

CHAPTER 7

7.0 DISCUSSION

The current study was a randomized control trial that examined the effect of *yoga* as an everyday school program for children with ASD in special school environments. To our knowledge, this is the first study to track the feasibility of a daily group *yoga* program for children with ASD in special school environments while examining other behavioral and physiological variables through a multi-informant approach. The current study showed a significant reduction in the autism severity as reported by the parents and improved motor proficiency for the *yoga* group. The teachers reported a significant decrease in the *yoga* group's social withdrawal aspect of problem behaviors. However, no significant changes were found in the social skill deficits, food and digestion problems, and sleep disorders in children with ASD. Many of the mixed findings in the study were consistent with other *yoga* studies on various aspects of autism (Kaur & Bhatt, 2019, Koenig et al., 2012; Sotoodeh et al., 2017). School settings provide familiar organized environments for regularity of group intervention (Cortina & Fazel, 2015), ensuring maximum participation of children. The inclusion of a consistent group *yoga* program in special school environments was found to be feasible for children with ASD, with a total PPR (86.15%) representing high participation and performance responses of children with ASD. Most of the children could understand and follow the *yoga* intervention components.

7.1 AUTISM SEVERITY

The study showed a significant reduction in autism severity, as reported by the parents of the *yoga* group. Our findings on the ATEC scores were comparable to a previous study conducted by Sotoodeh et al. (2017), which found that *yoga* significantly reduced autism severity as reported by the parents across an 8-week intervention. Interestingly, the current study noted a significant improvement in the ATEC subscale I. It was observed that the children became more responsive to the *yoga* teachers' instructions and attempted to speak and vocalize. Such responses could be attributed to different chanting in the *yoga* sessions. Children with ASD can imitate sounds like *OM* and recite a few words when given a daily auditory stimulus of mantra chanting (Kumar et al., 2014). Rhythmic bee's breath humming (*Brahmari*) also strengthened oral-motor movements (Mooventhan & Khode, 2014). Porter (2013) proposed that *yoga* created adequate opportunities for improving verbal and non-verbal communication through various forms of verbal and motor imitation of speech. The repetitive verbal instructions the *yoga* teachers gave while kinesthetically

demonstrating words could have increased the familiarity of simple words with reinforcing motor actions in *yoga*. For example, when the *yoga* teacher says lift your hand, she visually models it by raising her hand while repeating the names of the postures. The children mirrored the movements of the *yoga* teacher while some repeated her words to action. Such repetitive, imitative actions in *yoga* may have honed the ability of the children to follow given instructions. Our findings on this subscale were quite interesting while pointing out emerging studies with *yoga* as complementary to speech therapy, looked upon with increasing awareness by the speech therapists (Moore, 2012; Radhakrishna et al., 2010)

Yoga practices can significantly contribute to maintaining optimal health outcomes while improving the quality of life in children with ASD (Sequeira & Ahmed, 2012; Sootodeh et al., 2017). Regular *yoga* for children with ASD ameliorated gastrointestinal distress and sleep disorders (Narasingharao et al., 2017) while reducing hyperactivity and aggression (Koenig et al., 2012). Regular *yoga* can alleviate sensory defensiveness, facilitating an increased focus towards awareness of self and surrounding environment. *Yoga* also catered to inclusion in learning by integrating multisensory learning styles and encouraging better responses. Children with ASD are more receptive to the rhythmic movements of *yoga*, which soothe and regulate their stress levels to a more parasympathetic shift, thus can alleviate various autistic symptoms.

7.3 PROBLEM BEHAVIORS

Yoga can effectively manage problem behaviors in children with ASD in a school environment (Narasingharao et al., 2017). Significant differences were seen in the social withdrawal aspect of the problem behaviors. Koenig et al. (2012) reported that *yoga* in school for children with ASD significantly decreased problem behaviors in classrooms, such as irritability, social withdrawal, and non-compliance, with the teachers reporting a positive impact on key behaviors necessary for effective classroom functioning. *Yoga* can be a promising tool for reducing problem behaviors and contributing to classroom management. Various studies have shown that *yoga* can regulate stress in children with ASD and induce a relaxation response, positively impacting their problem behaviors (Narasingharao et al., 2017; Radhakrishna et al., 2010; Rosenblatt et al., 2011). Such regulation contributed to an improved brain function addressing the frontal lobe deficits as defined by the pervasive nature of autism for an optimal state of calmness fostering cooperation and voluntary

response in children (Ramanathan et al., 2019). The children could sit and perform the *yoga* poses with more attention while responding to the instructions of the *yoga* teachers during the *yoga* sessions. Group *yoga* also enhanced social interaction opportunities, mitigating the innate tendencies for social withdrawal often seen in children with ASD (Litchke et al., 2018). Repetitive movements in *yoga* can work as an efficient coping strategy, alleviating self-stimulatory behaviors and stress responses, thus reducing the need for exhibiting such problem behaviors (Artchoudane et al., 2019).

