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Tactile Defensiveness and Patterns of Social Behavior
In Autism
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Abstract

The expression of tactile defensiveness (TD) varies among individuals; however, it appears to affect a great number of people with autism. Nevertheless, little research has been conducted to evaluate TD in autism. Past literature regarding touch and typical social development suggests that a relationship between tactile stimulation, or in this case the aversion to this stimuli, and social behavior may exist. Utilizing survey data, it was found that TD was significantly related to the severity of characteristics of autism as well as to social subscales. In addition, significant differences in cognitive functioning among social subgroups (aloof, passive, active but odd, and typical) were found.

Tactile Defensiveness and Social Patterns in Autism

Autism, derived from the Greek word "autos" meaning "self," describes the withdrawn behavior exhibited by many persons affected by autism spectrum disorders (including Asperger's Disorder and Pervasive Developmental Disorder- Not Otherwise Specified or PDD/NOS). These developmental disorders are characterized by impairments in communication and social interaction as well as the display of atypical behavior. In addition to these core symptoms that all people with autism share, each individual manifests associated features such as hyperactivity, self-injurious behaviors, or odd responses to sensory stimuli, quite differently. Wing (1972) argued that the most obvious and vital criterion for diagnosis was a difficulty in communication or lack of understanding of language, and inability to communicate has been considered by some as the primary factor in the lack of social interaction. However, consideration of the associated features may offer alternative explanations of withdrawal.

Perhaps one of the most paradoxical features of autism is the variability of sensory perception. Many individuals with autism have difficulty processing auditory, visual, or tactile information appropriately, yet, reactions to these stimuli often differ. For example, a person with autism may seem insensitive to temperature or pain at times, yet be extremely oversensitive to other types of discomfort. Another individual may seem indifferent to a salient stimulus, but react violently to a weak stimulus (Victor, 1983; Wing 1972). This variability in perception also seems to differ among individuals, affecting some greatly while not affecting others at all. Accounts of reactions to tactile stimuli seem arbitrary and paradoxical, yet some research suggests a pattern may indeed exist. For example, a study by Boll, Berent, and Richards (1977) examining children

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with general brain impairments (not specifically autism) suggests that successful tactile-perceptual performance may be positively correlated with cognitive functioning.

This associated feature of autism may be one of the most difficult challenges for parents to endure. While many children with autism may not be bothered by "rough-housing," they may react aversively to a hug or other gentle sign of affection (Grandin, 1995). Thus, research that investigates tactile sensitivity and its possible relationships with social contact is important not only to therapists' understanding of autism, but also to parents' understanding of their children's behaviors.

Tactile Defensiveness

Individuals, not limited to those with autism, who exhibit "tactile defensiveness" have aversive reactions to various types of tactile stimuli (Barenek and Berkson, 1994). Tactile defensiveness (TD) varies among individuals depending on various factors. For example, Barenek and Berkson (1994) found a negative correlation between TD and chronological age indicating that younger children tended to exhibit more aversion to tactile stimulation than older children.

Reports of tactile defensiveness occur often in autism. Dr. Temple Grandin, a woman with high functioning autism, described her tactile experiences at a recent conference: "I pulled away when people tried to hug me, because being touched sent an overwhelming tidal wave a stimulation through my body" (1995, p. 193). Grandin, describing senses which seemed oversensitized and admitting she would sometimes "turn off" these senses to protect herself from overstimulation, gives insight to another plausible factor in withdrawal. In other words, social withdrawal may act as a protective mechanism by limiting tactile stimulation.

Therapeutic Applications

The theory of sensory integration therapy assumes that kinesthetic and tactile stimulation are factors in both development and behavior (Hoehn and Baumeister, 1994). Much controversy surrounds this type of therapy. Some critics argue that positive results reported about this therapy could have been influenced by a number of factors, including lack of blind studies, experimenter bias, failure to report all results collected, and the Hawthorne effect (Hoehn and Baumeister, 1994). On the other hand, some researchers argue that sensory integration therapy provides a means of organizing sensory input (Ayres, 1979). This organization provides a means of understanding the environment, thus increasing the amount of interaction with it.

