

## **CHAPTER 1**

### **1.0 INTRODUCTION**

Autism spectrum disorder (ASD), a behaviorally defined neurodevelopmental condition, refers to a group of disorders distinctly characterized by core symptoms of deficits in social communication and interaction and restrictive, repetitive behaviors or interests (American Psychiatric Association, 2013). ASD encompasses an umbrella term including autism, childhood disintegrative disorders, and Asperger's syndrome. It is considered a complex neurobiological disorder that persists throughout an individual's life. A pervasive developmental disorder, ASD is characterized by a complex heterogeneity in its presentation and is frequently accompanied by various psychiatric, cognitive comorbidities, and other medical conditions apart from the core diagnostic features. Children with ASD often show atypical sensory behaviors, problematic behaviors, executive functioning difficulties, intellectual disability, attention-deficit hyperactivity (ADHD), social anxiety disorders, epilepsy, poor motor proficiency, gastrointestinal distress, and sleep disorders; having an overreaching effect on their adaptive functioning (Mannion et al., 2014; Masi et al., 2017). Such delays in their adaptive functioning significantly affect their quality of life. Adaptive functioning refers to their daily living, communication, and social skills. It determines the level of support the children may require in their day-to-day life (Stedman et al., 2019). Children with ASD exhibit a wide range of abilities, from having fewer abilities to genius with exceptional skills. Hughes et al. (2018) defined autistic 'savants' as those with extraordinary skills in particular areas instead of overall normal functioning and are unique to many on the spectrum. ASD and its comorbidities present significant challenges to children and their families with various services offered for effective management (Steenfeldt-Kristensen et al., 2020). Many children with ASD undergo different therapies to address the multiple issues that can present financial challenges for the parents.

ASD symptoms range from mild to severe across a continuum delineated by varying degrees of impairments in functioning apart from its core diagnostic features that determine its severity (Cassanova, 2020; Ousley & Cermak, 2014). Autism symptoms differ extensively from one person to another, making ASD a spectrum disorder that exhibits a wide array of its severity. The symptoms manifest in children as early as eighteen months, where the characteristic features differ from typical development and various other developmental conditions (Zeidan et al., 2022).

However, the current succinct understanding of ASD primarily deals with these dual behavioral aspects as the core diagnostic features of this disorder. Early diagnosis is essential for treating this condition, enabling children to undergo early interventions designed to their unique needs. It has a far-reaching effect on mitigating many autism symptoms, showing better outcomes, and improving the quality of life in children (Mahapatra et al., 2019).

The hindrances in normal childhood development can cause language and social skills deficits, with verbal and non-verbal communication challenges spilling over as impaired social communication and interaction (Gattino et al., 2011). This developmental disorder can impact the children's perception of the world around them, thereby affecting their learning through daily experiences (Lal & Shahane, 2016). Various aspects of social abilities, such as the 'Theory of Mind'(ToM) that develop during four to five years of age, are affected in children with ASD. ToM refers to the mental ability to recognize and attribute thoughts, perceptions, feelings, desires, and intentions about oneself and others and is very relevant in social cognition. Lower ToM in children with ASD is associated with more autism symptoms affecting their behavior and social skills (Maw & Haga, 2018). Children can often have difficulties understanding and communicating what they hear and struggle to interpret body language, facial expression, vocal tones, gestures, emotional recognition, and maintaining eye contact cascading to an inability to communicate their needs (Lord & Mac Gee, 2011). These can give rise to compensatory problem behaviors, recognized as one of the significant challenges associated with autism. This developmental disorder interferes with the effective integration of body and mind, feelings, and emotions, creating many hurdles in social functioning; hence social functioning is a major challenge for children with ASD (Zhou et al., 2019). Most children with ASD exhibit poor motor proficiency with impairments in gross and fine motor skills issues, motor flexibility, and balance (Gkotzia et al., 2017). They also struggle with sleep disorders which exacerbate the severity of autism symptoms such as repetitive behaviors, maladaptive problem behaviors, and social communication difficulties (Goldman et al., 2011). More than 70% of children with ASD have gastrointestinal issues compared to children with other developmental disorders and typically developing (TD) children (Buie et al., 2010). Many children with ASD manifest stress responses in multiple contexts with increased anxiety and chronic stress. Most of their response to such stress can be quite inappropriate, accompanied by difficulties in emotional regulation, inability to communicate intrinsic feelings and emotions, extreme reactions to triggers, temper tantrums, and aggressive behavior (Hardy, 2016)

