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# The Development of a Touch Scale for Measuring Tactile Defensiveness in Children

(sensory integration, research, pediatrics)

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*A three-phase study was conducted to develop an attitude scale measuring tactile defensiveness in children aged 6 to 10 years. It was assumed that the effects of tactile defensiveness on the perception and behavior of children produces stereotypical responses that can be measured by an attitude scale. A 49-item scale was developed and administered to 80 normal and 22 tactually defensive children within a large suburban school district. A subsequent item analysis reduced the scale to 26 items. This touch scale yielded an internal consistency reliability of .79432 and could distinguish between groups at a statistically significant level (.0073). The touch scale offers potential for diagnosing tactually defensive children. However, future research is required before it can be employed as a diagnostic tool. Such research could focus on the test-retest reliability of the scale and the refinement of the diagnostic validity of the test.*

The work of Ayres (1–8), embodying the theory of sensory integration, has been adopted for evaluation, diagnosis, and treatment in occupational therapy. Her work constitutes a “protoscience” that needs further elaboration and refinement (7). One aspect of sensory integrative processing, the interaction of tactile system input, has been identified by Ayres for special theoretical and empirical considerations. Her initial theory of tactile defensiveness is summarized in the following excerpt (7):

It is provisionally hypothesized that there are dual functional cutaneous afferent systems—a protective system which responds to stimuli with movement, alertness and high degree of affect (often negative) and a discriminative system which enables interpretation of the temporal and spatial nature of stimuli for cognition. Under certain conditions, the two systems lose or never attain their natural balance, the protective system predominating, a state in which hyperactive, distractible behavior is aggravated and perceptual-motor development is retarded (p. 86).

The development of this provisional theory of tactile defensiveness evolved from a series of factor analytic studies (1, 3–5). These studies provided a basis for the theory of tactile interactions Ayres first delineated in 1964, associating

the dorsal column–medial lemniscal system and the spinothalamic pathways with Head’s (9, 10) hypothetical “epicritic” (discriminative) and “protopathic” (protective) systems, respectively. Concomitant with the development of the theory of tactile defensiveness Ayres created sensory integrative tests and a manual for their administration and scoring (6). Five of those tests constitute a tactile component. According to the manual, tactile defensiveness is most readily discerned during the administration of the tactile tests by observing a subject’s response to tactile stimu-

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lation, noting overt and covert aversive reactions to touch. However, an evaluation of tactile defensiveness is not currently a standardized part of these tests; operationally defined procedures for or normative data on the evaluation of tactile defensiveness have not been developed.

Moreover, researchers and clinicians are only beginning to understand and describe the phenomenon of tactile defensiveness. For example, Kinnealey (11) studied the response of mentally retarded children—ten of whom were aversive and ten of whom were not aversive to sensory stimulation—to tactile modalities. She found that there were significant behavioral differences between the two groups. By studying the responses of 5-year-old boys to the Southern California Sensory Integration Tests (SCSIT), Bauer (12) devised a checklist offering “objective guidelines in identifying children with tactile defensiveness” (p. 357). Soon after, Ayres (8) similarly delineated tactually defensive behaviors. Recently, Larson (13) identified eleven items discriminating between developmentally delayed children with and without tactile defensiveness.

Fisher and Dunn’s (14) updated theoretical explanation of the phenomenon of tactile defensiveness proposes that tactile input is regulated by inhibitory influences from higher centers of the central nervous system at the level of the spinal cord. In cases of tactile defensiveness, the higher level modulation is missing. A syndrome or condition of overreaction to certain types of touch, tactile defensiveness, results.

### **Assumptions Made**

If tactile defensiveness can be

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considered a characteristic behavior or attribute, then it is a trait and the degree to which a person possesses it can be measured (15). Social scientists have traditionally used psychometric measures, such as interest inventories or scales, to measure behaviors resulting from a particular characteristic or trait. Scales specifically measure subjects’ preferences as a reflection of their traits (16–18).

Danella (19) inferred that multiply handicapped children’s preference for sensory modalities reflect the characteristic organization of their nervous systems. Similarly, measurement of children’s responses to questions might reflect the characteristic organization of their nervous system as being either tactually defensive or not tactually defensive (normal).

Therefore, it is assumed that the effect of tactile defensiveness on the perception and behavior of children produces characteristic, stereotypical responses. It is assumed further, that these traits can be measured in children by an attitude scale.

