

## Brief Report: Theatre as Therapy for Children with Autism Spectrum Disorder

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**Abstract** The pilot investigation evaluated a theatrical intervention program, Social Emotional Neuroscience Endocrinology (SENSE) Theatre, designed to improve socioemotional functioning and reduce stress in children with autism spectrum disorder (ASD). Eight children with ASD were paired with typically developing peers that served as expert models. Neuropsychological, biological (cortisol and oxytocin), and behavioral measures were assessed in a pretest–posttest design. The intervention was embedded in a full musical theatrical production. Participants showed some improvement in face identification and

theory of mind skills. The intervention shows potential promise in improving the socioemotional functioning in children with ASD through the utilization of peers, video and behavioral modeling, and a community-based theatrical setting.

**Keywords** Autism · Theatre · Cortisol · Video modeling · Social · Stress

### Introduction

“I regard the theatre as the greatest of all art forms, the most immediate way in which a human being can share with another the sense of what it is to be a human being.”

~Oscar Wilde

Deficits in social functioning contribute to and potentially precede problems with anxiety in autism (White et al. 2009). Not surprisingly, biological stress (Corbett et al. 2006, 2009) and symptoms of anxiety (Muris et al. 1998) are frequently reported in persons with autism. Importantly, social variables can enhance or diminish the stress response (Levine and Mody 2003); thus, behavioral and biological indices of social functioning are important to consider in the treatment of autism. For example, oxytocin (OT), a hypothalamic peptide crucial to the formation of social bonds and important in stress buffering (Carter 1998; Insel 1997; Winslow et al. 1993), may be dysregulated in autism (Green et al. 2001; Modahl et al. 1998).

In autism, social skills training often includes a variety of techniques such as group intervention (Solomon et al. 2004), video modeling e.g., (Charlop and Milstein 1989),

SENSE Theatre—a stage of hope for children with autism—is a unique theatrical intervention research program designed to improve the social and emotional functioning of children with autism and related neurodevelopmental disorders. It is an Internal Revenue Service (IRS) 501(c)(3) non-profit organization expressly established to provide a community-based program dedicated to serving the autism community (see [www.sensetheatre.com](http://www.sensetheatre.com)). The participants in the investigation were part of a full musical production of Disney’s “The Jungle Book Kids” that was produced by SENSE Theatre and Davis Musical Theatre Company and performed for the public.

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social stories e.g., (Hutchins and Prelock 2006), social problem solving (Bauminger 2007), pivotal response training (Koegel and Frey 1993), script and cue procedures (Thiemann and Goldstein 2001), and computer-based interventions (Bellini and Peters 2008).

Much of human learning occurs by watching and imitating others. Children with autism who possess fundamental imitation ability are able to learn from observation, imitation, and modeling (Egel et al. 1981; Garfinkle and Schwartz 2002; Kohler et al. 1997). The inclusion of typically developing peer models can facilitate academic learning (Egel et al. 1981) and improve social functioning and play behavior in naturalistic settings (Harper et al. 2008; Terpstra et al. 2002) for individuals with autism.

Modeling techniques have been effective methods of teaching and video modeling seems particularly helpful for enhancing social functioning of children with autism (Charlop-Christy et al. 2000; Nikopoulos and Keenan 2007). Video may facilitate observational learning in autism by selectively focusing attention, maintaining learned material through repetition, and reproducing behavior via rehearsal in a medium (video) that children enjoy (Corbett and Abdullah 2005).

Drama therapy and theatrical techniques have been used to enhance social skills in children with communication and emotional challenges as well as autism (McAfee 2002; McCarthy and Light 2001; Peter 2003; Wright et al. 2006). Theatre, like modeling, may help individuals identify key social cues (e.g., recognizing facial expressions) (McAfee 2002) and develop skills in communication, movement, pretend play, and social interaction (Peter 2003). Additionally, music can significantly impact affect and memory (Janata et al. 2007). Thus, music therapy shows potential in enhancing functioning in autism (Kim et al. 2009).

