

# Neurosequential Model of Therapeutics in a Therapeutic Preschool: Implications for Work With Children With Complex Neuropsychiatric Problems

**Sharon Barfield**

*Health Policy and Research Solutions, Lawrence, KS*

**Christine Dobson**

*The ChildTrauma Academy, Houston, TX*

**Rick Gaskill**

*Sumner Mental Health and Wichita State University*

**Bruce D. Perry**

*The ChildTrauma Academy, Houston, TX and Feinberg School of Medicine, Northwestern University*

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*The two studies presented examine the use of the Neurosequential Model of Therapeutics on the social-emotional development and behavior of 28 children participating in a therapeutic preschool program. Results from these studies indicate that the use of the Neurosequential Model of Therapeutics approach to determine the nature, timing, and “dose” of developmentally appropriate activities and interventions within the context of a therapeutic preschool did improve the social-emotional development of the participating children. Interventions and activities were provided in the context of Filial Play Therapy as part of the therapeutic preschool environment. Six-month and 12-month follow-ups suggest gains in social-emotional development and behavior were retained. Implications for future use are discussed.*

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**Keywords:** neurosequential, therapeutic preschool, social-emotional development, serious emotional disturbance

Recent studies suggest that a growing number of preschoolers exhibit significant impulsivity, aggression, and other disruptive behavior. For young children living in at-risk environments, such as extreme poverty, homes with maternal mental health

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Sharon Barfield, Health Policy and Research Solutions, Lawrence, Kansas; Christine Dobson, The ChildTrauma Academy, Houston, Texas; Bruce D. Perry, The ChildTrauma Academy, Houston, Texas, and Department of Psychiatry and Behavioral Sciences, Feinberg School of Medicine, Northwestern University; Rick Gaskill, Sumner Mental Health, Sumner, Kansas, and Department of Counseling, Education and School Psychology, Wichita State University.

Bruce D. Perry developed the Neurosequential Model of Therapeutics (NMT) and is the copyright holder of the NMT semi-structured interview and quantitative “clinical practice tools” used in the NMT assessment and clinical problem-solving process.

Correspondence concerning this article should be addressed to Christine Dobson, The ChildTrauma Academy, 5161 San Felipe Ste. 320, Houston, TX 77056. E-mail: drcdobson@ChildTraumaAcademy.org

problems, parental substance abuse, and absence of social supports, the prevalence of neuropsychiatric problems is high (Gillam, 2005; Goldberg, Roghmann, & McInerny, 1994; Squires & Nickel, 2003; Webster-Stratton, 1998). The elevated incidence of exposure to trauma and maltreatment for this population is also well documented (Ammerman, Kolko, Kirisci, Blackson, & Dawes, 1999; Black, 2000; Child Welfare League of America [CWLA], 2001). There are multiple and complex functional consequences of growing up with chaos, threat, and trauma (Anda et al., 2006; Perry, 2008). Children growing up in at-risk or traumatized environments have a unique combination of delays, functional problems, and strengths that are determined by the nature, timing, and intensity both of adverse and attenuating experiences. Individual genetic and epigenetic factors also play a role in the impact of such experiences. These children often pose a significant challenge for educators attempting to provide developmentally appropriate enrichment, educational, and therapeutic experiences to a class where students display a wide range of developmental strengths and needs (Azzillessing, 2010; Donahue, Falk, & Provet, 2007).

Children with trauma, chaos, and threat-related developmental dysfunctions are a major challenge in a preschool setting, often displaying difficult behaviors and significant problems in emotional regulation and behavior. Bierman (2004) suggests that preschoolers with problems in these areas are at greater risk of rejection by peers and of becoming socially withdrawn. Studies have also shown that behavior problems in early preschool are the single best predictor of delinquency in adolescence, gang membership, and adult incarceration (Dishion, French, & Patterson, 1995; Reid, 1993). Unfortunately, the majority of preschool environments are ill equipped to deal with children exhibiting such challenging behaviors and traditional service delivery systems are overwhelmed by increasing numbers of families with multiple serious problems. A 2003 report by the National Institute for Mental Health (NIMH) found that “services for children are often fragmented and many of the traditional service models do not meet the needs of today’s children and families,” citing a shortage of evidence-based treatment (NIMH, 2003, p. 2).

