

CHAPTER 3

AIMS AND OBJECTIVES

3.1 Research questions

Critical research questions addressed were:

Is it possible to teach yoga as an add-on in a special school for children with ASD
What can these modules of yoga add to the conventional modules of educational interventions used presently?
3. Can Cognitive, Physical and Socio-emotional changes during yoga practice be scientifically measured /quantified?

3.2 Aim

To study the efficacy of yogic intervention in inducing changes in autistic behavior in children with ASD.

3.3. Objectives

- A. To cull out the reference to ASD & related conditions in ancient Indian scriptures.
- B. To study the efficacy of yoga practice through a control design in:
 - 1. Increasing sitting tolerance,
 - 2. Improving imitation skills,
 - 3. Reducing hyper-activity and
 - 4. Reducing of repetitive/stereotyped behavior.

3.4 Hypothesis

- 1. Integrated yoga practices can be taught to children with ASD in a special school setting
- 2. Regular practice of yoga will help in reducing the autistic behavior.
- 3. Regular practice of yoga will help in increasing the imitation behavior of autistic children.
- 4. Regular practice of yoga will help in reducing the repetitive stereo typed behavior of autistic children.

3.4.1 Null hypothesis

1. There will be no significant improvement in autistic behavior after the practice of yoga. There will be no significant increase in imitation behavior of autistic children after yoga intervention.
2. There will be no significant decrease in repetitive stereo typed behavior of autistic children after yogic intervention.

CHAPTER 4

METHODOLOGY AND DESIGN

4.1 Overview

The following section provides details regarding the methodology used for this study in order to answer the proposed research questions. This study was designed to discover if yoga was beneficial for children with ASD. The setting, selection, data collection tools and design of yoga implementation is explained in the following sections.

4.2 Subjects:

Admission register and medical records of children admitted between the years 2000-2007 to four special schools in Bangalore, India, were examined. 42 children with established ASD were profiled; 12 from four special schools satisfying the inclusion criteria were selected: 6 from school A formed the yoga group; 2 matching children from each of the schools B, C and D formed the non-yoga group. Demographic details of the subject is given in Table 4.

Table 4: Demographic details

| No. | School | Mean IQ Range | Mean Age | Sex M/F | SEB | EB |
|-----|-----------------------------|------------------|-------------|------------|-----------------|----------|
| 1. | School A – Yoga Group | 76.5 | 12.7 | 5/1 | Middle Class | Graduate |
| 2. | School B- Non-yoga Group | 82.3 | 12.5 | 2/0 | Middle Class | Graduate |
| 3. | School C- Non-yoga Group | 79 | 11.4 | 2/0 | Middle Class | Graduate |
| 4. | School D- Non-yoga Group | 84 | 13.2 | 1/1 | Middle Class | Graduate |

SEB : Socio-economic background (minimum Rs. 8,000) EB : Educational background (graduate mothers)

The subjects were mostly from middle class socioeconomic background and commuting to the school from their house was an issue in the school community. All subjects received some instruction in the general education classroom (preparatory) and all received special education under ABA model. In yoga group – School A subjects were 5 boys and 1 girl with a mean age of 12.7 years. In non-yoga group – School B subjects were 2 boys with a mean age of 12.5 years, School C subjects were 2 boys with a mean age of 11.4 years and School D subjects were 1 boy and 1 girl with a mean age of 13.2 years.

4.2.1 Inclusion / Exclusion criteria

- (a) Diagnosis of autism according to ICD-10 criteria (World Health Organization, 1993^[60])
- (b) Age 8-14 yrs initially.
- (c) Parents' educational background - minimum graduates.
- (d) Parents' socio-economic background - middleclass, income of Rs. 8,000 (\$160) /month).
- (e) Record indicating that the child had received between 15 and 20 hours per week of one- to-one treatment for a year at the special school.
- (f) Exclusion criteria: presence of neurological disorders of known etiology; significant sensory or motor impairment; major physical abnormalities; and history of head injury and /or neurological disease. The demographic data of the participants is given in Table 4.