## Aims and Hypotheses

The investigation was initiated with the belief that theatre may provide an ideal environment to teach a variety of core skills that children with autism often lack. The primary aims were to assess Social Emotional NeuroScience Endocrinology (SENSE) Theatre, a community-based intervention program, using a pre- and post-treatment design in the context of an enjoyable, supportive, and active social experience. We hypothesized that children with autism would demonstrate improvement in social perception (memory of faces, the expression of emotions, and theory of mind) skills and adaptive functioning. It was also hypothesized that changes would occur over time in biological response to include reductions in cortisol level and a reciprocal rise in the level of oxytocin.

## Methods and Materials

Informed written consent was obtained from parents and verbal assent was obtained from all research participants prior to inclusion in the study. The Institutional Review Board of the University of California, Davis approved the study.

### Participants

Participants included eight children (7 boys, 1 girl) with autism spectrum disorders (six with autism, two with pervasive developmental disorder-not otherwise specified) referred to as SENSE participants, paired with eight typically developing children (4 boys, 4 girls) referred to as peers. The participants ranged in age from 6 to 17 years ( $Typ = 13.86$ ,  $SD = 3.49$ ;  $Aut = 11.30$ ,  $SD = 3.98$ ). There were no significant differences between the groups based on age  $t(13) = 1.31$ ,  $p = 0.21$ .

Inclusion required the families to attend the majority of 38 rehearsals and six performance dates. SENSE participants required a diagnosis of an ASD based on DSM-IV-TR criteria (APA 2000) corroborated by the Autism Diagnostic Observation Schedule-Generic; (Lord et al. 1999). There were no requirements based on age, IQ or gender. The SENSE participants' were administered the Wechsler Abbreviated Scale of Intelligence, (Wechsler 1999). IQ scores ranged from 62 to 102 (mean = 82.36,  $SD = 16.44$ ). The typically developing children did not require an evaluation although parents completed the *Social Communication Questionnaire* (Rutter et al. 2003), a screening tool for autism, and results all fell below clinical levels.

### Neuropsychological Measures

Specific subtests related to social and emotional processing from the NEPSY (Korkman et al. 2007), a standardized neuropsychological battery of measures for ages 3–16 years, were administered by a licensed psychologist (J.R.G.) pre- and post-treatment and used as dependent variables.

*NEPSY Memory for Faces* (MF) is a measure of face identification and memory for faces requiring the child to identify persons recently perceived and following a delay.

*NEPSY Affect Recognition* (AR) is a measure of emotion perception requiring the child to identify different emotional facial expressions.

*NEPSY Theory of Mind* (TOM) is a measure of TOM requiring the child to apply mental state concepts to interpret and predict self and other behavior.

## Parent Questionnaires

*The Social Responsiveness Scale* (SRS) (Constantino and Gruber 2005) assesses domains characteristic of autism.

*The Stress Survey Schedule for Persons with Autism and Other Developmental Delays* (SSS) (Grodén et al. 2001) assesses various types of stress.

*The Short Sensory Profile* (SSP) (Dunn 1999) assesses sensory sensitivity.

*Adaptive Behavior Assessment System* (ABAS) (Harrison and Oakland 2000) assesses 10 areas of adaptive functioning.

## SENSE Theatre Intervention Procedures

The SENSE Theatre program was expressly designed to target the socioemotional challenges of autism by utilizing well-established behavioral intervention paradigms implemented in combination with theatrical techniques. The approach arose from the SENSE translational research program (B.A.C.) and extensive experience in theatre.

The SENSE participants were paired with typically developing actors who in addition to being co-actors in a musical production, served as the participants' peer models. These youth actors were conceptualized as master models of verbal and nonverbal communication, socioemotional perception and expression, as well as behavioral and affective control. Under the supervision of the clinical staff (psychologists and behavior specialists), the peer models worked with the SENSE participants to acquire broader skills and individualized target behaviors. The peers also performed the participant's role on video, which was broadcast on a secure password-protected website, allowing participants to watch, imitate, and practice their roles from home via video modeling.