## THE NEUROSEQUENTIAL MODEL OF THERAPEUTICS

The Neurosequential Model of Therapeutics (NMT) is a developmentally sensitive, neurobiologically informed approach to clinical work (Perry, 2006). The NMT includes an assessment process that creates a “functional map” of the child’s brain based upon current status of various brain-mediated functions (see Perry, 2009). The map is a visual representation of the “localization” and status (e.g., developed, well-organized vs. undeveloped or disorganized) of various brain-mediated functions (e.g., *brainstem* – respiration, suck/swallow/gag; *diencephalon* – feeding/appetite, sleep; *limbic* – affect regulation/mood, attunement; *cortex/frontal cortex* – self-awareness/self-image, abstract/conceptual cognition). The NMT assessment, then, provides the clinician and educator with the individual child’s strengths and vulnerabilities in an array of key domains of functioning: sensory integration, self-regulation, relational, and cognitive. This information helps direct the selection and timing of developmentally appropriate enrichment, educational and therapeutic activities. Two key assumptions of this model are (1) that thera-

peutic and educational, efforts are most effective when they are provided in a sequential manner that replicates neural organization and development (e.g., cognitive enrichment would be less effective if the child has not yet organized rudimentary self-regulation capabilities), and (2) that therapeutic interventions must provide adequate patterns and frequency of experiences that will activate and influence the areas of the brain that are mediating the dysfunction.

### FILIAL THERAPY

Filial Therapy was seen as the most appropriate way to introduce the NMT-recommended activities to children participating in the therapeutic preschool. Thus, Filial Therapy was the conduit through which the interventions were introduced and applied in both studies presented. Modeled after child-centered play therapy, Filial Therapy engages and trains parents to be agents of change, doing play therapy with their children (Landreth, 2002; Landreth & Bratton, 2005). It is intended to change child perceptions about parental attitudes and behavior; to allow the child to express their needs and feelings to the parents; and to give the child a greater sense of self-worth and confidence. The goals of Filial Therapy include: (1) encouraging the child to choose the activities while setting limits; (2) helping the parent develop empathetic understanding of their child's basic needs and feelings as expressed through play; (3) helping the parent use empathetic responses, communicating that the child's needs and feelings are understood and accepted whatever they may be; and (4) helping the child learn to accept responsibility for their actions, within the scope of limit setting (Guerney, 1964; Landreth, 2002). There is preliminary evidence to suggest the effectiveness of this therapy (Landreth, 2002; Landreth & Bratton, 2005) as well as the effectiveness of the modality for children experiencing a variety of mental health issues (Beers, 1985; Brandt, 1999; Hannah, 1986; Kaczmarek, 1983; Kops, 1999; Landreth & Bratton, 2005; Perez, 1987; Saucier, 1986; Schopler, Brehm, Kinsbourn, & Reichler, 1971; Tyndall-Lind, 1999). Other studies have demonstrated the efficacy of teaching Filial Therapy to groups of nonmental health professionals interacting with children in a variety of environments, including parents, teachers, and high school students (Jones, Rhine, & Bratton, 2002; Post, McAllister, Sheely, & Hess, 2004). These studies suggest that use of Filial Therapy techniques contributed to decreased aggression, anxiety, and depression in young children. However, studies examining the impact of play therapy, including Filial Therapy, have lacked strong study designs, such as pre- and posttest designs, comparison groups or self-as-control group designs (LeBlanc & Richie, 2001) thus creating a need for additional research in this area as suggested by Bratton and Ray (2000).

The present report describes the effects of implementing the NMT within a rural Midwestern therapeutic preschool environment. Two small studies examining the use of the NMT approach on the social-emotional development and behavior of 28 children participating in the program are presented. Each study examined the primary research question, "Do the NMT suggested interventions (e.g., somatosensory and relational activities) promote social-emotional development and improved behavior for children participating in the summer, NMT only, therapeutic preschool program?" The second study expanded this question to examine whether more improvements were

seen with the NMT-based summer program when compared to program offered during the academic year which did not include the NMT component.

## METHOD

### Sample

The two studies presented were implemented within a therapeutic preschool developed through a collaborative agreement between Head Start and a Midwestern public sector Community Mental Health Center utilizing Medicaid funding. The *study populations* consisted of a purposive, convenience sample of children ages two and a half to seven who were receiving mental health services through a therapeutic preschool in the rural Midwest. The two studies were conducted with a total of 28 children and took place over two consecutive summers.