Regardless of the controversy surrounding sensory integration therapy, incidental accounts of therapeutic tactile applications indicate that a relationship may exist between tactile stimulation and social patterns. For example, Temple Grandin developed the deep pressure machine, or her "squeeze machine," to apply deep pressure to her entire body producing a calming effect (Saks, 1995). A study investigating the effects of massage therapy on infants and children with various medical conditions revealed that after one month of massage therapy, children with autism were less sensitive to tactile stimulation and more socially interactive with their teachers (Field, 1995). In addition, compared to their own initial scores, these children received higher scores on the Autism Behavior Checklist and the Early Social Communications scales after receiving therapy. Similarly, McClure and Holtz-Yotz (1990) found that splints prescribed to protect a boy with autism from self injurious behavior actually had therapeutic effects as well. They found that while wearing splints or some other accessory that applied constant pressure, the boy engaged in more social interactions.

Tactile Contact and Typical Social Development

Studies in non-autistic populations illustrate the importance of tactile contact in normal social development. Tactile contact has often been viewed, by psychologists and sociologists, as a necessary component of social development. According to studies reported by Suomi (1990), restricting the tactile contact of rhesus monkeys results in abnormalities in social development. Harlow's classic experiment (1958) illustrated that, when exposed to a cloth covered surrogate "mother" that provided no nourishment and a wire covered "mother" that provided milk from a bottle, infant rhesus monkeys spent significantly more time with the cloth covered "mother" forsaking nourishment for the less tactually aversive stimulus. Thus, sustenance is not the only motivation for the development of the mother-infant attachment relationship; touch is a vital factor as well.

Human studies, not limited to autism, suggest a relationship between tactile stimulation and development. One valuable study indicates that response (i.e., increased heart rate) to tactile stimulation develops by the 7 ½ week of gestational development, whereas, responses to vestibular or proprioceptive stimulation do not develop until 9 ½ weeks of gestational development (Hooker, 1952 in Gottfried, 1984). The early development of this modality may indicate the fundamental importance of tactile functioning (Gottfried, 1984). In other words, response to tactile stimulation is likely to be fundamental in human development.

A study conducted by Rose (1984) indicates that babies born prematurely have a higher risk of exhibiting developmental problems, perhaps because response to tactile, vestibular, and proprioceptive stimulation has not yet fully matured. Rose found that before treatment, preterm infants showed less cardiac response to tactile stimulation (being touched with a plastic filament)

during active sleep than full term infants. In addition, she found that preterm infants were not as successful at completing cross modal tasks (i.e., oral-visual, tactual-visual) as full term babies. However, results of preterm infants that received stimulation including massaging and rocking were similar to full term babies on both tests. Thus, the development of tactile/kinesthetic response seems to play an important role in the performance of some cognitive tasks.

Current Study

Consideration of information concerning tactile stimulation and social development not limited to autism may be conducive to understanding the role of tactile defensiveness in the social patterns of those with autism. Considerable research has evaluated the relationships between autism and sensory systems such as hearing and vision; however, little research investigates the variability of tactile defensiveness in autism. Perhaps, the evaluation of social interaction would provide a means of predicting tactile defensiveness. Wing and Gould evaluated patterns of social behavior in children with autism and theorized that four subgroups characterized by particular social patterns exist within the disorder (1979). "Social aloofness," the most severe style, describes a child that is indifferent in virtually every form of social interaction. "Passive interaction" describes one who accepts social contact but will not initiate this contact. The "active, but odd interaction" distinction includes those who initiate social contact with others but maintain inappropriate, idiosyncratic behavior. Finally, the "typical interaction" group engages in appropriate social interaction.

A recent study found significant differences in EEG patterns between the "passive" group and the "active, but odd" group indicating valid distinctions between the groups defined by Wing and Gould (Dawson, Grofer-Klinger, Panagiotides, Lewey, and Castelloe, 1995). Other follow

up studies found significant differences in social behavior among the subgroups supporting the original classification (Borden and Ollendik, 1994; Volkmar, Cohen, Bregman, Hooks, and Stevenson, 1989). However, the results of the Volkmar et al. study indicate that differences in mental age may be responsible for the significant differences among subgroups.

This current study attempted to replicate findings in previous studies and evaluated the relationship between TD and autistic characteristics and the relationship between TD and social patterns using the subgroups as defined by Wing and Gould. Analysis of a questionnaire developed by Castelloe and Dawson (1993) was used to determine the social subgroup to which each child belongs. Empirical evidence indicates that this questionnaire is both reliable and valid (O'Brien, 1996). Considering previous literature evaluating TD, as well as studies that suggest tactile contact is important in social development, the following hypotheses were predicted:

Hypothesis Set 1: Attempted Replication

It was hypothesized that a negative correlation would describe the relationship between TD and cognitive functioning (Boll et al.; Volkmar et al.) as well as TD and chronological age (Barenek and Berkson).