7.4 MOTOR PROFICIENCY

7.4.1 TOTAL MOTOR PROFICIENCY

Significant group differences were seen in the total motor proficiency with a small to medium intervention effect ($R^2 = .055$). Two motor domains (manual coordination and body coordination) also showed significant differences post-intervention. Extensive literature has shown that regular physical *yoga* practice can benefit the motor skills of developing children (Birdee et al., 2009; Galantino et al., 2008). Our findings were consistent with these studies, showing an increase in the total motor proficiency of the *yoga* group after the *yoga* intervention. The rhythmic, repetitive movements of *yoga* fostered the ability of motor imitation, allowing the *yoga* teachers to visually guide movements that reinforced movement patterns daily for the children. It may have led to improved ability in the motor learning of the children.

7.4.2 MANUAL COORDINATION

Guided movements in *yoga* involve using arms and hands in different directions. Although no such direct instructions were given, we observed this subtly encouraged children to track movements of arms and hands with their eyes (Deorari & Bhardwaj, 2014). Such visual inputs may have equipped the children with better coordination and motor control of their upper limbs. The children in the *yoga* group showed better performance in the upper limb coordination subtest post-intervention. However, not much improvement was seen in one of the manual coordination subtests (stringing of beads), a task involving fine motor skills of reaching, grasping, and requiring bimanual coordination with small-sized objects. This was in line with what we observed in the fine manual control subtests, which showed no significant change in tasks involving using hands and fingers with finer precision, like drawing and writing (Kaur & Bhat, 2019; Mokobane et al., 2019).

7.4.3 BODY COORDINATION

Stretching and strengthening movements in *yoga* cause various extensions and compressions of muscles and joints, stimulating proprioceptive and vestibular inputs for better coordination in body movements (Campbell & Martin, 2017; Mohanty et al., 2014). Such muscular inputs are well received by children with ASD (Porter, 2013). The *yoga* teachers emphasized and named different body parts while demonstrating postures with verbal instructions. Many postures reiterated the use of both sides of the body and encouraged crossing its midline. All of these could have heightened body awareness, thus assisting better bilateral coordination of movements. Studies have shown that regular *yoga* can facilitate static and dynamic balance with better postural control in children through its multiple sensory inputs and muscle-strengthening (Folletto et al., 2016; Stueck & Gloeckner, 2005). It can explain the enhanced ability and confidence of performance shown by the *yoga* group in the balance subtest postintervention, requiring them to walk heel to toe on a line.

7.4.4 STRENGTH AND AGILITY

Surprisingly, there was no significant change in the strength and agility subtests, a gross motor domain in which only marginal improvement was observed in the *yoga* group. As the subtests involved counting motor tasks (one-legged hop and knee push-ups) dependent on a more complex skill such as motor speed, possibly a consistently more extended *yoga* practice could have contributed to an improvement. Overall, the *yoga* group's improved motor proficiency was predominantly more in gross motor skills, namely the body coordination subtests, with a large effect size ($R^2 = .148$) than fine motor skills. Our findings here were comparable with a previous study that showed that *yoga* in children with ASD improved gross motor skills more than fine motor skills (Kaur & Bhat, 2019). Fine motor skills need more precise control and coordination of arms and the finer muscles of hands and fingers, along with a host of other factors like attention, eye-hand coordination, and visual stimuli integration. Perhaps a more extended intervention was required to impact such fine motor skills.

