

Integrated approach to yoga therapy and autism spectrum disorders

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ABSTRACT

A specially designed Integrated Approach to Yoga Therapy module was applied to Autism Spectrum Disorders over a period of two academic years. Despite low numbers (six in each arm), consistency and magnitude of effects make the findings significant. Parental participation, allowing firm guidance to be given to each child, resulted in significant improvements in imitation and other skills, and in behavior at home and family relationships. We hypothesize that guided imitation of therapist body positions stimulated mirror neuron activation, resulting in improved sense of self.

Key words: Autism spectrum disorder, communication, integrated approach to yoga therapy, social and imitation skills.

INTRODUCTION

Autism spectrum disorder (ASD) characteristics include “markedly abnormal or impaired development in social interaction and communication, and restricted activity and interest repertoires”.^[1] Studies of many risk factors, neurochemical, genetic, natal, etc., have found no association with autism. No causative theory exists, but causative hypotheses have been proposed, and various interventions based on them. Treatments based on behavioral models are currently the best validated. Learning principles applied intensively early in the development improve socially important behaviors. No treatment fits all requirements, and no established protocol relates child, family, and target behaviors to individualized treatment regimes.

In the matched control study reported here, six children with ASD practiced a specially formulated Integrated Approach to Yoga Therapy (IAYT) module, in addition to their applied behavior analysis (ABA). Changes in communication, social, cognitive, and adaptive skills were compared to six matched controls, who only received ABA. Pre-, mid-, and post-therapy, special educators assessed

subjects on ASD’s nine core targeted behaviors: eye to eye gaze (EEG), sitting tolerance (ST), body posture (BP), body awareness (BA), depth perception and balance (DPPB), imitation skills (IS), self-stimulatory behavior (SSB), receptive skills related to spatial relationships (RSRSR), and self-injurious behavior (SI). Results indicate that IAYT improves imitation skills and social-communicative behaviors, playing an important role in improving quality of life.

Many parents of children with ASD use Complimentary and Alternative medicine (CAM), since no single intervention has proved effective in alleviating ASD’s core symptoms.^[2] Reports exist of significant recovery using various combinations of mainstream and alternate medicine combinations. IAYT, in particular, is noninvasive and has no side effects. Parents are willing to try it.

Yoga’s traditional knowledge concerns physiological and psychological processes that change physiological parameters through respiratory manipulation (breathing technique), postures (asanas), and cognitive controls (relaxation and meditation). Yoga is ideally a lifetime practice, far more than an adjunctive therapy, generally discontinued after particular conditions have been corrected. Children with ASD require lifetime Yoga practice.

The majority require a program with repetition, structure, and continuity, as established in IAYT sessions, which seem to increase critical skills. ASD children typically display decreased co-ordination, body awareness, and sensory integration; competitive physical outlets are frustrating.

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Yoga is noncompetitive, and provides an environment where risk-taking and self-confidence can increase.

Improvements in sensory integration, attention, sensory defensiveness, and increased verbal receptivity for commands related to spatial perception are reported.^[3-5] In one study, heart rate was measured pre- and post-yoga sessions, and correlated with improved test scores in certain skill areas: turn taking, receptive language following verbal directions, body awareness and proximity, following routines, regulating, and self-monitoring.^[6] Another reported increased concentration, focus, organization, and relaxation after 25 yoga sessions,^[7] consistent with the hypothesis based on many years observation that ASD children have frontal lobe deficits involving cortical and subcortical regions, as suggested by ASD's pervasive nature. Working to improve brain function directly through Yoga may improve behavior better than focusing on the problem.

MATERIALS AND METHODS

Subjects

Admission and medical records of children entering SGS Vagdevi School, Bangalore, 2000-2007, were examined. Forty-two children with established ASD were profiled; six satisfying inclusion/exclusion criteria were selected.