The SENSE Theatre experience was offered free to the research participants. In March of 2009, all interested actors, with and without autism, were invited to auditions for "Disney's The Jungle Book" held at Davis Musical Theatre Company (DMTC). Approximately 20 youth with autism expressed an interest in the program, but many families were unable to participate due to scheduling conflicts. The theatre director (J.P.) selected the cast of 37 actors and assigned the eight SENSE participants roles commensurate with their ability.

Approximately 1 week prior to the first rehearsal, the SENSE participants completed diagnostic and neuropsychological procedures at the M.I.N.D. Institute. The rehearsal schedule was based on a general community theatre approach. The musical was broken down into specific scenes. The songs were taught first, followed by basic blocking of places and action, and finally choreography. The rehearsals were initially 1 day per week and gradually

progressed to 3 or 4 days per week depending on the child's role. The rehearsals were 2 h per session. The actual trial lasted 3 months.

Care was taken to provide a supportive social environment and individualized assistance. To enhance social interaction with others, the peers helped the participants through modeling appropriate social behavior, shaping techniques, external reinforcement (e.g., stickers), intrinsic reinforcers (e.g., praise), and in vivo and video peer modeling. Initial support was provided through one-to-one behavioral support, verbal and physical prompting, social reinforcement, redirection techniques, and verbal cues. Each actor's role was broken down into teachable parts to facilitate learning. Generalization was enhanced through the use of peers, multiple trainers, parent involvement, and video modeling. Once peers established rapport and gained competence in working with the participant on and off the stage, support from team staff was gradually faded.

## Video Modeling

Video modeling was conducted by peer actors who, in addition to their own parts, learned and performed the SENSE participant's role on video. For singing or facial gestures, the cameras were framed in a close-up or medium close-up shot. For full-body actions, such as special choreography, the actor's entire body was videotaped to clearly demonstrate the full actions they were expected to perform.

Selected takes were visually and aurally improved using a digital video editing system (Apple's Final Cut Pro). The video clips were then compressed for internet publication and posted on a secure website using the video and photo-sharing service "SmugMug" (<http://www.smugmug.com>). SmugMug account holders are able to create secure password protected galleries that are not accessible by search engines.

Parents of participants were given access to the protected video galleries allowing their children to repeatedly practice the actions recorded on the videos. Depending on their role, participants were encouraged to watch and role play the videos with care providers for 15–30 min daily to aid in the acquisition, maintenance, and generalization of skills. Parents reported consistent video modeling in response to weekly checks by research personnel. The scenes were also brought into the theatre via computer DVDs which allowed on site individual practice.

## Cortisol Sampling Protocol

Basal levels of salivary cortisol were collected for six diurnal cycles (3 pre- and 3 post-). Home-based samples

were collected by parents upon waking, half an hour after waking, in the afternoon between 1,300 and 1,500 h, and in the evening within a half-hour of bedtime. Our standardized procedures are detailed in previous reports (Corbett et al. 2008).

Parents temporarily stored samples in the home refrigerator. Once brought to the lab, samples were stored in a  $-20^{\circ}\text{C}$  freezer. Samples were centrifuged at 3,000 rpm for 20 min to separate the aqueous component from mucins and other suspended particles. Salivary concentrations of cortisol were estimated in duplicate using commercial radioimmunoassay kits (Siemens Medical Solutions Diagnostics, Los Angeles, CA). Intra- and inter-assay coefficients of variation were 2.76 and 6.23, respectively.

To evaluate physiological response, the SENSE participants provided salivary samples at the beginning and end of rehearsals; specifically, at the First (1st), Middle (19th), and Last (38th) Rehearsal. In addition, salivary samples were collected at the pre- and post- assessments conducted at the M.I.N.D. Institute.

