification of tactile defensive behavior is based on clinical observation and is most easily observed during the administration of several tests of discriminative tactile perception. Bauer (3) designed the Tactile Sensitivity Behavioral Responses Checklist to measure the frequency of defensive responses during the administration of the somatosensory tests of the Southern California Sensory Integration Tests (4). Although this checklist seems to assist in more accurate and objective observation during testing, no objective way is available to evaluate dysfunction while the child is an infant or is functioning on a lower developmental level and is not an appropriate candidate for these tests. Therapists must rely on their clinical expertise and subjective observation of the child to determine the presence or absence of tactile defensiveness. Necessary information concerning the child's history of sensory functioning can be obtained by interviewing the parents to supplement clinical observations of the child (5).

Although tactile defensiveness may interfere with perceptual motor development and learning, its major implications are in the area of behavior (2). This integrative deficit may interfere with the parent-child relationship and also with peer interactions during later development. Children with tactile defensiveness are often misunderstood by peers and mishandled by parents and teachers (6). The emotional lability and unpredictability of the tactilely defensive child would seem to have a significant influence on social-emotional development.

Evidence of Tactile Defensiveness in Various Clinical Populations. A variety of clinical populations have been described in the literature that demonstrate evidence of deficits in tactile perception and disturbances in the integration and interpretation of sensory input. Although many of these behaviors have not been identified as components of tactile defensiveness, their similarities to this disorder are evident.

Prechtl (7) described two distinct syndromes of minimal brain damage that can be observed in the newborn. The first group of infants, described as "hypokineti," were often hypertonic with exaggerated responses and a remarkably low threshold to sensory stimulation. The behavior of the hyperexcitable infants may be compared with behavior associated with tactile defensiveness, especially the hypersensitivity to sensory stimulation and variations in neural state. It also seems that this behavior can be recognized early in life as a problem of the infant's nervous system rather than as a function of the mother's mishandling of the child. McCracken (8) evaluated tactile and perceptual problems in 7- and 8-year-old educable mentally retarded children. Recorded behavioral observations revealed that 62 percent of the children made some comment, showed an emotional reaction, or behaved in a manner that indicated an aversion to tactile stimulation. In a study to determine the effectiveness of treatment programs on the sensory and motor development of 75 trainable mentally retarded children, clinical observations revealed that 47 percent of the children exhibited tactile defensive behaviors (9).

Clinical observations by Luria (10) and Bender (11) were made of a group of mentally retarded children. The children were restless, irritable, unusually sensitive to loud noises, and hypersensitive to the modality of touch. These behavioral descriptions seem to closely parallel tactile defensive behavior described by others.

Ayres and Tickle (12) and Daniels (13) have described sensory processing disturbances as well as the existence of tactile defensiveness in autistic children. Their observations are consistent with the findings of others who have reported that these hypersensitive behaviors are not usually limited to the tactile system.
but are also frequently observed in several other sensory systems.

Neurophysiological Mechanisms Underlying Tactile Defensiveness. There appear to be two current hypotheses with regard to the etiology of tactile defensiveness. Although they are not mutually exclusive, the underlying neuroanatomical and physiological mechanisms will first be discussed separately, and then their relationship presented.

The first hypothesis is based on the dual components of the tactile system. The spinothalamic or protective system serves to interpret potentially threatening incoming stimuli as a sign of danger and responds to these stimuli with movement, alertness, and a high degree of affect. The lemniscal or discriminative system enables interpretation of the temporal and spatial nature of stimuli for cognition and is thought to have an inhibitory effect on the action of the protective system (14). It is postulated that under certain circumstances and within certain individuals, the systems lose or never attain their natural balance and the protective system predominates over the discriminative system.

The second possible explanation of tactile defensiveness is based on the interconnections between the somatic afferent system and the central nervous system, especially the reticular activating system. To function effectively, the central nervous system must be able to filter or inhibit much of the sensory bombardment from the environment that is irrelevant at that specific moment (15). It is postulated that in the tactually defensive child, central influences from higher levels may result in an imbalance in descending mechanisms of the reticular system with a lack of or a predominance of the excitatory component, resulting in too much or not enough inhibition. This leads to an inability to appropriately respond to or suppress differentially the stimuli within the perceptual field. This imbalance decreases the ability to perceive incoming stimuli from tactile and other sensory modalities.