### **Developing a Standardized Test**

A standardized test for assessing tactile defensiveness in children should be developed for two reasons. First, professional credibility, as well as research avenues, could be enhanced if tactile defensiveness not only were deduced from clinical

observations during the SCSIT evaluation, but also were indicated by a subject’s performance on a standardized instrument.

The second reason relates to the generation of scientific knowledge. If, as Reynolds (20) proposed, the first step in the development of scientific knowledge is categorization, standardized, operationally defined procedures would assist occupational therapists in classifying dysfunctional behaviors or attributes. Such instrumentation could allow for more objective methods of classification, which would more easily lend themselves to research.

The syndrome of tactile defensiveness may be considered a sensory integrative disorder in which “tactile sensations cause excessive emotional reactions, hyperactivity or other behavioral problems” (8, p. 184). The behavioral manifestations of tactile defensiveness may be excessive fighting, inability to sit quietly at a school desk, or inability to enjoy “contact comfort” with a significant other. The goal of this study is to develop a research instrument for evaluating tactile defensiveness in elementary school-aged children.

### **Method**

The study employed a modification of traditional personality measurement, Likert or summative scales. The scale for measurement of tactile defensiveness was constructed according to accepted

guidelines (18) and had 3 phases as follows:

*Phase 1: Construction of the Scale*

The first phase generated an empirically based list of descriptors of behaviors associated with tactile defensiveness. The process is detailed elsewhere (21). The steps can be summarized as follows.

The variable to be measured was defined, and the behaviors relating to the variable were collected. Ayres (personal communication, 1983) reviewed the list of behaviors to enhance the construct validity of the scale being constructed. Using the revised collection of behaviors, several test items or descriptors were written on each behavior. The descriptors were then rated according to the degree to which items were associated with tactile defensiveness by a panel of experts composed of faculty members of Sensory Integration International (SII). (For information, write to Sensory Integration International, 1402 Cravens Avenue, Torrance, CA 90501.) Descriptive statistics were computed for each item and those items receiving a mean score of 6 or better, out of a possible 12, were included in the scale. This yielded a 49-item test.

*Phase 2: Pretests*

A series of pretests was conducted with elementary school-aged children to determine the test format, response style, and language of the items. A detailed analysis of these procedures and instructions on how to modify Likert methodology for use with children are provided elsewhere (22).

*Phase 3: Administration of the Scale to a Normative Sample*

The implementation of phase 3 consisted of (a) an administration

of the touch scale to a normative sample and (b) an item analysis.

*Subjects.* One hundred and two subjects, categorized as either normal ( $n = 80$ ) or tactually defensive ( $n = 22$ ) participated in phase 3.

Normal subjects were children attending regular classes, having an IQ of 80 or more, and receiving fewer than three checks out of 11 checks on the tactile defensiveness checklist by the classroom teacher. Since SII-certified therapists were not available to evaluate the presence or absence of tactile defensiveness, the checklist for tactile defensiveness was based on work by Ayres (8) and developed as a classification method for use in phase 1 of the current study. (Detailed information on the checklist can be obtained by contacting the author.)

Tactually defensive subjects were defined as children who receive three or more checks on the tactile defensiveness checklist, have an IQ of 80 or more, and are not physically handicapped.

Teachers were oriented to the checklist and informed about tactile defensiveness by the school principal or their immediate supervisor, individuals who had been trained by the author. Subjects were obtained as follows.

At one elementary school, systematic random sampling was employed to select students for the study. Teachers completed the tactile defensiveness checklists on those children who had received permission from their parents to participate in the study. All 80 children categorized as normal came from this school.

In addition five children from this school served as tactually defensive subjects because they received three or more checks on the checklist. The other 17 tactually defensive subjects were obtained in