All children entering the study had previously failed in the normal county Head Start preschool setting, which was colocated with the therapeutic preschool. Children included in both studies were identified with serious emotional disturbance (SED) and behavioral problems. This SED designation was required by the state for participation in the therapeutic preschool program. Participating children were dually enrolled in the preschool and mental health center with the understanding that many of the services would be delivered in the preschool setting. Both studies received approval through the Human Subjects Committee at the University of Kansas, Lawrence, KS.

### Design

Each child participating in either of the two studies received an NMT assessment upon entering the program. The assessment included the gathering of data on key areas of developmental history, developmental and current relational health, as well as current functioning in a range of brain-mediated capabilities (CNS functioning). While there were a wide range of individual strengths and vulnerabilities across the children, all had significant impairment in self-regulation capabilities and on related brainstem and diencephalic functions. The primary set of NMT-recommended interventions, therefore, included a range of specific somatosensory activities (e.g., rocking, therapeutic massage), individualized relational interactions (i.e., one-to-one time out of class), other patterned, repetitive, developmentally matched activities (i.e., singing, sequencing, rhythmic movement, therapeutic touch, infant games, play, movement activities, pacification, rudimentary social skills, calming activities) and *Conscious Discipline* (Bailey, 2000) with the goal of gaining greater social and emotional regulation. All of the recommended activities were selected based on their capacity to provide organizing input to the disorganized, undeveloped lower areas of the brain (i.e., brainstem and diencephalon). It is important to note that individual plans were created that titrated the dose, nature, timing, and combination of motor, relational, and somatosensory experiences to best suit the individual child's strengths, interests, and needs. (For a detailed explanation of the NMT process see Perry & Hambrick, 2008). Both studies examined the impact of

the NMT-recommended interventions on the social-emotional development and behavior of children participating in the therapeutic preschool summer program.

During the academic school year, the program design provided an age-appropriate environment for typically functioning preschoolers with the ability for struggling children to move in and out of the classroom to be calmed and regulated through participation in therapeutic activities. The therapeutic component involved supportive mental health professionals who were available to soothe, calm, and regulate the child throughout the day during those times when the child had difficulty functioning in the regular program environment. Individualized activities such as rocking, swinging, massage, and other patterned, repetitive somatosensory activities were utilized only as needed. During the school year the student-staff ratio was approximately four or five children to one teacher.

In contrast, the summer program's focus was entirely on the NMT approach with directed somatosensory and relational activities provided multiple times throughout the week, with no academic content included. All activities were treatment oriented according to the individual NMT assessment and the child's treatment plan. The student-staff ratio within the therapeutic preschool during the summer program was approximately one and a half students to one staff member.

## **Staff Training**

### *Filial Therapy*

Program staff also received training in Filial Therapy techniques. For use in the current study, Filial Therapy training was used to help staff develop empathetic understanding of the basic needs and feelings of each child, as expressed through play; to help staff use empathetic responses, communicating that the child's needs and feelings were understood and accepted, whatever they might be; and to help the child learn to accept responsibility for their actions within the scope of limit setting (Guerney, 1964; Landreth, 2002).

Training and supervision in Filial Therapy (including a 15-week training, observation, videotaping, feedback, bug-in-the-ear technique, and twice weekly meetings) was monitored by the Clinical Director, Head Start Director, and case manager supervisor. The Clinical Director was a Registered Play Therapist Supervisor with the Association for Play Therapy. Both Head Start and mental health personnel, including bachelor's level mental health case managers, teachers with bachelor's degrees in early childhood education or development and paraprofessionals with high school degrees and 1 to 2 years experience, provided services for children participating in the program and participated in the Filial Therapy training. The Clinical Director, Head Start Director, and case manager supervisor monitored model fidelity to this training as well as to the various somatosensory activities.

### *Neurosequential Model of Therapeutics*

All staff received training in the NMT core concepts. This training included 8 hr of didactic training, 12 hr reading, and more than 10 hr of ongoing case-based

supervision in the core principles underlying the NMT. Staff was trained in the impact of developmental trauma on early brain development and to understand that activities provided must be developmentally relevant, repetitive and patterned, rewarding, and rhythmic, while being respectful of the family, child, and culture. NMT Assessments were conducted by the Clinical Director with the help of the staff working directly with the children.