The subjective experience of a tactile stimulus is not merely a function of the type of receptor stimulated, but depends on the adequate functioning of mechanisms within the central nervous system. An imbalance within the tactile system may result in the predominance of the behavioral response system designed for protection and survival over a response system designed to attend to the spatial and temporal qualities of tactile stimuli. In addition, an imbalance in the central descending control mechanisms may help to explain the emotional lability and variations in degree of tactile defensive reactions at any one moment within a child.

Summary. Tactile defensiveness is manifested in a variety of clinical populations, including mentally retarded and developmentally delayed children. There is presently a lack of adequate assessment techniques for young children or those functioning on a lower developmental level, and therapists must rely on their clinical expertise to identify tactile defensive behaviors. Interviews with the parents to obtain information about the child’s history of sensory functioning is currently being used by therapists, but differences in the sensory histories of children with and without tactile defensiveness has yet to be demonstrated. If there are items from the child’s sensory history that clearly differentiate between a group of children with tactile defensiveness and a group without tactile defensiveness, then this type of interview may be used with more confidence in supplementing clinical observations of the child.

Methodology

Subjects. The subjects were 20 mothers of children enrolled in the Cerebral Palsy Center of Atlanta, Georgia. Ten were mothers of tactually defensive children, and ten were mothers of children who did not show signs of tactile defensiveness. The subjects were typical of mothers and children from a major metropolitan city with diverse educational, economic, and cultural backgrounds.

Children with a diagnosis of developmental delay, a chronological age (CA) between 2 and 6 years, a mental age (MA) of more than 6 months, and the ability to crawl or walk were considered eligible for participation in the study. MA was determined by the Bayley Scales of Infant Development (16) and the Vineland Social Maturity Scale (17).

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Chronological Age and Mental Age of Children With and Without Tactile Defensiveness (TD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group With TD Without TD</td>
</tr>
<tr>
<td>Chronological Age (months)</td>
<td>Mean 48.40 36.40</td>
</tr>
<tr>
<td>Mental Age (months)</td>
<td>Mean 14.80 14.40</td>
</tr>
</tbody>
</table>

The children meeting these criteria were observed by two occupational therapists who worked at the center and had clinical expertise in...
the assessment of tactile defensiveness. Each child's reaction to touch and tactile stimulation was independently assessed by each therapist, and each was asked to judge the presence or absence of tactile defensiveness. Guidelines for the observation of tactile defensive behaviors were compiled from observations reported in the literature and were used to assist in this determination.

Criteria for a child's inclusion in the study were the concurrence of both therapists on the presence or absence of tactile defensiveness for the child. Those children on whom agreement could not be reached were not included—approximately 30 percent of the children initially observed.

Two groups of ten children were formed and equated on the basis of MA (see Table 1). There were no significant differences between groups on MA, $t = .11$; CA difference approached significance, $t = 2.00$, $p = .06$. Each group of children was composed of five males and five females. The children were predominantly black, with nine black and one white child in each group. Although all children were diagnosed as developmentally delayed, four had additional diagnoses of spastic diplegia or quadriplegia, and two of these children were included in each group.

Procedures. The parent interview was developed from descriptions of tactile defensiveness reported in the literature and from a number of sensory history questionnaires currently used by therapists evaluating sensory integrative functioning (5, 18-20).

The items chosen for the interview consisted of ten categories of behavior and development. Four categories, general areas of development, included Developmental History, Muscle Tone, Mobility, and General Behavior. Six categories were in areas of behavior frequently associated with tactile defensiveness or a hypersensitivity in other sensory systems—that is, Tactile Response to People, Tactile Response to Environment, Gustatory Awareness, Olfactory Awareness, Auditory Awareness, and Visual Awareness.