7.5 FOOD AND DIGESTION PROBLEMS

Gastrointestinal distress and selective eating are frequently seen in children with ASD. No significant differences were observed in this study on the food and digestion problems of children

with ASD. However, positive changes were seen post-intervention in children's food and digestion problems, as reported by the parents. One of the theories explaining the etiology of autism symptoms with gastrointestinal issues is the gut-brain axis. This axis is a bidirectional communication system between the central nervous and gastrointestinal tract. This axis is controlled by the autonomic nervous system, consisting of sympathetic and parasympathetic nerves. As seen in children with ASD, high-stress levels can trigger sympathetic responses leading to various gastrointestinal issues due to the constant interaction of the digestive and nervous systems (Carabotti et al., 2015; Walecki et al., 2018). Research suggests that *yoga* can have a therapeutic influence on the gut-brain axis by reducing sympathetic dominance as it influences the autonomic nervous system (Kaveri et al., 2015).

7.6 SLEEP DISORDERS

The parents reported only positive changes with no significant differences post-intervention in sleep disorders in children with ASD. Sleep disorders are highly prevalent in children with ASD leading to more autism severity, problem behaviors, and social skills deficits (Chen et al., 2021). Regular *yoga* can alleviate sleep disorders by bringing about a state of calmness and relaxation in children with ASD (Narasingarao et al., 2017).

Food and digestion problems and sleep disorders are interlinked with various autism symptoms in children with ASD (Chen et al., 2021; Ferguson et al., 2019). The present study showed significant improvement after *yoga* intervention in special schools across various aspects of autism, such as autism severity, social skills deficits, problem behaviors, and motor proficiency. Such improvement may have contributed to the positive effect of *yoga* in alleviating physiological aspects such as food and digestion problems and sleep disorders, as reported by the parents. *Yoga* can thus be a promising intervention for such physiological issues in children with ASD.

The DSM -V defines social skill impairments and RRB as the dyad of core deficits in ASD, with the latest understanding acknowledging poor motor proficiency as a substantial factor amongst the myriad of challenges faced in autism that manifest as dysfunctions in social interaction and problem behaviors (APA 2013; Fulceri et al., 2019; MacDonald et al., 2013). Studies suggest an indelible link between social skills deficits, problem behaviors, and poor motor proficiency (Fulceri et al.,

2018; Ohara et al., 2019). Motor proficiency is recognized as one of the causal factors for RRBs influencing autism severity and is considered critical for adequate language development and communication. Social skills training is known to ameliorate associated problem behaviors in children with ASD (Gernsbacher et al., 2008; Shea et al., 2018; Stins & Emck, 2018). Gastrointestinal symptoms and sleep disorders are related to many internalizing and externalizing problem behaviors in children with ASD (Gorrindo et al., 2012; Mazurek et al., 2013). The heterogeneity of symptoms in autism gives rise to the need for different therapies for addressing such issues in children with ASD.

In contrast to goal-specific traditional therapies, *yoga* works as a holistic mind-body intervention to alleviate various autistic symptoms and other associated comorbidities (Gwynette et al., 2015; Kaur & Bhatt, 2019). Children with ASD often tend to communicate through body gestures and vocalizations with predominant preferences for visual learning, with information reinforced in *yoga* through modeling postures, imitation, cues, and prompts (Williams, 2010). Regular *yoga* offers a cumulative therapeutic effect on various physiological and behavioral aspects, relieving the severity of autism symptoms by fostering an increase in GABA (Gamma-aminobutyric acid) levels in the brain (Streeter et al., 2007; Hardy, 2015). Children with ASD are known to receive well repetitive *yoga* movements that regulate their stress levels to a more parasympathetic shift, thus favorably impacting heart rate variability and inducing a relaxation response. (Rosenblatt et al., 2011; Vidyashree et al., 2019).

The parents reported more positive outcomes in comparison to the teachers' reports. One reason could be that the school environment requires learning skills and execution of tasks which sometimes can be demanding on the children. It can sometimes overwhelm children with ASD leading to more stress responses. At home, the children may not be required to meet such demands. Many parents reported that their children looked calmer and more peaceful. Also, since the children spent more time with parents than with teachers, this could have contributed to such observations. The parent's report was based more on a wide range of autism-related symptoms. They may have observed an improvement with regular *yoga* on several such symptoms.

On the other hand, the teacher's report specifically addressed children's social responsiveness and problem behaviors as observed in the school environment. As lack of social responsiveness

constitutes a core symptom of autism, a longer duration of intervention may be required to anticipate any significant change. *Yoga* is a familiar concept in India and is perceived as a practice for maintaining one's health and well-being. Many parents were very open and enthusiastic about their children participating in *yoga*.