**Table 1**  
Demographic Characteristics of Subjects  
( $N = 102$ )

| Characteristic      | Frequency | %    |
|---------------------|-----------|------|
| Sex                 |           |      |
| Male                | 58        | 56.9 |
| Female              | 44        | 43.1 |
| Category            |           |      |
| Normal              | 80        | 78.4 |
| Tactually defensive | 22        | 21.6 |
| Diagnosis           |           |      |
| Normal              | 92        | 90.2 |
| Learning disabled   | 10        | 9.8  |
| Grade               |           |      |
| Kindergarten        | 4         | 3.9  |
| First               | 25        | 24.5 |
| Second              | 23        | 22.5 |
| Third               | 15        | 14.7 |
| Fourth              | 19        | 18.6 |
| Fifth               | 15        | 14.7 |
| Sixth               | 1         | 1    |
| Race                |           |      |
| Caucasian           | 86        | 84.3 |
| Black               | 5         | 4.9  |
| Oriental            | 8         | 7.8  |
| Middle Eastern      | 3         | 2.9  |
| Age (in years)      |           |      |
| 6                   | 8         | 7.8  |
| 7                   | 19        | 18.6 |
| 8                   | 18        | 17.6 |
| 9                   | 20        | 19.6 |
| 10                  | 22        | 21.6 |
| 11                  | 13        | 12.6 |
| 12                  | 2         | 2    |

the following manner. First, special education teachers of learning-disabled children located in 31 elementary schools or teachers in other elementary schools of the same subregions of the school district completed the checklist on 120 students, identifying 12 of them as tactually defensive. Second, two elementary schools within the same subregion of the same school district agreed to let their students participate in the study. In one school all teachers completed the checklist on two different occasions, and no tactually defensive children were identified. In the other school all teachers completed the checklist on all children, identifying three children as tactually defensive. Third, an assistant principal at yet another elementary

school within the same subregion of the same school district volunteered the information that two of her students probably were tactually defensive. Completed checklists on these two students confirmed this assumption.

Parental permissions were obtained on all subjects.

Demographic characteristics of the 102 students are presented in Table 1.

*Equipment.* Three poster board blocks were inscribed with three response formats, *No*, *A Little*, and *A Lot*. The blocks measured 2 in. × 2 in., 2 in. × 3 in., and 2 in. × 4 in., respectively.

*Procedure.* A research assistant (RA) administered the 49-item scale during regular school hours to each subject individually without knowing whether the subject was categorized as normal or tactually defensive. The subject was oriented to the task. Practice test items were read aloud to the subject, and the subject was asked to respond either by saying *No*, *A Little*, or *A Lot* or by pointing to the block of his or her choice. Thus, the RA could identify the subject's response choice by the subject's verbal or motor responses.

The subjects were timed with a stopwatch. The subject was reminded to ask for an item to be repeated or explained during the test. Each was praised at the end of the test session.

## Results

On the average, the subjects categorized as normal took 10.0250 minutes to complete the test ( $SD = 2.429$ ), and the subjects categorized as tactually defensive took 11.5455 minutes to complete the test ( $SD = 3.203$ ).

Responses were coded 1 for *No*, 2 for *A Little*, and 3 for *A Lot*.

**Table 2**  
Internal Consistency Reliability Analysis

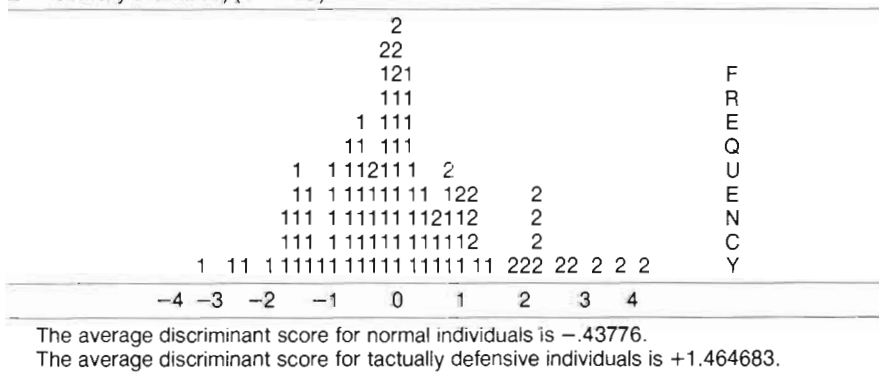
| No. | Item   | Item-to-Total Correlation |
|-----|--|---------------------------|
| 1.  | Does it bother you to go barefooted?                                   | .32895                    |
| 2.  | Do fuzzy shirts bother you?  | .28346                    |
| 3.  | Do fuzzy socks bother you?   | .33356                    |
| 4.  | Do turtleneck shirts bother you?                                       | .36930                    |
| 5.  | Does it bother you to have your face washed?                           | .28833                    |
| 6.  | Does it bother you to have your nails cut?                             | .27037                    |
| 7.  | Does it bother you to have your hair combed by someone else?           | .36969                    |
| 8.  | Does it bother you to play on a carpet?                                | .28508                    |
| 9.  | After someone touches you, do you feel like scratching that spot?      | .41547                    |
| 10. | After someone touches you, do you feel like rubbing that spot?         | .29432                    |
| 11. | Does it bother you to walk barefooted in the grass and sand?           | .39084                    |
| 12. | Does getting dirty bother you?   | .37139                    |
| 13. | Do you find it hard to pay attention?                                  | .25607                    |
| 14. | Does it bother you if you cannot see who is touching you?              | .26573                    |
| 15. | Does fingerpainting bother you?  | .28457                    |
| 16. | Do rough bedsheets bother you?   | .23169                    |
| 17. | Do you like to touch people but it bothers you if they touch you back? | .41579                    |
| 18. | Does it bother you when people come from behind?                       | .31621                    |
| 19. | Does it bother you to be kissed by someone other than your parents?    | .31443                    |
| 20. | Does it bother you to be hugged or held?                               | .23572                    |
| 21. | Does it bother you to play games with your feet?                       | .25136                    |
| 22. | Does it bother you to have your face touched?                          | .40088                    |
| 23. | Does it bother you to be touched if you don't expect it?               | .45395                    |
| 24. | Do you have difficulty making friends?                                 | .24082                    |
| 25. | Does it bother you to stand in line?                                   | .35001                    |
| 26. | Does it bother you when someone is close by?                           | .29069                    |