Before data collection for this study was begun, the interview was pilot tested with several parents of learning-disabled children from the Occupational Therapy Clinic at Boston University. The final questionnaire was then completed and consisted of 102 items, with 20 items regarding past and present behavioral and sensory sensitivity. The questionnaire was reviewed by five therapists trained in the evaluation of sensory integrative dysfunction and certified in the administration of the Southern California Sensory Integration Tests (4). The therapists were asked to identify those items they considered most clearly reflective of tactile defensiveness. Thirty items on the questionnaire were considered indicative of tactile defensiveness by at least four of the five therapists; this included items regarding the tactile system, as well as other sensory systems. Although these 30 items were those used to determine whether there was a difference in the sensory histories of children with and without tactile defensiveness, all 102 items were used in the interview.

The final questionnaire was used to interview the mothers of each of the 20 children. Each mother was interviewed individually at home or at the center. The researcher interviewing the mothers did not know the group (with or without tactile defensiveness) to which each child belonged. Descriptive comments made by the mother regarding the child's defensiveness or sensitivities were also recorded. The total time to conduct each interview ranged from 20 to 30 minutes.

Results
Analysis of Tactile Defensiveness Items. The total number of positive responses to the 30 items previously considered indicative of tactile defensiveness was determined for each child. Separate totals were computed for past and present behavioral and sensory sensitivity. The mean number of positive responses for each group of children is presented in Table 2.

To determine whether there was a difference in the number of positive responses to the 30 items considered indicative of tactile defensiveness as a function of group (with tactile defensiveness/without tactile defensiveness) and time (past behavioral response/present behavioral response), a two-by-two repeated measures analysis of variance was performed. Group was a significant factor, $F(1,18) = 9.07$, $p < .01$, with a significantly greater number of

<table>
<thead>
<tr>
<th>Group</th>
<th>With TD</th>
<th>Without TD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past Behavioral Responses</td>
<td>Mean</td>
<td>11.20</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>3.33</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>5-15</td>
</tr>
<tr>
<td>Present Behavioral Responses</td>
<td>Mean</td>
<td>10.20</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>3.94</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>4-15</td>
</tr>
</tbody>
</table>
positive responses to these 30 items from the mothers of children with tactile defensiveness. Time was not significant, $F(1,18) = .58$, and the Group by Time interaction was not significant, $F(1,18) = .58$. Thus, the results indicated that the items discriminated significantly between the groups of children for both past and present behavioral and sensory sensitivity.

**Analysis of Individual Items.** To differentiate which items from the interview could be used with the most confidence to determine the presence or absence of tactile defensiveness in an infant or young child, the responses to each of the 102 items on the questionnaire with regard to past behavioral and sensory sensitivity were analyzed individually. The Yate's correction for continuity was used to compute the distribution of Chi square for each item (21). Since the sample in this study was small, all items at or below the .10 significance level are reported. Eleven items were identified as discriminating most clearly between a group of children with tactile defensiveness and a group without tactile defensiveness and are listed in Table 3.

From these 11 items that discriminated most clearly between groups of children, it was found that 5 of the items were among the 30 items previously identified by therapists as indicative of tactile defensiveness. Four of these items were in the category of Tactile Response to People and one item was in Tactile Response to Environment. Of the other six items not previously considered by the therapists as most indicative of tactile defensiveness, two were in the category of Tactile Response to Environment, three in General Behavior, and one in Tactile Response to People.

**Descriptions of General Development.** Analysis of the category of Developmental History revealed no remarkable differences between groups of children with and without tactile defensiveness. The categories of Muscle Tone and Mobility were also not discriminating between groups of children. Some mothers of tactually defensive children reported that their children crawled with fisted hands, resisted putting their bare feet on the floor, and curled under their toes each time their feet were placed on the floor. These comments may indicate a hypersensitivity to tactile stimulation. Also, several children in each group toe walked.

In the category of General Behavior, it was reported that as infants several children in each group were generally pleasant and good natured, whereas only a couple of children in each group were irritable infants. Most children in each group were described by their mothers as currently having a short attention span and being easily distractible.