Hypothesis Set 2: TD and Autism

It was hypothesized that positive correlations would describe the relationship between TD and the severity of autistic characteristics.

Hypothesis Set 3: TD and Social Behavior

It was hypothesized that a difference would be found in TD among the 4 social subgroups, and TD would be most strongly expressed in the subgroup with the least interactive social style, specifically the "aloof" group.

Method

Participants

Participants were recruited from a recent conference discussing autism, a previous survey study conducted by Dr. Linda Kunce, and local support groups for parents with children with autism. In addition, an advertisement was placed in a newsletter professionals and parents with children with autism. One hundred twenty surveys were mailed to parents who had expressed an interest in the study; fifty-two surveys were completed and returned (43% return rate). All respondents were parents of children with an autism spectrum disorder. A majority of the respondents were female (90.2%); most respondents were birth parents (96.1%), the remaining 3.9% were adoptive parents. Based on the information received, 90.2% of the respondents were married, 9.8% were divorced. The mean respondent age was 40.9 (ranging from 24 to 63). Demographic data indicates members of the sample were of fairly high socioeconomic status. The average length of education was 16.4 years and average gross family income was \$67,574 (range 12,000-230,000). Surveys were received from 18 different states; however, about half of the respondents were from Illinois.

A majority of the children about whom the survey was answered were male (84.3%). All of the children were Caucasian. All of the children had been diagnosed with a developmental disorder (39.2% were diagnosed with classic autism, 25.5% were diagnosed with high functioning autism, 11.8% were diagnosed with Asperger's disorder, 21.6% were diagnosed with PDD/NOS, and 2% were diagnosed with other types of developmental disorders. The average age of the children was 9.735 (range 3-18.5); about 1/3 of the children were within preschool and second grade, 1/3 between third grade and sixth grade, and 1/3 between seventh grade and twelfth grade.

A majority of the children communicated through spoken language (86.3%), while 13.7% communicated primarily through gestures.

Most children received some type of special education or special assistance (66%), but an average of 57% of the children's school week was spent in regular class. Most children are currently receiving sensory integration therapy or had received it in the past (51%). Thirty five parents reported some information regarding cognitive functioning tests; however, only 23 reported the scores. Based on the available information given, the mean full IQ score was 87.1. Based on the parents' own estimates of their children's cognitive functioning, most children perform below average age expectations (specifically, 14.3% are reported to function significantly above age level, 12.2% above age level, 16.3% at age level, 44.9% below age level, and 12.2% significantly below age level). However, 67.3% of the parents indicated that a lot of scatter exists among their children's skills and abilities.

Procedure

A packet of measures was mailed to volunteers, and phone calls were made in an attempt to increase return rate. The participants were asked to complete the survey questions by indicating the degree to which their child expresses a behavior described in the question. For example, if asked, "Does it bother your child to wear fuzzy shirts," the participant would respond on a scale from 0 to 2 (0 indicating never, 1 indicating sometimes, 2 indicating frequently).

Materials

Measures included: (1) Dawson's Behavioral Development Questionnaire: assigns the child with autism to the most appropriate subgroup ("aloof," "passive," "active, but odd," or "typical") described by Wing and Gould and provides a dimensional measure of a child's aloofness,

passivity, and active but odd behaviors (Castelloe and Dawson, 1993), (2) Royeen's Tactile Defensiveness Questionnaire: assesses the level of tactile defensiveness in 6- to- 12 year olds (Royeen, 1986), (3) a portion of Larson's Tactile Defensiveness Questionnaire: assesses the level of tactile defensiveness in 2- to- 6 year olds (Larson, 1982), and (4) the Gilliam Autism Rating Scale: determines the total severity of the characteristics of autism by considering 4 subscales: communication deficits, deficits in social interaction, stereotypical behaviors, and developmental delays (Gilliam, 1995). Table 1 illustrates sample questions from each measure.

Results

Creation of TD Scale Score

The TD score was determined by adding the scores from the combined items of the Royeen and Larson scales. Originally, the measure started with 37 items; however, 7 items that were not directly related to touch and 4 items with low correlations were deleted creating a final measure with 26 items and adequate internal consistency (Cronbach's alpha of .89).

Replication Attempts

Results in this current study do not replicate those found in previous studies regarding relationships between touch and age and cognitive functioning. A Pearson correlation coefficient found no significant correlation between TD and age, $r(51) = -.04$, ns. Using a Spearman rho, no significant correlation was found between TD and cognitive functioning, $r_s(49) = .04$, ns.