The NMT assessments demonstrated a range of deficits in relational functioning and self-regulation within this population. In an effort to utilize the most effective means of addressing both the self-regulation and relational challenges Filial Therapy was used as an empathic, relationally sensitive approach to introducing the patterned, repetitive somatosensory activities. Therefore, rather than using a more traditional client-centered play therapy approach, the program used the somatosensory activities as the play activity and the filial skills to teach positive relationship and responding skills to the staff. The staff, teachers especially, in turn taught both Filial Therapy and somatosensory techniques to the parents of participating children in an effort to increase the parent's skills in understanding and communicating with their children.

### **Study 1 Design**

Study 1 was conducted as a pilot study and included a single group, pre- or posttest design with data collected over the 6 week summer program. Multiple time series measures were also used. Children participated in four, 2 hour Filial Therapy sessions per week where the individualized somatosensory activities were the focus. The mean number of sessions attended by participating children was 19.8. Absences were attributed to reasons such as vacations, field trips, and family day.

Thirteen children participated in the first study. Participant ages ranged from 2.5 to 6 years, with a mean age of 4.6. Three (23%) of the children were female and 10 (77%) were male. All participants were White and all experienced multiple risk factors. Risk factors included: physical abuse (15%), runaway behavior (39%), harm to self or others (15%), parent with serious psychiatric illness (39%), parent convicted of a felony (15%), sibling in an institution (31%), sibling in out-of-home care (31%), family history of mental illness (62%), family or domestic violence (77%), and family history of substance abuse (62%). Approximately 46% of the children participating in the study experienced four or more of these risk factors.

### **Study 2 Design**

Study 2 was conducted as an expanded follow-up study to further examine the use of the NMT model in the same therapeutic preschool environment the following summer. This study included a quasi-experimental, multiple time series design conducted to compare the NMT based summer program with the school-year program, which did not include the NMT component, in promoting social-emotional development. The study used an AB single-subject design where children served as their own control group. Baseline data were collected during the last 5 weeks of the regular



school year when children received the school-year program services. Intervention phase data were gathered during the 10-week summer program at which time children received the NMT-only program. The NMT assessments were administered at the beginning of the summer program. Based upon these assessments, intervention plans were developed for study children that included participation in two, 2-hr therapy sessions per week during which somatosensory activities were the focus. The mean number of summer sessions per child was 12.9. Three children did not complete the study, with one completing 7 weeks and two others completing 5 weeks. Because of the small sample size, these children were included in the study. A pre- or posttest design was used to examine changes in behavior.

Fifteen children participated in the second study with ages ranging from four to seven, with a mean age of 5.2. Four (27%) were female and 11 (73%) were male. Fourteen (93%) were White and one (7%) was African American. Ninety-three percent of the children participating in Study 2 experienced at least two risk factors, with nearly 27% experiencing four or more. Risk factors experienced by participants in the second study included: physical abuse (20%), runaway behavior (20%), harm to self or others (20%), parent with serious psychiatric illness (27%), parent convicted of a felony (27%), sibling in an institution (13%), sibling in out-of-home care (13%), family history of mental illness (60%), family or domestic violence (67%), and family history of substance abuse (47%).

### **Instruments and Data Collection**

Both teachers and parents were blind to the collection of data for the studies presented. Teachers were regularly required to track student progress using various standardized measures as a requirement for the program.

#### *Preschool Social and Emotional Developmental Readiness Index*

The Preschool Social and Emotional Developmental Readiness Index (PSEDRI) is a 25-item composite scale designed to measure social-emotional development in preschool children (Gaskill, Barfield, Shields, & Theurer, 2003). It consists of six domains including (1) Emotion Regulation, (2) Helpfulness, (3) Fair Assertiveness, (4) Impulse Modulation, (5) Cooperation, and (6) Empathy. The instrument is strengths-based and focused on positive, desired behaviors of children as indicators of their social-emotional development. The tool is constructed on a scale from zero to five, with zero indicating the behavior has never been observed and five indicating the behavior is observed most of the time. Thus, the higher the score the better the functioning in each of the six domains. The PSEDRI has been found to be a robust measure with high internal reliability (0.949), interrater reliability (82% agreement), as well as good face and content validity.