**Descriptions of Tactile Sensitivity.** In the category of Tactile Response to People, several mothers of children with tactile defensiveness commented that, as infants, their children did not want to be touched or bothered. Some liked to be held for only a short period of time and this seemed to vary according to the children's mood. In the category of Tactile Response to Environment, it was reported that children with tactile defensiveness did not explore and manipulate objects as infants. Items regarding a dislike for different textures of clothing or a preference for long sleeves or for wearing shoes did not discriminate between groups of children, since most mothers stated that their children demonstrated no preference for clothing.

**Descriptions of Other Sensory

---

**Table 3**

<table>
<thead>
<tr>
<th>Items Discriminating Between a Group of Children With and Without Tactile Defensiveness</th>
<th>Chi Square Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Avoid getting hands in finger paints, paste, sand, etcetera?</em></td>
<td>5.95†</td>
</tr>
<tr>
<td><em>Stiffen body when picked up?</em></td>
<td>5.08†</td>
</tr>
<tr>
<td>Seem to prefer to play alone?</td>
<td>5.00†</td>
</tr>
<tr>
<td>Enjoy playing with other children?</td>
<td>5.00†</td>
</tr>
<tr>
<td><em>Struggle against being held?</em></td>
<td>4.26†</td>
</tr>
<tr>
<td>Rarely show a reaction to being pushed or hit by other children?</td>
<td>4.26†</td>
</tr>
<tr>
<td>Avoid using hands for extended periods of time?</td>
<td>4.26†</td>
</tr>
<tr>
<td>*Dislike being held, cuddled, and hugged?</td>
<td>3.52‡</td>
</tr>
<tr>
<td>*Object to being touched by others?</td>
<td>2.81‡</td>
</tr>
<tr>
<td>Seem to lack awareness of being touched by others?</td>
<td>2.81‡</td>
</tr>
<tr>
<td>Seem overly sensitive to bath temperature?</td>
<td>2.79‡</td>
</tr>
</tbody>
</table>

*Items previously considered indicative of tactile defensiveness.
†Chi Square = 3.84; $df = 12$, $p < .05$
‡Chi Square = 2.71; $df = 12$, $p < .10$
Sensitivities. While six mothers of children with tactile defensiveness gave positive responses to the items previously considered indicative of tactile defensiveness in the category of Gustatory Awareness (i.e., resistance to textured foods, preference for bland foods, and an oversensitivity to food temperatures), there was also a near equal number of similar feeding difficulties in the group of children without tactile defensiveness. Mothers in both groups commented that their children were fussy eaters, did not like hard or rough-textured foods, and would not accept solid food until approximately 3 years of age.

The category of Olfactory Awareness revealed little about either group of children. Most mothers reported they never noticed anything about their children's sense of smell, whereas some stated they thought their child at least seemed to smell food. In the category of Auditory Awareness, it was reported by a couple of mothers in each group that their children appeared overly sensitive to and bothered by sounds. In the category of Visual Awareness, a few mothers of children with tactile defensiveness reported that their children were overly sensitive to lights and frequently rubbed their eyes.

Summary. When compared to the responses from mothers of children without tactile defensiveness, the number of positive responses to the 30 items previously considered indicative of tactile defensiveness was significantly greater from the mothers of children with tactile defensiveness. There was no significant difference for either group in the number of positive responses to the items for past and present behavioral and sensory sensitivity. Individual item analysis identified 11 items from the interview that most clearly discriminated between groups. Of these 11 items, 5 were those previously considered indicative of tactile defensiveness. The category of Tactile Response to People had the greatest number of discriminating items.

Discussion

The use of a parent interview with regard to their child's history of sensory functioning appears to be the appropriate tool to assist in the identification of tactile defensiveness in developmentally delayed children. Since the presence or absence of a defensive reaction was observed by parents when their child was an infant, the use of an interview with regard to the infant's response to touch may be helpful in the early differential diagnosis of tactile defensiveness.