TD and Severity of Autistic Characteristics

A Pearson correlation coefficient was used to examine the relationship between TD and the severity of characteristics of autism as measured by the GARS scores. As shown in Table 2, results indicated that as the severity of the characteristics increased, TD increased as well.

Specifically, significant positive correlations were found in the following subscales: TD and communication deficits, TD and impairments in social behavior, and TD and stereotypical behavior. Additionally, results showed a nonsignificant trend between TD and developmental delays.

TD and Social Styles

Use of the social subgroup measure resulted in the following distribution: 22.9% passive (N=11), 50.0% active but odd (N=24), 18.8% aloof (N=9), and 8.3% typical interaction (N=4). As found in previous studies, significant differences in cognitive functioning across the subgroups were found, $F(3,41) = 3.73$, $p < .02$. Post hoc analysis using Tukey b revealed the aloof group ($M=1.78$) was significantly lower than the active but odd group ($M=3.21$) in respect to cognitive functioning; means of the passive and typical subgroups were moderate ($M=2.44$ and $M=3.33$, respectively). A one way analysis of variance was used to test the hypothesis that TD would vary across subgroups. The overall ANOVA suggested a nonsignificant trend for differences in TD across the groups, $F(3,44) = 2.30$, $p = .08$. A post hoc analysis revealed no significant difference between any of the subgroups; however, a review of the means of the TD scores showed the active but odd subgroup had the highest mean ($M=21.58$), while the typical subgroup displayed the lowest mean ($M=9.5$). The passive and aloof subgroups exhibited moderate means ($M=15.27$ and $M=16.33$, respectively). When controlling for cognitive functioning as a covariate, no significant difference in TD was shown among the subgroups, $F(2,38) = 1.58$, $p = .219$.

A Pearson correlation coefficient was used to examine TD and its relationship to social styles as dimensions rather than as categories. As Table 3 shows, the more typical behavior

parents reported, the lower the level of TD. On the other hand, the more active but odd behaviors parents reported, the higher the level of TD. Correlations between TD and aloofness and TD and passivity were not significant.

Multiple Regression

A multiple regression analysis was used to determine whether age, the overall severity of characteristics of autism, cognitive functioning, and the 4 social subscales could be used to predict TD. The overall regression significantly predicted TD accounting for 57.8% of variance, $F(7,39) = 7.63$, $p < .0001$, $R^2 = .58$. More specifically, the variables that contributed significantly were the active but odd subscale and typical social behavior subscale and the overall score assessing the severity of characteristics of autism.

Discussion

Unlike previous studies no significant correlations were found between TD and age nor TD and cognitive functioning. However, as predicted, moderate positive correlations were found between TD and the severity of autism. More specifically, correlations were found between TD and deficits in communication, TD and deficits in social skills, and TD stereotypical behaviors. In other words, as severity of reported autistic characteristics increase, so does TD.

Based on previous research that indicates the importance of tactile stimulation and typical social development, it was hypothesized that the subgroup that participates in the least amount of social contact (the aloof subgroup) would express the highest level of TD. Though not significant, the active but odd subgroup appeared to express the highest level of TD. Further, the active but odd social style was most strongly and positively correlated with TD. Interestingly, the active but odd subgroup (aside from the typical subgroup) is the most socially interactive.

Additionally, of the non-typical social subgroups, this group had the highest level of cognitive functioning. Because calculation of TD was dependent upon parent reports, it is possible that this group was perceived to have more aversions to tactile stimulation as children with higher cognitive functioning skills may be able to communicate their tactile aversions. In other words, children in the other groups may suffer from TD as well; however, communication barriers prevent the parents from understanding aversive reactions may be attributable to aversions to tactile stimulation. On the other hand, TD may actually be higher in these persons with autism who have more active but odd social styles, higher cognitive functioning, or both.

Temple Grandin's accounts of her experiences with tactile stimulation as well as parents' reports of aversive reactions to tactile stimuli in high functioning children and children with Asperger's disorder suggest that many people with high cognitive functioning skills suffer from TD. This may explain the failure to reproduce the negative correlation found in the study by Boll et al (1977). However, the lack of a reliable, validated measure of cognitive functioning for most children in the sample makes it impossible to draw a definite conclusion. That is, because not all parents supplied a score from their children's most recent intelligence tests, this study was dependent upon the parents' best estimate of their children's abilities to serve as a measure of cognitive functioning. Although there was a good correlation between the IQ scores provided and the parents' estimates, this is not the most accurate measure of mental ability.