7.7 PARENTS' FEEDBACK

Written feedback on the *yoga* intervention was collected from the parents of children with ASD. The parents shared varying responses to the intervention. Many parents reported improvements in alertness, understanding, and response to instructions, improvement in speech and verbal and non-verbal communication, and reduction in hyperactivity. They shared that the children's aggressive behavior towards others was reduced to a certain extent. Few children showed more comfort in socially interacting with others, better sitting tolerance and imitation skills, reduction in tactile sensitivity, and self-stimulatory behaviors. Some parents observed children's improved flexibility, gross motor movements, bloating, and flatulence.

7.8 TEACHERS' FEEDBACK

As shared by the teachers, their written feedback showed some improvements in children's imitation skills, response to instructions, sitting tolerance, patience in turn-taking, hyperactivity, attention, and alertness. In some children, they observed a reduction in crying, increased eye contact, and more involvement in school activities.

7.9 FEASIBILITY OF CONDUCTING A GROUP YOGA PROGRAM FOR CHILDREN WITH ASD

A total PPR of 86.15% was reported by the *yoga* teachers across the intervention. The children regularly participated in the daily *yoga* intervention with an average attendance (of 89.4%) across the four special schools. The *yoga* teachers reported an encouraging PPR (75.49%) in chanting, where the children imitated the lip movements of the *yoga* teachers and participated in the chanting. A higher PPR in relaxation (91.12%) was seen compared to breathing practices (75.19%). The children were given very few verbal instructions during relaxation. It was observed that the participation response of the children improved as they eased into the daily practice of relaxation in

the corpse pose at the end of every *yoga* session. As breathing practices require more coordination between mind, breath, and body, the children may still need more practice to show better responses. The *yoga* teachers reported the highest PPR for preparatory practices (94.12%) and *yoga* postures (94.32%), both of which were active physical components of the *yoga* sessions.

The *yoga* teachers visually demonstrated the postures while giving short verbal prompts. The teachers modeled the postures as a mirror image, allowing the children to imitate the postures easily. Few children were given gentle physical prompting to guide them into postures. Students were also given time to respond and perform the postures at their own pace. They were encouraged to repeat the postures rather than hold them. During the intervention, the children started showing more comfort in performing the postures and were encouraged to hold them for a short time. Some children who were initially hesitant to engage in partner poses gradually showed more willingness to perform them with their peers. A few children also started taking the initiative to help and support their partners during the partner poses. The intervention started with one partner pose, gradually increasing to four, with the children exhibiting more comfort in performing *yoga* in a group setting

The school staff assisted the *yoga* teachers in helping the children perform the *yoga* postures. Modifications of postures were accommodated for some children according to their challenges. Such modifications of any *yoga* posture do not reduce its inherent benefits (Betts & Betts, 2006). Children who found certain balancing postures challenging were given wall support. Very few verbal instructions were given during relaxation in the corpse's posture at the end of the *yoga* session. It helped the children to relax voluntarily while minimizing any other distractors. Positive reinforcements were also given by the *yoga* teachers encouraging active participation of the children in the *yoga* sessions. Throughout the intervention, the children exhibited an increased ability to perform postures in response to the instructions of the *yoga* teachers.

Rhythmic, repetitive *yoga* movements reinforced motor learning, where most children showed comfort in performing and mastering the same *yoga* practices for a week. It made them more open to trying new postures, adding more variability to their learned movements (Kubat, 2019). Most children could transition from simple to more complex postures as their movements became more spontaneous and needed less prompting by the teachers. As motor skills are learned behavior (Shah & Barto, 2007), regular *yoga* could facilitate better motor learning, contributing to more confident

execution of movements. Such improved motor proficiency in children can extend beyond *yoga* practices by encouraging them to perform basic functional tasks and other activities with more cooperation and confidence (Mochan, 2017).

7.10 CHALLENGES FACED DURING IMPLEMENTATION OF YOGA INTERVENTION

Children with ASD can often find it difficult to follow and respond to instructions and have less sitting tolerance, attention span, and various problem behaviors. In the initial phase of the intervention, the *yoga* teachers faced challenges in implementing the *yoga* modules due to less attention span and sitting tolerance in a few children. Some children also showed difficulties in responding to instructions. Such children were given more prompts and assistance, encouraging their participation in the intervention. Sometimes, children exhibited problem behaviors such as aggression and crying, refusal to respond to instructions, impulsiveness, and inconsistent participation. On such occasions, the children were not forced to participate in the intervention. They were allowed to be left alone and later encouraged to join voluntarily and given further prompts and assistance. On days when any child was disturbed and not willing to participate, they were sent back to their classrooms.