This measure was added specifically for the studies presented and teachers only knew they were using a new measure to track their students. Teachers were provided ample time to become skilled and comfortable using the PSEDRI before the beginning of the first study. During the first study, PSEDRI pre- or posttest

measures were taken by service providers at the beginning and end of the 6-week summer session. PSEDRI time series measures were completed daily by service providers for each child during the 6-week study period, rendering 257 data collection points. On average, there were 19.8 points per child. During the second study, the PSEDRI was completed by staff daily for each child during the baseline phase and the intervention phase. The baseline phase consisted of 173 data points and the intervention phase consisted of 193 data points. On average, there were 11.5 points during the baseline phase and 12.9 during the intervention phase per child. These data were also used for time-series measures to increase the studies' internal validity and to observe the timing and magnitude of the changes.

### *Achenbach Child Behavior Checklist*

The Child Behavior Checklist (CBCL) is designed to assess emotional and behavioral problems in children as reported by their parents and teachers. The CBCL consists of 120 items related to behavioral problems scored on a 3-point scale ranging from not true to often true. This measure has been repeatedly found to have good reliability and high construct and criterion-related validity. For the purposes of both studies, age-appropriate Internalizing and Externalizing problem scales were used to obtain both parent and teacher's perceptions of the child's behaviors at pre- or posttest. Internalizing scores reflect somatic complaints, withdrawal, anxiety, or depression while externalizing scores reflect aggressive behavior (Achenbach, 1991). The CBCL was administered as a pre- or posttest in both Study 1 and 2.

Teachers and parents of participating children completed the CBCL. Completion of these measures on a quarterly basis was a requirement for all children receiving services through the public mental health system. The completion of this measure was routine and required and not only used as part of these studies. For the present studies, the CBCL was completed at the beginning and end of the summer programs.

## **RESULTS**

### **Data Analysis**

The appropriate *t* tests, described below, were conducted for both studies with a confidence level of .05. In addition, effect sizes were calculated to look at practical significance and effect magnitude. Although variability in interpretation exists, generally, an effect size of 0.2 is considered small; 0.5, medium; and 0.8, large (Cohen, 1988).

#### *Study 1*

*Social and emotional development.* Paired *t* tests were conducted to determine differences between pre- or posttest means. The PSEDRI findings for the first study are presented in Table 1. There was a statistically significant improvement in composite PSEDRI scores from pretest to posttest ( $t = 6.16, p < .001, d = 2.34$ ).



**Table 1.** Difference in Pretest and Posttest PSEDRI Scores and Time Series PSEDRI Scores (Social-Emotional Development) for Study 1

PSEDRI scores	Pretest mean ( <i>SD</i> )	Posttest mean ( <i>SD</i> )	<i>t</i>	<i>p</i>	<i>d</i> (effect size)
PSEDRI composite ( <i>n</i> = 13)	1.79 (.508)	2.98 (.848)	6.16	<.001**	2.34
Emotion regulation	1.88 (.449)	2.86 (.810)	5.4	<.001**	2.18
Helpfulness	2.04 (.824)	3.31 (1.22)	4.4	<.001**	1.54
Fair assertiveness	1.92 (.768)	3.87 (.768)	7.5	<.001**	2.54
Impulse modulation	1.73 (.693)	2.64 (1.01)	3.8	<.001**	1.31
Cooperation	1.94 (.584)	3.21 (1.09)	5.23	<.001**	2.17
Empathy	.94 (.668)	1.77 (1.14)	3.19	.003**	1.24
	Time series mean ( <i>SD</i> )	Week 1 mean ( <i>SD</i> )			
PSEDRI composite ( <i>n</i> = 13)					
Week 2	1.82 (.288)	1.85 (.430)	-.346	.73	-.07
Week 3	1.74 (.318)	1.85 (.430)	-1.39	.168	-.26
Week 4	2.72 (.799)	1.85 (.430)	6.25	<.001**	2.02
Week 5	2.77 (.670)	1.85 (.430)	7.33	<.001**	2.14
Week 6	3.05 (.753)	1.85 (.430)	9.2	<.001**	2.79

\*\*  $p < .01$ .

Statistically significant improvements were also found in all PSEDRI domains from pretest to posttest as shown in Table 1. The effect sizes in all domains were markedly large.