Unfortunately, there are some limitations to this study. The lack of a reliable measure of cognitive functioning may have affected attempts to replicate previous studies that examine the relationships between touch and cognitive functioning. A low sample size, particularly the low number of children in the typical subgroup (N=4), limits the generalization of the findings in this

study. In addition, this study may have been vulnerable to bias as the measure of TD was dependant upon parent reports rather than an objective observer. In addition, there may have been a bias in the return of questionnaires. In other words, parents who felt their children suffered from TD may have been more likely to complete and return the surveys.

Future studies should include more objective, reliable measures of cognitive functioning and TD, to replicate the correlations found between TD and severity of autistic characteristics and social styles. In addition, studies assessing the trend that suggests TD is mostly expressed in the most socially interactive group should be conducted. Specifically, a follow up study utilizing a larger sample size as well as non- autistic control groups may be able to find more significant differences among social subgroups.

Although this study offers information concerning the relationship between TD and social patterns in children with autism, additional studies are necessary to expand the knowledge of social behavior within this population and improve treatment. Currently, treatments including sensory integration therapy and massage therapy are controversial; anecdotes suggest the therapies improve aspects of social behavior; however, there is little empirical evidence to support this. Although this study cannot conclude that sensory integration therapy is successful, it does suggest that many parents are reporting increased levels of TD with more severe characteristics of autism and some social styles. In addition, 51% of the children in this sample had received sensory integration therapy at some time suggesting a need for treatment of sensory related problems. Thus, further studies evaluating these relationships are worth investigating as they may provide more information about the efficacy of sensory treatments.

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Table 1

Sample questions measuring social patterns, TD, and severity of autistic characteristics.

Behavioral Development Subgroups (Castelloe and Dawson, 1993)

Directions: Using a scale from 1 to 6 (1 indicating never, 6 indicating always), please rate how well each of the following items describes your child.

1. ____ When my child is with unfamiliar adults or children, (s)he will respond when others attempt to communicate with him/her, but only as long as the other person structures or leads the conversation.

Indicates passive social style

2. ____ My child spontaneously communicate with others. However, when (s)he communicates his/her language is centered around a narrow range of topics and has a one-sided, awkward or unusual manner.

Indicates active but odd style

3. ____ When my child is with unfamiliar adults or children, (s)he does not respond when others speak or gesture to him/her. *Indicates aloof social style*

Tactile Defensiveness Questionnaire

Royeen (1986):

	No	A Little	A lot
1. Does it bother your child to go barefooted?	0	1	2
2. Do fuzzy shirts bother your child?	0	1	2
3. Do fuzzy socks bother your child?	0	1	2

Larson (1982):

4. Does your child seem overly sensitive to bath temperature?	0	1	2
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Gilliam Autism Rating Scale (1995)

	Never	Seldom	Sometimes	Frequently
1. Whirls, turns in circles. <i>Stereotypical</i>	0	1	2	3
2. Repeats words or phrases over and over. <i>Communication</i>	0	1	2	3
3. Laugh, giggles, or cries inappropriately. <i>Social</i>	0	1	2	3
		Yes	No	
4. Did the child develop a skill (e.g., walking) and then regress? <i>Developmental Disturbances</i>		1	0	

Table 2

Correlational matrix of TD with each of the 4 measures on the GARS and the total GARS score

	TD	Communi- cation	Social Interaction	Stereotypical Behavior	Develop- ment	Total severity
TD						
Communi- cation	.41 (N=48) p = .004					
Social Interaction	.52 (N=51) p = .000	.74 (N=48) p = .000				
Stereo- typical Beh.	.35 (N=51) p = .011	.59 (N=48) p = .011	.64 (N=51) p = .000			
Develop- ment	.25 (N=51) p = .072	.46 (N=48) p = .001	.41 (N=51) p = .002	.36 (N=51) p = .010		
Total severity of autism	.49 (N=51) p = .000	.85 (N=51) p = .000	.87 (N=51) p = .000	.72 (N=51) p = .000	.70 (N=51) p = .000	

Table 3

Correlations between TD and each of the 4 social subscales

	Aloof	Active/ Odd	Passive	Typical
TD	.04 (N=51) p = .789	.47 (N=51) p = .001	.05 (N=51) p = .749	-.42 (N=51) p = .002