Inclusion/exclusion criteria

Inclusion: Diagnosis of autism according to ICD-10 criteria.^[8] Age 8-14 years; parents' education - minimum graduates; socioeconomic background - middleclass; record of 15-20 hr weekly, 1-to-1 treatment for at least 1 year at special school. **Exclusion:** neurological disorders of known etiology; significant sensory or motor impairment; major physical abnormalities; history of head injury or neurological disease.

Demographical details are given in Table 1.

Procedure

All six children attended regular elementary classes, receiving 15 hr ABA-based training and 5 hr IAYT weekly for two 10-month academic years with 2 months summer holiday gap. Teaching sessions involved 1-to-1 instruction with one parent present. IAYT sessions were conducted in open, green surroundings; with a serene atmosphere. Children marked boundaries of operation round their mats in the same place every day.

Assessment and data collection

Special educators and parents helped data collection through questionnaires and tests as given in Table 2. Assessment was conducted pre- (sessions 1-12), mid- (sessions 200-202), and post- (sessions 389-391) the intervention. Two special educators completed assessment and were co-related at every point. Intra- and interobserver reliability was thus calculated.

The 5×per week, 1 hr, IAYT intervention was conducted over 82 weeks at SGS Vagdevi School. "Warm-up," "strengthening," "release of tension," and "calming" exercises were practiced. In the initial 2 weeks, parents were trained to guide their child's full participation. Regular home practice was emphasized.

Yoga intervention

The IAYT module developed over 35 years experience with ASD children, with Yogasanas and breathing exercises selected to improve cognitive, social, and communication skills.

The sequence, including warm-up, strengthening, loosening, and calming asanas, yogic breathing practices, and chanting are listed in Table 3.

Table 1: Demographic details

School	Mean IQ Range	Average Age	Sex M/F	SEB	EB
School - SGS Vagdevi	76.5	12.7	5/1	Middle class	Graduate

SEB, socioeconomic background (minimum Rs. 8000); EB, educational background (graduate mothers)

Table 2: Test measures

Behavior check list	Items	Scale
Check list 1: The Autism Research Institutes' form E-2 check list	Eye to eye gaze (EEG), sitting tolerance (ST), body posture (BP), body awareness (BA), depth perception and balance (DPPB), imitation skills (IS), self-stimulatory behavior (SSB), receptive skills related to spatial relationships (RSRSR) and self-injurious behavior (SI)	3-point rating scale (0 = little, 1 = moderate, 2 = a lot)
Check list 2: Imitation test battery (ITB)	Imitating gross motor actions (IGMA), imitating vocalization (IV), imitating complex motor actions (ICMA), imitating oral facial movements (IOFM), imitating breathing exercises (IBE)	3-point rating scale (2 = exact imitation, 1= occasional imitation, 0 = rarely imitated)
Check list 3: Repetitive stereotyped behavior test battery (RSBTB)	Stereotyped behavior, self-injurious behavior, restricted behavior, sameness behavior, and repetitive behavior	4-point rating scale: (3 = behavior occurs severe, 2 = behavior occurs moderate, 1 = behavior occurs mild, 0 = behavior does not occur)

Table 3: Yoga intervention

Warm-up practices	Loosening practices	Strengthening asanas	Calming asanas	Yogic breathing practices	Chanting
a. Jogging b. Forward and backward bending in standing posture	a. Neck exercises b. Waist-back bending exercises c. Waist forward bending	a. Trikonasana (triangle pose) b. Veerabhadrasana (warrior pose) c. Parvathasana (mountain pose) d. Sasankasana (moon pose)	a. Sukhasana (cross legged pose) b. Shavasana (corpse pose) c. Makarasana (crocodile posture)	a. Preparatory blowing exercises b. Sasha swasa (rabbit) c. Vyaghra swasa (tiger) d. Simha mudra (lion pose) e. Hasta prasarita swasa (hands in and out breathing)	a. AAAA b. UUUU c. MMM d. OMM e. Short mantras