Paired *t* tests were also run to determine differences in time series PSEDRI composite scores over the 6-week period. Also shown in Table 1, the composite PSEDRI scores were similar from week 1 to week 2; then declined in week 3. Thereafter, scores improved significantly from week 1 to all other weeks.

**Behavior.** Paired *t* tests were also used to examine differences between parents' and teachers' pre- or posttest ratings of the children's Internalizing and Externalizing CBCL scores. CBCL findings are provided in Table 2. At pretest, the parents' rating of their children's Internalizing CBCL scores (*n* = 10) ranged from 53 to 75, with a mean of 68.9 (*SD* 7.43). Externalizing CBCL scores ranged from 62 to 92, with a mean of 79.6 (*SD* 11.53). Examination of mean scores at posttest revealed no significant improvement, but effect sizes were meaningful ( $t = 1.52, p = .16, d = .58$  and  $t = 1.49, p = .17, d = .44$ , respectively). Three parents did not complete the CBCL at posttest.

Teacher ratings of Internalizing CBCL scores at pretest (*n* = 13) ranged from 52 to 73, with a mean of 64.8 (*SD* 6.82). Externalizing CBCL scores ranged from 60

**Table 2.** Parents and Teachers Ratings of Differences in Pretest and Posttest CBCL Scores (Behavior) for Study 1

CBCL scores	Pretest mean ( <i>SD</i> )	Posttest mean ( <i>SD</i> )	<i>t</i>	<i>p</i>	<i>d</i> (effect size)
Parents ( <i>n</i> = 10)					
Internalizing	68.9 (7.43)	64.6 (10.0)	1.52	.16	.58
Externalizing	79.6 (11.53)	74.5 (7.08)	1.49	.17	.44
Teachers ( <i>n</i> = 13)					
Internalizing	64.8 (6.82)	62.3 (6.55)	1.6	.135	.37
Externalizing	70.5 (7.55)	66.2 (5.15)	2.34	.038*	.57

\*  $p < .05$ .

to 83, with a mean of 70.5 (*SD* 7.55). Posttest mean scores showed improvement, although not statistically significant for internalizing behavior ( $t = 1.6, p = .135, d = .37$ ). However, externalizing behavior improved significantly ( $t = 2.34, p = .038, d = .57$ ) and effect sizes were appreciable.

Study 2

*Social and emotional development.* Independent *t* tests were used to compare differences between mean baseline phase scores and mean intervention phase scores. Results from the PSEDRI measures for the second study are outlined in Table 3. The data show significantly more improved composite PSEDRI scores during the NMT intervention phase compared to the baseline phase school-year program,  $t = 6.34, p < .001$  with an effect magnitude between medium and large ( $d = .61$ ). The findings further show statistically more improved PSEDRI scores during the NMT intervention/summer phase compared with the baseline phase school-year program in all but one domain, regulation, in which scores increased although not significantly.

For Study 2, independent *t* tests were conducted to examine differences in PSEDRI time series composite scores (see Table 3). This table shows slight improvement in PSEDRI mean scores from baseline to weeks 2 and 3 and significant improvement from baseline to all subsequent weeks. Effect sizes ranged from over medium to over large.

Study 2 was intended to be an ABA design; however, the withdrawal phase (A) of the single-subject design could not be completed because most participants had moved into other educational placements during the postintervention phase. Chil-

**Table 3.** Differences in Baseline and Intervention Phase PSEDRI Scores and Time Series PSEDRI Scores (Social-Emotional Development) for Study 2

PSEDRI scores	Baseline phase (A)	Intervention phase (B)	<i>t</i>	<i>p</i>	<i>d</i> (effect size)
	Mean ( <i>SD</i> ) (data points = 173)	Mean ( <i>SD</i> ) (data points = 193)			
PSEDRI composite ( <i>n</i> = 15)	2.8 (.553)	3.14 (.458)	6.34	<.001*	.61
Emotion Regulation	2.61 (.583)	2.72 (.524)	1.9	.058	.19
Helpfulness	3.12 (.774)	3.34 (.882)	2.58	.01*	.28
Fair assertiveness	3.02 (.842)	3.23 (.836)	2.33	.02*	.25
Impulse modulation	2.77 (.813)	3.46 (.744)	8.36	<.001*	.85
Cooperation	2.95 (.647)	3.45 (.620)	7.60	<.001*	.77
Empathy	1.85 (.938)	2.19 (.89)	3.27	.001*	.36
	Time series mean ( <i>SD</i> )	Baseline mean ( <i>SD</i> )			
PSEDRI composite ( <i>n</i> = 15)					
Week 2	2.85 (.493)	2.8 (.553)	.414	.681	.09
Week 3	2.9 (.382)	2.8 (.553)	1.18	.247	.18
Week 4	3.14 (.375)	2.8 (.553)	3.72	.001*	.61
Week 6	3.14 (.378)	2.8 (.553)	3.07	.007*	.61
Week 8	3.39 (.263)	2.8 (.553)	6.02	<.001*	1.07
Week 10	3.44 (.551)	2.8 (.553)	5.04	<.001*	1.16