4.2.2 Ethical clearance and informed consent

Swami Vivekananda Yoga Anusandhana Samsthana's (SVYASA) Institutional Ethical Committee and Review Board approved the study protocol. Signed, informed consent to participate in the study was obtained from all parents.

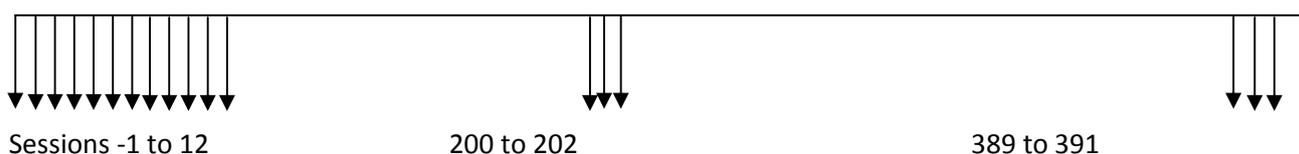
4.3 Design

4.4 Structure of Sessions

This was a prospective matched control design lasting 22 months. All 12 children attended regular elementary classes at special schools, receiving weekly and 15hrs of

ABA-based training. The experimental group received, additionally, weekly 5hrs IAYT (1hr /day) for two, 10-month academic years, with two months summer holiday gap. IAYT was implemented everyday in the morning before the regular classes commenced. This was conducted in an open, green, serene environment overlooking a temple and an ashram. Most teaching sessions involved one-to-one instruction with one parent present. Children used their own mats, marking their own boundary of operation in the same place every day. Special educators and parents contributed to a range of data collection procedure through questionnaires and tests of assessment. Assessment was conducted at three stages pre (1st month), mid (11th month) and post (20th month). Eight special educators completed assessment and co-related at every point. The assessment schedule is given in figure 1.

Figure 1 : Assessment Schedule for Yoga and Non-Yoga Group



4.5 Assessments

All the parents both in Yoga and Non Yoga group who gave consent to participate in the study were interviewed using modified E-2 check list. Their observation was recorded at the beginning and end of the research project.

Following behaviors modifiable through yoga based on DSM criteria and previous reports and studies were selected for the study. Six target behaviors were:

- Eye to eye gaze
- Sitting tolerance
- Body posture and balance
- Imitation skill
- Self-stimulatory and self-injurious behaviors and
- Receptive skills related to spatial relationships.

In addition, imitation skill was further studied under following parameters:

- Imitating gross motor actions (IGMA)

- Imitating vocalization (IV)
- Imitating complex motor actions (ICMA)
- Imitating oral facial movements (IOFM)
- Imitating breathing exercises (IBE)

Similarly, repetitive stereotyped behaviors (RSB) were studied under following parameters:

- Restricted behavior
- Sameness behavior
- Repetitive behavior

Special educators, parents contributed to a range of data collection procedure through questionnaire and tests. These were,

1. The modified form of Autism Research Institutes’ form E-2 check list (check list– 1) (Rimland 2007 ^[61]),
2. Imitation Test Battery (ITB) (check list 2),
3. Repetitive Stereotyped Behavior Test Battery (RSBTB) (check list 3)
4. Check list of special educators’ observation and parents’ interviews.

Test battery and parameters measured is given in Table 5.

Table 5: 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: (0= rarely imitated, 1= occasional imitation, 2= exact imitation). |
| 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: (0= behavior does not occur, 1= behavior occurs mild, 2 = behavior occurs moderate, 3= behavior occurs severe) |

4.6 Data Analysis

In order to determine if a relationship existed between the yoga intervention and behaviours associated with ASD column graph was drawn taking the average value of the observers to determine the impact of the intervention. Behavioural change in terms of percentage change was calculated from base-line to mid to post and from base-line to post. This improvement at baseline, mid and post-intervention and the relationship between yoga intervention and sub parameters with reference to imitation skills and RSB. was indicated visually in the Graphs 1 – 17 and Table 10 – 25.