7.11 YOGA TEACHERS' FEEDBACK

Written feedback was collected from the *yoga* teachers on changes observed in the children across the 12-week *yoga* intervention. The *yoga* teachers shared increased understanding and response to their instructions in children and improvements in verbal and non-verbal communication and imitation skills. Many children showed increased flexibility and reduced problem behaviors such as crying, social interaction, sitting tolerance, attention, aggressive behavior, eye contact, and impulsiveness. Few children who had been assisted in the initial phase with help and prompting showed some improvement by participating more actively in the *yoga* with less support and prompts.

7.12 YOGA IN THE SPECIAL SCHOOL ENVIRONMENTS

The school environment played a crucial factor in providing a familiar and organized setting for a

group intervention, ensuring regular participation of children (Serwacki & Cook-Cottone, 2012). The cost-effectiveness of offering *yoga* in a school broadens its scope of availability to large numbers of students (Betts & Betts, 2006). It was observed that there were many inherent advantages in including *yoga* as a regular intervention in special schools. It is possible that *yoga* may work better for these children in group settings providing a naturalistic social context than in individual settings (Chen & Pauwels, 2014). It also reduces the parental burden of taking children elsewhere for *yoga* when they want to give it a try. Regularity of intervention can also be ensured by integrating *yoga* into a special school routine. *Yoga* practices are also flexible enough to adapt to different schools' varying needs. The short and structured *yoga* modules fit well into the busy special school timetables with optimum utilization of time. The *yoga* teachers could easily complete all the modules within the specified time. Also, *yoga* practice requires only a *yoga* mat with props as an additional option. No props were used in the *yoga* sessions as they could distract the children in a group *yoga* program. With the high PPR to the intervention seen in children with ASD, a group *yoga* program can be implemented in special school environments.

Few studies support *yoga* as an everyday practice in special schools for children with ASD. Previous studies required parental support for the implementation of *yoga* programs in schools. Only a single study explored its effects on children with ASD in an inclusive school environment independent of parental support (Koenig et al., 2012). This study did not involve any parental assistance, with only the *yoga* teachers and supporting school staff present in the *yoga* sessions: this allowed the children to develop skills within their own strengths and limitations. Many children with ASD attend special schools to learn basic skills fostering self-sufficiency in their daily lives. The high PPR in the study showed that the children could be involved in the *yoga* intervention at their own pace, facilitating more voluntary compliance for participation and performance in the sessions.

7.13 PREVIOUS STUDIES

Previous studies showed that *yoga* could impact various aspects of autism. A study by Sootodeh et al. (2017) found that *yoga* intervention for children with ASD led to a significant decrease in autism severity as defined by the total ATEC scores, with a reduction seen in various autism symptoms related to sociability, sensory/cognitive awareness, and health/physical/behavior. Another study also

found that *yoga* can have positive therapeutic implications in reducing autistic symptoms in children with ASD (Deorari & Bharadwaj, 2014). The ATEC provides a comprehensive list of the wide range of autistic symptoms commonly associated with children with ASD. However, few other studies found that *yoga* can significantly change specific behavioral and physiological aspects of autism. Social communication and RRBs are the specific core diagnostic symptoms of autism spectrum disorder associated with a host of behavioral and physiological symptoms, making it a heterogeneous disorder (Frye, 2018). Children with higher autism severity are predisposed to exhibit more social skill deficits and problem behaviors (Tsai et al., 2020). *Yoga* intervention encouraged the development of social skills while alleviating behavioral issues in children with ASD (Radhakrishna et al., 2010). This interventional study found that an integrated approach to *yoga* therapy for two years fostered better eye contact, sitting tolerance, imitation skills, social communication, joint attention, play, language, and response to verbal instructions in children with ASD. These aspects are known to contribute to effective social skills in children while alleviating problem behaviors. Social skill deficits and problem behaviors are interrelated issues in autism, affecting their functionality and response to the environment (Shea et al., 2018; Volker et al., 2010). Litchke et al. (2018) showed that *yoga* brought a positive change in the mood issues seen frequently in children with ASD with improved emotional and social skills. Two other studies stated that *yoga* could aid in alleviating problem behaviors in children with ASD (Koenig et al., 2012; Rosenblatt et al., 2011). The therapeutic efficacy of *yoga* in children with ASD showed a significant reduction in various gastrointestinal distress and sleep disorders (Narasingharao et al., 2017).