\*  $p < .05$ .

dren participating in this study all experienced functional challenges in regular preschool environments leading to their acceptance into this therapeutic preschool program. Typically, children spend less than 1 year in the therapeutic preschool as its purpose is to improve behavior and aid in developmental growth so they can be reintegrated into regular schools. Therefore, only three children were still enrolled in the therapeutic preschool during the withdrawal phase.

All children who exited the program were expected to enter a regular preschool or kindergarten classroom without special education services. Parents of the three children who entered kindergarten agreed to be contacted to answer questions about their children's school readiness. At the end of the first semester of public school, all of the children were attending school regularly (90 to 100% of the time). Two parents (67%) rated their children's academic performance as good and one (33%) rated their child's academic performance as excellent. On a scale from one to five, with one indicative of poor and five indicative of excellent, the mean parental rating of their children's school performance was 3.57.

*Behavior.* As in the first study, paired *t* tests were conducted to determine differences between parents and teachers' pre- or posttest ratings of the children's Internalizing and Externalizing CBCL scores. Findings for this study are provided in Table 4. At pretest the parents' ratings of their children's Internalizing CBCL scores ( $n = 14$ ) ranged from 58 to 80, with a mean of 71.1 ( $SD$  6.28). The Externalizing scores ranged from 62 to 92, with a mean of 78.2 ( $SD$  10.5). An examination of mean scores at posttest indicated no significant improvement, however, effect sizes were noteworthy ( $t = 1.43, p = .177, d = .43$  and  $t = 1.61, p = .13, d = .28$ ). Parents of the three children who left the program early did not complete the CBCL posttest at the children's departure from the program.

At pretest, the teachers' rating of the children's Internalizing CBCL scores ( $n = 12$ ) ranged from 52 to 73, with a mean of 64.9 ( $SD$  6.28). The Externalizing CBCL scores ranged from 60 to 83, with a mean of 71.0 ( $SD$  7.62). An inspection of teachers' mean Internalizing scores at posttest revealed improvement, although not significant ( $t = 2.09, p = .06, d = .49$ ). Teachers' mean Externalizing scores, however, showed significant improvement ( $t = 2.79, p = .017, d = .67$ ). The effect sizes for both Internalizing and Externalizing score change were considerable. Teachers completed the CBCL posttest on one of the three children who did not complete the study.

It is important to note, that while all children participating in the therapeutic preschool had severe emotional and behavioral problems, this was not reflected in all of the pretest CBCL scores. For example, in Study 2, although the upper end of

**Table 4.** Differences in Pretest and Posttest CBCL Scores (Behavior) for Study 2

CBCL scores	Pretest mean ( <i>SD</i> )	Posttest mean ( <i>SD</i> )	<i>t</i>	<i>p</i>	<i>d</i> (effect size)
Parents ( $n = 14$ )					
Internalizing	71.1 (6.28)	68.4 (8.33)	1.43	.177	.43
Externalizing	78.2 (10.5)	75.3 (9.62)	1.61	.13	.28
Teachers ( $n = 12$ )					
Internalizing	64.9 (6.57)	61.7 (6.4)	2.09	.06	.49
Externalizing	71.0 (7.62)	65.9 (5.29)	2.79	.017*	.67

\*  $p < .05$ .

the scores was 92, two parents rated their children's Internalizing scores in the subclinical range. This may be attributed to the providers' strengths-based training approach that encouraged parents to focus on their child's strengths and positive characteristics, rather than only on the negative.