#### Oxytocin Collection and Assay

Samples were collected via blood draw by a pediatric phlebotomist at the pre- and post-assessments. Blood was collected on ice and centrifuged at  $4^{\circ}\text{C}$ , 3,300 rpm for 12 min. Plasma was then stored in a  $-80^{\circ}\text{C}$  freezer until assay. The assay kit (Assay Designs, Ann Arbor, Michigan) has been validated (Bales et al. 2005; Carter 2007). Analyses were conducted using 0.05% concentration and the coefficient of variation was 4.55%.

#### Statistical Analysis

The investigation used a pretest–posttest design. Means and standard deviations were calculated for each of the dependent measures and are presented in Tables 1 and 2. Neuropsychological (NEPSY Face Matching, Affect Recognition, Theory of Mind), biological (cortisol and oxytocin assessment), and behavioral parent-report measures (SRS, SSS, SSP, ABAS) were analyzed using paired sample  $t$ -tests. A repeated measures approach was included

**Table 1** Independent variables

Variable	Pre mean (SD)	Post mean (SD)	$t$ -score	$df$	$p$ -value
ABAS	51.25 (21.82)	56.71 (28.12)	−0.56	7	0.59
SRS	97.75 (25.19)	88.63 (38.21)	0.99	7	0.36
SSS	114.00 (25.51)	114.50 (39.58)	0.07	7	0.94
SSP	120.75 (25.13)	128.50 (24.13)	−0.77	7	0.47

*SD* standard deviation, *df* degrees of freedom, *ABAS* adaptive behavior assessment scale, *SRS* social response scale

for the cortisol stress response values for the First, Middle, and Last rehearsal.

#### Results

Within group analyses of pre-post for the parent report measures using paired sample  $t$ -tests are reported in Table 1. There were no significant differences (all  $p > 0.05$ ). In contrast, as can be seen in Table 2, the results of neuropsychological measures indicate statistically significant differences between the pre- and post-treatment measures for the identification of matching faces [ $t(7) = -2.62$ ,  $p = 0.034$ ], and TOM skills [ $t(6) = -2.73$ ,  $p = 0.34$ ]. However, the identification of facial expressions did not reach statistical significance [ $t(6) = -1.12$ ,  $p = 0.304$ ]. The effect size suggests that the participants showed some improvement in face identification and TOM skills in response to the treatment.

Regarding the cortisol values, repeated measures analyses revealed a significant interaction between Intervention Time (First, Middle, and Last rehearsals of the treatment) and Rehearsal Time (Pre and Post Rehearsal) [ $F(1,6) = 19.302$ ,  $p = 0.001$ ]. There were also main effects for Time [ $F(1,6) = 16.81$ ,  $p < 0.0001$ ] and for Pre-Post Rehearsal [ $F(1,6) = 127.36$ ,  $p < 0.0001$ ]. As seen in Table 3, posthoc analysis revealed that the most significant changes in cortisol occurred between the First and the Middle rehearsals, showing a reduction in cortisol from the start and end of these rehearsals. Subsequently, the final rehearsal did not show a notable difference in cortisol level suggesting habituation in the latter rehearsals and performances. There was also a significant difference between

**Table 2** Neuropsychological results of SENSE participants pre- and post treatment

NEPSY	Pre mean	Pre SD	Post mean	Post SD	$t$	$p$	95% Confidence interval	$D$
MF	6.88	4.39	9.00	2.88	−2.61	0.034	(−4.04, −0.21)	1.68
AR	15.29	9.44	19.00	6.63	−1.22	0.304	(−11.81, 4.38)	0.62
TOM	13.14	6.89	15.86	6.51	−2.73	0.034	(−5.14, −0.28)	1.44

*SD* standard deviation, *D* Cohen's *D*, *A* adjusted, *UA* unadjusted, *MF* matching faces, *AR* affect recognition, *TOM* theory of mind. The Cohen's *D* was calculated using a repeated measures formula which accounts for the dependency between the two groups. The formula can be found at: <http://wilderdom.com/courses/surveyresearch/calculators/Cohensdrepeatedmeasures.xls>