The parent interview developed for this study attempted to be comprehensive. It was rather lengthy and might have been more effective if those items found to be more appropriate for infants and developmentally delayed children were emphasized. In the area of general development, the categories of Developmental History, Muscle Tone, and Mobility offered little valuable discriminating information. In the category of General Behavior, the items with regard to hyperactivity and distractibility were not discriminating in these groups of children. These behaviors appear to be generally characteristic of developmentally delayed children. Although it was expected that more children with tactile defensiveness would have been irritable as infants, this was not found to be true. Rather, most of these children were pleasant and good natured, often reported as being passive, underactive, and "too good."

The most discriminating area of behavior, as would be expected, was that concerning the child's response to touch. Although several children had feeding problems and a hypersensitivity in other sensory systems, these were reported for individual children in both groups, and thus, these areas of behavior were less discriminating. It is probably still important to include items concerning a hypersensitivity in other sensory systems, but these items should not be used alone to determine the presence or absence of tactile defensiveness.

The lack of highly developed observational skills of some mothers is a definite limitation of this study. The interview consisted of many guiding questions that often helped them to remember certain areas of behavior or changes in behavior patterns. The lack of previous knowledge by the researcher about the presence or absence of tactile defensiveness in a given child seemed to control for the possibility of biasing the parents' responses; however, when listening to the parents' behavioral descriptions of their children, it was frequently apparent during the interview that a child was tactually defensive.

Although it is recognized that the sample in this study was small, several behavioral trends appear to be indicated. Because of individual differences and variations in behavior, more children need to be studied to provide more information on these trends. It may prove valuable to conduct this type of study with other clinical populations, including learning-disabled, emotionally disturbed, and autistic children, to identify similarities and differences in response patterns. While it is often difficult to conduct longitudinal studies, this would be a more precise method of determining infant behavior patterns that could be
identified as precursors to tactile defensiveness.

The identification of tactile defensiveness is based on clinical observation, both in response to tactile discrimination testing and in response to touch and tactile stimulation from the environment. Experience in working with children with sensory integrative dysfunction leads to the development of clinical expertise that is then more confidently used to determine the presence or absence of tactile defensiveness. The therapist without clinical expertise may still need to assess tactile defensive behavior in order to plan appropriate treatment programs. The use of a sensory history questionnaire can be an especially valuable tool for the beginning therapist, as well as an adjunctive tool for the clinically experienced therapist.

Summary
Interviews were conducted with the mothers of developmentally delayed children with regard to their child's past and present behavioral responses to tactile and other sensory stimuli. It was found that the mothers of the group of tactually defensive children reported a significantly greater number of positive responses to items previously determined to be indicative of tactile defensiveness than did the mothers of children without tactile defensiveness. There was no significant difference for either group in responses to the items for past and present behavioral and sensory sensitivity. An individual item analysis revealed 11 discriminative items, with the category of Tactile Response to People having the greatest number of discriminating items.

The use of a sensory history questionnaire appears to be an appropriate and useful tool to assist in the differential diagnosis of tactile defensiveness. While most parents reported that they observed these defensive responses in their children as infants, they were unaware of the significance of the responses. An understanding of these individual behavioral patterns is critical in establishing a positive parent-infant relationship (22). The knowledge of the reaction of these children to tactile and other sensory stimulation is essential to assist as a guide in parent counseling and in the development of appropriate treatment programs to develop and improve sensory integrative mechanisms.

Acknowledgments
Appreciation is extended to Sharon Cermak and Anne Henderson for their wisdom, guidance, and encouragement; and to Trudie McIntoy and Mitsue Hunt of the Cerebral Palsy Center of Atlanta for their observation and selection of children. This article is based on research conducted in partial fulfillment of the requirements of a Master of Science Degree at Sargent College of Allied Health Professions, Boston University. It was supported in part by an Allied Health Professions Traineeship Grant, United States Department of Health and Human Services.

REFERENCES
2. Ayres AJ: Sensory Integration and Learning Disorders, Los Angeles: Western Psychological Services, 1972
11. Bender L: The brain and child behavior. Arch Gen Psychiatry 4: 531-547, 1961
18. Yost H: Relating aspects of sensory integration theory to observed behavior. Cent Study Sensory Integrative Dysfunction Newsletter 7: 5-6, 1979