Frequencies on each test item were computed. Those test items to which over 50% of the subjects responded *A Lot* were deemed not exclusively characteristic of tactually defensive children since over half of the subjects responded that way, and therefore they were dropped from the scale. Two items

having to do with lace and embroidery were dropped since they appeared to be sexually and culturally biased.

Subsequently, the reliability analysis for internal consistency of the remaining items was calculated. Total-scale reliability and individual-item-to-total reliability were

**Figure 1**  
Summated and group mean discriminant (weighted) scores for all individuals (1 = normal, 2 = tactually defensive) ( $N = 102$ )



**Table 3**  
Discriminant Analysis Classification Results

| Group               | No. of Cases | Predicted Group Membership |                     |
|---------------------|--------------|----------------------------|---------------------|
|                     |              | Normal                     | Tactually Defensive |
| Normal              | 80           | 70 (87.5%)                 | 10 (12.5%)          |
| Tactually defensive | 22           | 5 (22.7%)                  | 17 (77.3%)          |

The percentage of grouped cases correctly classified equals 85.29%.

computed using the Statistical Package for the Social Sciences (23). A special computer program for reliability computation was developed and is reported elsewhere (24). Using the special program, reliability analyses were repeated dropping all variables with individual-to-total reliability correlations of .0 and .1. Optimal reliability analysis, having 26 test items, is presented in Table 2. The coefficient alpha for the total 26-item scale is .79432 and the standardized alpha is .79456.

A discriminant analysis using all 26 items was conducted to statistically distinguish between the normal and tactually defensive group. (A discriminant analysis assigns weights to all variables to best distinguish between groups.) The discriminant analysis revealed that the touch scale did distinguish between groups (Wilk's Lambda = .576180,  $df = 26$ ,  $p = .0073$ ). A presentation of the single composite discriminant score for each subject appears in Figure 1 as does the average of the discriminant scores for all individuals in both the normal and the tactually defensive groups. Classification results based on the discriminant function are presented in Table 3.

## Discussion

Benson and Clark (25) state that .80 or greater is an accepted value for the reliability index (internal consistency) of a scale. Since this experimental version of the touch

scale had a standardized reliability index that rounds off to .80, the internal consistency of the touch scale is deemed acceptable.

The discriminant analysis demonstrated that the touch scale could statistically discriminate between groups. And a classification analysis indicates that a practical significance (85% correct classification rate) confirms the statistical significance. Thus, it appears that the touch scale offers potential for screening tactually defensive children.

### Limitation of the Study

The estimate of the percentage of the correct classification based on the discriminant scores is biased upward since the same data served both to construct and to evaluate the discriminant function.

### Future Research

The issue of test-retest reliability needs to be addressed in future research. If acceptable levels of test stability can be demonstrated, subsequent research can be conducted to refine the diagnostic validity of the touch scale by using SII-certified therapists to evaluate the presence or absence of tactually defensiveness for group classification.

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