**Table 3** Autism cortisol rehearsal (First, Middle, Last) and pre-post values

Autism cortisol rehearsal	Mean	SD	<i>t</i>	<i>p</i> value
<b>FIRST REH</b>				
Reh1Pre1	2.24	0.54	11.698	0.000
Reh1Post1	0.69	0.43		
<b>MIDDLE REH</b>				
Reh2Pre2	0.97	0.21	6.01	0.001
Reh2Post2	0.49	0.21		
<b>LAST REH</b>				
Reh3Pre3	1.21	0.51	1.64	0.156
Reh3Post3	0.89	0.15		

SD standard deviation, *Reh* rehearsal, *Pre1* beginning of first rehearsal, *Post1* end of first rehearsal

the beginning (pre) times for the First and Last rehearsal [ $t(6) = 4.31$ ,  $p = 0.005$ ].

In contrast, there were no significant differences for pre-post paired comparisons of cortisol collected during assessments [ $F(1,6) = 0.003$ ,  $p = 0.96$ ] or diurnal values (all  $p > 0.05$ ). Similarly, there were no differences between the pre-post values of OT [ $t(6) = -0.31$ ,  $p = 0.77$ ].

## Discussion

The current pilot investigation evaluated SENSE Theatre, a theatrical intervention program designed to improve the socioemotional functioning of children with autism.

There were no statistical differences in pre-post comparisons for OT level or parent report measures. It is unclear if the indices are unaffected by the intervention or if the sample size and limited power are too small to detect differences; thus rendering the results ambiguous.

As predicted, SENSE participants showed modest improvement in face identification and theory of mind skills. Exposure to the intervention contributed to some improvement in social perception. It is proposed that the “active practice” of reciprocal social interaction through in vivo and video modeling and role playing may facilitate social awareness and perspective taking. It is believed that the opportunity to dynamically engage with others in a skilled, supportive, and reciprocal manner is a key contributory element of the program.

The ASD participants showed elevated cortisol at the beginning of the initial rehearsal, which declined over time. It is likely that these findings reflect simple habituation following some early situational anxiety. Additionally, reduced cortisol levels were shown when comparing the initial pre-treatment to the post-treatment rehearsal values.

It is again likely that the reduction in cortisol is a reflection of habituating to the environment and may indicate improved comfort in the setting from practice and experience. Importantly, we did not specifically utilize stress reduction techniques as part of the program. Thus, increased familiarity with the social milieu may be a benefit.

Another important factor observed, but not quantified, was evidence of increased empathy, social referencing, and communication in the typically developing children toward the participants with ASD which was reported to have generalized to school settings and toward other children with disabilities. Drama can promote self-efficacy as an individual gains greater awareness and sensitivity toward others (Peter 2003).

SENSE Theatre incorporated a number of promising strategies for social skills training (White et al. 2007), such as: modeling, providing a nurturing, fun environment, natural reinforcers, multiple trainers, and video modeling. Music may have also added a positive impact. It is likely that several factors combined to create the encouraging outcome.

Despite the potentially promising results, the study did not use a randomized experimental design, was limited by a very small, heterogeneous sample, and did not include a control group. Participation did not require cessation of ongoing interventions; however, treatment approaches were held constant. Our next investigation will address these concerns by a much larger, homogeneous sample in an enhanced experimental design (e.g., manual development, control group, random assignment (Smith et al. 2007)).

In summary, the pilot project succeeded in evaluating this novel intervention by including neuropsychological, biological, and behavioral data. The results show the potential promise of using a theatrical approach and setting, along with established behavioral science methods, to facilitate the development of core areas of challenge in youth with autism.

**Acknowledgments** The SENSE Theatre members and authors thank Christine Totah and Brenda Shelton for outreach and peer recruitment. We are grateful to Steve and Jan Isaacson and the Board of DMTC that allowed SENSE Theatre to participate in and produce a Storybook Production. We thank Chris Wang for his creative graphic design. We are also indebted to our loyal volunteers, Maggie Gooze, Brianna Doherty, and Lia Smith for their generous help and dedication. Most importantly, we offer a thunderous standing ovation to our donors who believe in the magic of SENSE Theatre.

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