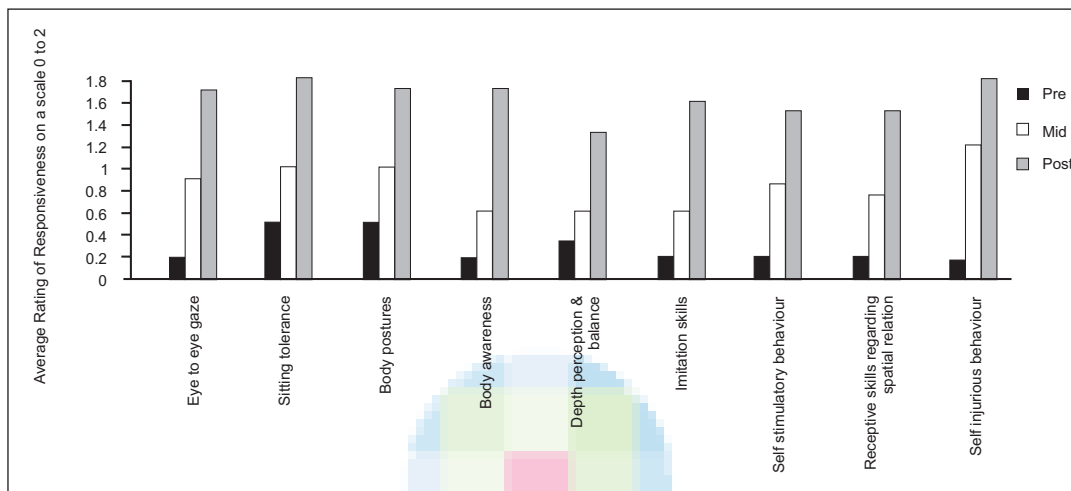


Figure 1: Graphic representation of observed improvement. Black bars, base-line data; white bars, 1-year reassessment showing consistent improvements on all variables; gray bars, second year's reassessment showing continuing improvements. Note that all children originally with ASD have left the ASD defined range after 2 x 10-month interventions.

RESULTS

Results are presented in three parts: first, baseline characteristics; second, impact on ASD symptoms and perceived child outcomes; third, effects on a wide range of behaviors, nonverbal skills, social interaction, imitation, and repetitive stereotyped behaviors (RSB). Despite small sample size, consistency across tests and subjects make the results significant [Figure 1].

Behavior characteristics addressed in the research were significant to parents and staff. Parents find lack of eye contact, hyperactivity, and resistance to change difficult to endure; staff emphasize those impacting learning negatively: lack of eye contact to gain attention, lack of imitation skills, poor sitting tolerance, and temper tantrums. Table 4 summarizes results of their qualitative reports at baseline.

Behaviors manifesting during Yoga and in class were consistent with baseline reports of parents and staff.

After the first 12 sessions, no observable changes in eye-to-eye gaze, sitting tolerance, or imitation skills occurred. Thereafter, subtle changes in behavior were recorded by observers and parents. Children initially unaware of their breath gradually learned to breathe in and out, and to deepen their breathing. Hand held mirrors, blowing toy materials, candles, soap bubbles, straw to drink water, etc. were used at this stage. Noticeable changes to slower and quieter breathing patterns were observed in the last few sessions.

By mid-session assessments, observed behavioral changes included eye-to-eye gaze (focus retained on objects: lighted candle, focus circle, color mat); sitting tolerance; and body posture. Improvements were noted in receptive skills to verbal commands concerning spatial relationship during *trikonasana* (triangle position) and *uttanasana*; imitation skills; self-stimulatory activity; and self-injurious behaviors. Teachers reported increased alertness after sessions.