7.14 COMPARISON

The current research study confirmed that *yoga* in special school environments could work as a holistic modality for the well-being of children with ASD. It incorporated several behavioral and physiological issues that are known to be predominantly observed in children with ASD. Delivery of intervention and conducting *yoga* sessions for children with ASD conducive to their unique strengths and challenges is crucial for eliciting the participation responses of the children. Training qualified *yoga* teachers to teach children with ASD was an essential part of this study, with a detailed curriculum given to teachers to better understand the needs and challenges of children with ASD. Children with ASD often find it challenging to respond to interventions and respond to instructions compounded further by problem behaviors and communication issues (Imms et al.,

2016). Very few studies have randomized children with ASD into matched groups. The current study is the first to track the daily participation and performance responses and non-responses and evaluate the feasibility of conducting a consistent group program for children with ASD. Integrating *yoga* into the school routine allows many children with ASD while ensuring consistency of participation.

Further, this study incorporates parents' and teachers' assessments, providing a comprehensive array of benefits across several behavioral and physiological variables by having regular *yoga* in special school environments. Very few studies have provided a structured *yoga* intervention as a consistent practice in special school environments that is essential for children with ASD. Most studies have highlighted *yoga*'s specific benefits for children with ASD. Special schools train children with basic functional and academic skills to enable children to lead an independent life. Previous studies have included *yoga* practices for children with ASD for an extended time of over an hour (Narasingharao et al., 2017; Radhakrishna et al., 2010). Such long interventions are not feasible in many busy special schools that function for shorter hours than mainstream schools, according to the strengths and limitations of the special children.

Moreover, as children with ASD often struggle with various issues such as attention, communication, problem behaviors, and sensory dysfunctions, such a long duration of intervention can be taxing for the children discouraging them from effective participation. *Yoga* sessions in schools involving parents can make it difficult for special schools to integrate *yoga* regularly as it becomes highly dependent on the availability and convenience of parents to support the children in the *yoga* sessions. Such interventions cannot be sustained for a long time in school environments. This study did not include parental support for the delivery of *yoga* intervention in special schools, thereby encouraging children to independently participate at their own pace and comfort with the only assistance of their teachers. The short modules delivered by *yoga* teachers also supported the practical implementation of incorporating *yoga* in busy special school timetables. This study proved that short *yoga* sessions conducive to children with ASD fostered better participation responses. Such *yoga* sessions with a judicious mix of repetitive and new practices allayed task anxiety and boosted confidence in children. The current study thus highlighted *yoga* as a holistic intervention in special school environments encompassing the therapeutic aspect of *yoga*, educational implications, and the practical feasibility of conducting regular group *yoga* programs for children with ASD

7.15 MECHANISM

Yoga developed as structured modules in this study helped address various behavioral and physiological issues in children with ASD. Daily practice of *yoga* improved body awareness in children with ASD. *Yoga* sessions for children with ASD with visual imitation and guided instructions created opportunities to practice various forms of verbal and motor imitation while encouraging the motor ability of speech (Goldfarb 2012; Porter 2013). Naming body parts with instructions for guided movements in *yoga* in different directions further enhanced body awareness in children. Body awareness and the ability to identify and control one's body movements are essential for developing motor proficiency and social skills such as empathy and facilitating effective sensory integration (Ropar et al., 2018). Chanting in *yoga* sessions as specific sound sequences can support vocabulary development, reinforcing children's lexicon through repetitive instructions and a kinesthetic embodiment of words through different movements in *yoga* (Longtin & Fitzpatrick, 2017; Williams, 2010). It also encouraged imitation of lip movements facilitating an inclination for speech. *Brahmari* supported rhythmic humming strengthening the oral-motor movements and breath control that fostered phonological awareness (Harvey, 2018; Moonventhan & Khode, 2014). The chanting was reinforced by the *yoga* teachers' attention to each child, emphasizing lip movements and repetitions. Parents reported an encouraging trend in children showing an increased inclination to talk and engage in verbal interaction with gradual yet consistent addition of words to the children's limited repertoire of speech. Throughout the intervention, many children could identify and pronounce the name of poses and engage in simple verbal interaction with the *yoga* teachers. Our findings on this subscale were quite interesting while pointing out emerging studies with *yoga* as complementary to speech therapy, looked upon with increasing awareness by the speech therapists (Radhakrishna et al., 2010; Moore, 2012).