4.7 Data Collection / Extraction

8 observers, 2 each from school A, B, C, D were trained for a week to observe the behaviors and to grade them according to a grading system developed by the author during pilot study was used. These gradings were collected from the observers

periodically. Summary of the parents interviews analysed at the beginning and end of the Yoga intervention.

Baseline data collection using the test batteries mentioned above began one week prior to implementing the yoga intervention. Following eighty weeks of yoga implementation, the test battery was used again to determine the present levels of performance in the same category. Eight special educators completed assessment and co-related at every point.

Eight observers collected data at baseline, mid, and post sessions as per the schedule given in figure 1. Raw data was entered in spread sheet using Microsoft excel. Percent change was calculated and a graphic representation in the form of Bar chart is depicted in Graphs 1-17 and Tables 10-25.

Data was collected for all the parameters selected for intervention, for all subjects, by all observers, both in the non-yoga group and the yoga group.

4.8 Intervention

4.8.1 ABA therapy module

Both experimental and control group received ABA therapy module in the regular school is given in Table 6.

Table 6: ABA Therapy Module

| Yoga intervention Group(exp) | Non Yoga Group(con) |
|--|----------------------------|
| Developing perceptual & cognitive behavior | Expressive communication |
| Increase attention & focusing | Receptive language |
| Increase imitative behavior | Visual performance |
| Increasing symbolic play | Academic |
| Memory & recall | Social & behavioral skills |
| Increase interactive behavior | Life learning skills |
| Developing daily living skills | Play & socialization |
| Reducing self injurious, repetitive behavior | |

4.8.2 Yoga intervention

The integrated yoga module used in this study was based on ancient yoga text, to bring about a total development at physical, mental, emotional, social and spiritual levels. The techniques include physical practices (Kriyas, asanas, satvik diet, breathing practices with body movements and pranayama, devotional songs, and life style change). The set of yoga practices selected for the yoga intervention for specific benefits is listed in Table 7. The sequence consisted of warm-up practices, strengthening asanas, loosening practices, calming asanas , yogic breathing practices and chanting. The integrated yoga module was selected from the integrated set of yoga practices used in earlier studies on yoga for positive health.((Nagendra and Nagaratna,1985 ^[62])

The yoga intervention consisted of ten different asanas that promote breathing, posture training, relaxation and focusing. During first 4 weeks of yoga therapy children were exposed to a chart depicting yoga schedule from beginning to the end. Typically, the sessions started with bell ringing ,signaling that they have to spread their mat and sit in vajrasasna with namaskara mudra and listen to prayer rather than reciting the prayer. The yoga intervention consisted of ten different asanas that promote breathing, posture training, relaxation and focusing. This was followed by warm-up exercises, loosening practices, strengthening asanas, calming asanas, yogic breathing practices and chanting. The sequences of yoga practices were same for each child initially and later they were tailored to the individual child. During yogic breathing practices children were not aware of breath. Parents held hand-held mirrors below the nostrils and showed them how it gets fogged when they breathe out. Children were asked to blow candles, soap bubbles, dry leaves, paper, pitch pipes and wind instruments to understand “breathing out”. Children were asked to feel the bulging of the belly when they were breathing in. When once children started imitating these actions and became aware of breath, they were asked to just breathe in and out calmly for total of one to two minutes. Later, they were taught the regular breathing exercises. Asanans were used in conjunction with breathing for 2 to 3 minutes. All the yoga sessions ended up with shavasana and shanthi mantra. Initially children could never assume shavasana with closed eyes. Blindfolds were used to close their eyes with soft music playing in the background.

Table 7: Yoga Intervention

| Warm-up practices | Loosening practices | Strengthening asanas | Calming asanas | Yogic Breathing practices | Chanting |
|---|--|--|---|---|--|
| a. Jogging b. Forward & 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 |