During the post-assessment, children previously unable to connect with the therapist started coming closer during

Table 4: Qualitative reports of parents and staff at baseline

All subjects displayed
Poor eye contact and sitting tolerance
Poor balance and awkward body posture
Poor imitation skills
Object, body, and hand stereotypes, e.g., body rocking, hand flapping, twiddling sticks
Self-injurious behavior, e.g., hitting and biting self, pulling hairs
Poor receptive skills related to spatial relationships
Poor breath awareness

continuous chanting of mantras; they seemed to enjoy chants as they encouraged a sense of rhythm and a means to work on coordination. Slow mantra chanting witnessed appreciable increases in oral-facial movement imitation skills. Children who initially sat outside the mat, or span or jumped on the mat, demonstrated discipline by sitting in *vajrasana* when gentle touch was applied on their lower back. Significant changes occurred in communication, language, play, and joint attention. Patterns of eye contact steadily improved, e.g., focusing on the therapist's counts by drumbeat. Over the intervention, children started to trust, share, initiate, and reciprocate. By the 372nd session, all children showed increased vocal imitation skills by imitating vowels "a, e, i o, u" and "OM." They greeted the therapist with a smile, vocalizing "namaste." Parents reported improvement in ability to interact with other children and family members.

DISCUSSION

Our observations confirm previous reports of qualitative behavior changes in ASD children following short-term yoga interventions: increased tolerance of sitting and adult proximity and subsequent socialization. Our quantitative results amplify them. Aberrant immune activity may also be regularized. Interactions between immune and nervous systems begins in the embryo. Successful neurodevelopment depends on balanced immune response. Symptoms consistent with poorly regulated immune response have been reported in autistic children.^[9] Neurotransmitter abnormalities are reported, e.g., increased serotonin.^[10] Growth factors and hormones may be unstable; studies see both increase and decrease. Some genes may be associated with autism but probably account for fewer cases.^[11]

Stress retards neuron growth in the hippocampus, associated with memory, helping explain why anxious ASD children have difficulty learning.^[5] Stimulation exercises and environmental enrichment all help increase hippocampus cells. As IAYT calms the physical body, the child becomes more focused and organized. Not much research exists on

how early interventions work. The brain can both duplicate and transfer function, allowing information to go to brain areas not usually used for that purpose.^[12]

Feeling safe is essential for relaxation. Individual mats help children identify personal space and remain supine. Combining physical exercises with speech and language stimulation increased recall ability, imitation skills, verbal receptive skills, and expression. *Ardhasherasana* (half inverted position), *Ardhachakrasana* (half wheel position), and *trikonasana* (triangular position) stimulate vestibular and proprioceptive sense. *Parivrittrikonasana* (modified triangular position) and its variations seem to stimulate parasympathetic activity, calming the nervous system. With direct instruction even those with extreme attention deficit can slow their breath and use breath regulation to control unwanted movement of body and mind.

ASD children sense input from muscles and joints better than eyes and ears.^[5] Heavy touch pressure often produces positive responses. This enhanced RSB reduction during therapy. Some suggest that the central nervous system in ASD children processes information abnormally, causing over- or under-arousal. Repetitive stereotyped behavior may calm over-aroused nervous systems and alert under-aroused ones.^[13,14] Engaging in repetitive IAYT procedures may thus make ASD children feel more calm and more awake, becoming a powerful motivator.

An important observation was that slowing down facial, vocal, motor, and auditory cues would impact children's imitative and cognitive performance, particularly when the environment was changing too fast, agreeing with the finding that slowing down facial and vocal events enhances imitative, verbal, and cognitive skills of some ASD children,^[15] and supporting the rapid visual-motion integration deficit hypothesis.^[16]

Comprehension of spatial commands (right, left, front, back, up, down) may have improved during *Yogasana* practice, because subjects could use the therapist's body, which remained at their eye level, as a visual aid. Kinesthetic/tactile stimulation given during *asanas* helped children learn them. They thus became aware of imitating the "Being" aspect of the therapist during each yoga posture. We hypothesize that reinforcing this experience slowly brought the children a greater sense of their felt-self, or identity, enabling them to learn to relate better to others. Thus, the children slowly progressed to the stage of being able to interact with others as more normal people.

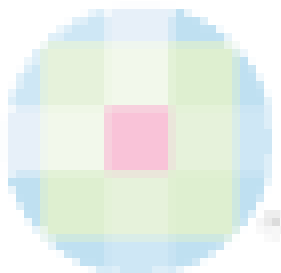
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