Sukshma vyayama (loosening practices) facilitated body awareness, warming the body, and prepared the children for *asana* practice. *Sithilikarana vyayama*, or dynamic practices, energized the body. Breathing exercises and abdominal breathing were included to introduce an awareness of breathing. Children with ASD often find it difficult to coordinate movements with breath. Breathing practices served to subtly bring such awareness to the children. Various *asanas* in different positions improved motor planning, strengthening muscles and joints, balance, bilateral coordination, core

strength, spine flexibility, digestion, and stress alleviation. *Asanas* such as *pavanamuktasana*, *vajrasana*, *shalabhasana*, *bhujagasana* helped in stimulating abdominal organs for better digestion. Many children exhibited more affinity toward wind-releasing pose *pavanamuktasana* as it provided them relief from abdominal distress. Many children could perform the balancing posture *vrikshasana*, while few were given wall support which empowered them to perform the asana more confidently.

Asanas in different positions also fostered the ability of children to transition from one posture to another. Children with ASD often find it challenging to transition from one task to another, creating anxiety and non-compliance (Sevin et al., 2015). Repetitive *yoga* practices reduced new task anxiety and increased the confidence of children to participate and respond to instructions from yoga teachers. Schoolteachers reported that some children became more receptive to instructions during school activities. Stretching and strengthening movements in *asanas* cause various extensions and compressions of muscles and joints, stimulating proprioceptive and vestibular inputs for better coordination in body movements (Campbell & Martin, 2017; Mohanty et al., 2014). The intervention in this study showed that such structured, regular *yoga* improved the motor proficiency of children with ASD.

The *yoga* practices in the structured modules improved imitation skills with repetitive and new practices reinforced weekly by *yoga* teachers through modeling poses and short verbal instructions. Group *yoga* sessions also created a tolerance for a group setting, and partner poses encouraged peer interaction between children. *Yoga* in a group setting elicited spontaneous imitative responses and better peer interaction which encouraged better eye contact, turn-taking, emotional expressivity, and response to instructions (Goldberg, 2013; Kenny, 2002; Radhakrishna et al., 2010). Regular physical yogic practices alleviated sensory defensiveness and needs by engaging different body senses facilitating an increased focus towards awareness of self and surrounding environment (Allen & Anita, 2014). Parents reported children being more expressive and receptive to affection with reduced tactile defensiveness, increased eye contact, responsiveness to instructions, sitting tolerance, comfort in different social settings, alleviation in gastrointestinal issues, and sleep disorders.

Pratyahara, or withdrawal of senses, is essential for children with ASD. They struggle with

sensory dysfunctions that can cascade into various social skills deficits and problem behaviors. Abdominal breathing and relaxation enhanced awareness to voluntarily allow themselves to disengage from distressing sensory triggers and relax consciously (Artchoudane et al., 2019). Progressively, there was a noticeable decrease in the children's resistance to relaxation in *shavasana*.

Yoga catered to inclusion in learning by incorporating various learning styles providing visual, auditory, tactile, and kinesthetic reinforcements giving multiple sensory inputs. It catered to the diverse learning needs of children with ASD. Its integration into the school curriculum ensured participation regularity while promoting experiential learning for ASD children through rich sensory inputs (Chissick, 2019; Keonig et al., 2012). Most of the children responded to the simple *yoga* practices where the regularity of intervention and ease of performance fostered a willingness to participate in the *yoga* classes. There was a steady improvement throughout the intervention in their ability to focus on performing poses in response to instructions. Daily *yoga* practices created more alertness with a reduced inclination towards sedentary behavior and aided in calming hyperactivity for effective behavioral regulation in children with developmental disorders (Birdee et al., 2009; Koenig et al., 2012). As a therapeutic process, *yoga* aided in managing distressing autism symptoms while fostering a feeling of health and well-being (Mochan, 2017; Sequeira & Ahmed, 2012). As a way of life, *yoga* can be included in special school environments as an everyday practice for children with ASD.