## DISCUSSION

Because of the small sample sizes of these studies they must be qualified as exploratory in nature. However, given the increasing numbers of young children presenting with serious emotional and behavioral difficulties and the significant challenge to the preschool setting, these are promising, though preliminary findings. The findings suggest that determining the true developmental vulnerabilities of these children, training staff and clinicians to be aware of the level of the dysfunctions and providing them with specific prescriptive therapeutic activities can provide positive changes in children from very challenging developmental backgrounds. Further, these studies suggest that structured incorporation of somatosensory and relationally empathic interventions (i.e., individualized somatosensory regulating activities) did improve the social and emotional development of the participating preschoolers. These findings further suggest that the inclusion of the NMT assessment and recommended interventions into therapeutic preschool programs can facilitate social and emotional development for children and improve the probability that high-risk and traumatized young children can transition into a regular classroom environment. Findings from the second study also show significant growth in nearly every area of social-emotional development after participation in the summer, NMT only, program. This suggests that even more enriched NMT-directed programming and therapeutic settings would have more robust positive outcomes.

A 6-month follow-up of the children participating in Study 1 suggests that they retained the social-emotional gains made during the summer NMT intervention. Fidelity monitoring and effect maintenance was also conducted as part of the second study that showed the children participating in the NMT had retained their social-emotional gains at 6-month and 12-month follow-ups.

Findings from an examination of the CBCL data also provide insight into the importance of improving the social and emotional functioning of young children. While parents did not report significant changes in behavior, they did note changes in the right direction. Parents with children participating in both studies reported modest decreases in internalizing and externalizing behaviors. Teachers, however, reported more marked improvement in the behavior of the children in their classrooms. In both studies, teachers reported a significant decrease in externalizing behaviors following completion of the NMT-only, with Filial Therapy summer program. While changes in internalizing behaviors were not significant, they were also in the right direction, with participating children decreasing internalizing behaviors as endorsed by teachers.

## LIMITATIONS

Several limitations of the studies presented here should be considered. First, the studies had small sample sizes. Second, the lack of racial and ethnic diversity of the populations studied (nearly all White living in the rural Midwest) limits the generalizability of the findings. Finally, the lack of a comparison group in Study 1 and its preexperimental design weaken the findings leaving questions as to whether the findings could have been attributed to maturation or other extraneous variables.

Despite these limitations, the findings are promising. Both studies used methods that increased internal validity. First, both studies used time series designs. Second, although the small sample sizes were a limitation, they allowed for the examination of data, both individually and in the aggregate. A closer examination of PSEDRI scores showed that a large majority of children spiked on the same days, lending validity to the inference that changes were attributable to the program rather than something that would have happened by chance. Third, service providers doing the scoring were not aware studies were being conducted, diminishing instrumentation as a threat to internal validity. Finally, quasi-experimental design studies, with comparison groups, strive for equivalent groups. The children served as their own comparison group for Study 2. Therefore, because the children were compared to themselves, the groups were definitely equivalent.

## CONCLUSIONS

In summary, the findings from the two studies presented, while based on small sample sizes, suggest that the inclusion of NMT assessment and recommended interventions in programs serving young children with SED and behavioral problems can help improve social and emotional regulation. The NMT approach has proven useful in providing a clear picture of the developmental strengths and vulnerabilities of children assessed with this model, in the current setting. Well-trained staff that provided supportive, nurturing and consistent care was an essential component of this program. These mental health and education professionals provided the necessary patterned, repetitive experiences that helped soothe, calm, and reregulate the children with whom they worked. The involvement of nurturing staff provided small reparative experiences necessary for gains in social and emotional functioning that were requisite for the child's later success in their next educational setting. These studies show that by integrating patterned, repetitive somatosensory activities into the educational environment in consistent, predictable ways throughout the day challenging behaviors can be decreased.

## Future Directions

The true utility of the NMT approach will be determined in well-designed studies with larger controlled samples. Larger studies comparing preschool programs that have implemented the NMT within more traditional programs are needed. Future studies should include a more diverse group of children, including

older children and adolescents, children from a variety of ethnic backgrounds, as well as those seen in diverse of clinical settings (e.g., outpatient mental health, foster or adopt, residential treatment, hospital). The addition of nonclinical comparison groups should also be considered. Key issues to study should include comparing different degrees of caregiver involvement and comparison with other types of intervention approaches. The effect of longer-term application of NMT-directed interventions, including follow-up NMT assessments at regular intervals is also warranted.

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