## **1.1 PREVALENCE OF ASD**

The last few decades have witnessed a global increase in prevalence and awareness of ASD. Several prevalence studies were conducted worldwide, considering the variations in geographic, ethnicity, cultural, and socio-economic factors. It was reported that children were diagnosed with ASD around 1/10,000 in the 1960s, and 72/10,000 in the 1980s, escalating to 1% in the 2000s. Recent research predicts worldwide prevalence rates to reach more than 2% (Taylor et al., 2020). Prevalence of ASD in the United States (US) was about 1.70 -1.85%, United Kingdom (1.53-1.92%, in children and adolescents respectively), China (3.923%), Arab Gulf countries (0.14% - 2.9%) and Korea (2.64%) (Qiu et al., 2019; Zeidan et al., 2022). All studies showed that the prevalence rate of ASD was higher in males compared to females. Recent research on prevalence rates revealed an increased rate of ASD in Asia (Qiu et al., 2019). In India, the diversity in culture and geographical distributions revealed variability in pooled estimates of the prevalence of autism in urban populations and rural populations. Studies from urban areas show pooled percentage prevalence of 0.11 and in rural regions 0.09, with an estimated number of around 1.7-2 million children (Chauhan et al., 2019; Mahapatra et al., 2019). However, India still lacks an accurate estimation of the prevalence of autism due to the lack of standardized tests for ASD encompassing its intrinsic cultural diversity and multilingual population (Rudra et al., 2017). Despite such challenges, the current scenario in India has been witnessing an increased prevalence of ASD as the most common developmental disorder in children (Juneja &Sairam, 2018).

## **1.2 ETIOLOGY OF ASD**

The exact causes of ASD are unknown; however, various genetic and non-genetic factors, by themselves or in combination, are considered risk factors for the development of ASD. The etiology of ASD can be multifactorial, with genetic and non-genetic factors. Syndromic ASD is correlated with genetic factors such as chromosomal abnormalities manifesting as Rett's syndrome, Fragile X syndrome, and MECP2 duplication syndrome (Sauer et al., 2021). Non-syndromic ASD etiology is still relatively unknown due to genetic heterogeneity. A combination of prenatal and postnatal environmental factors and genetic de novo mutations contribute to this condition. ASD is commonly viewed as a complex inheritable condition. In the mid-1970s, the genetic role in ASD came to light with genetic epidemiology studies which showed that it is an inheritable condition.

Studies on twins revealed that if one twin was autistic, the risk factors for the other twin also significantly increased for developing conditions such as social anxiety, learning disabilities, and other cognitive impairments (Amaral, 2017). Classical childhood autism with no specific metabolic issues holds a risk of 3-8% with a single child identified with ASD in the family. The non-genetic factors increasing the risk of ASD include environmental factors such as parental age, maternal status in terms of nutrition, metabolic condition, infections, stress, drugs, exposure to toxins, and heavy metals. Few studies showed that certain infectious illnesses in pregnancy, such as German measles, can increase the risk of ASD. Maternal immune responses are known to trigger inflammation in the fetus leading to gene dysregulation (Bölte et al., 2018). Parental age can increase the risk of genetic mutations. Improper nutrition during pregnancy with excess or deficient micronutrients can impact the fetus's brain development, leading to neurodevelopmental impairments. Folic acid deficiency has a greater chance of developing ASD in children. Intake of certain medications for treating conditions like depression, epilepsy, valproic acid, and thalimide in pregnancy is known to elevate the risk of ASD (Sauer et al., 2021). Several theories of vaccination effects on developing children linking children to ASD were also considered; however, they were later retracted as misconceptions. ASD has no specific biomarkers aiding diagnosis and is only identified by clinical observation of its characteristic features (Alpert, 2021).

### **1.3 HISTORICAL PERSPECTIVE OF ASD**

Autism was introduced as a concept in 1911 by a German psychiatrist Eugen Bleuler to describe symptoms observed in severe schizophrenia cases. The word autism is taken from the Greek term ‘*autos*,’ or ‘self,’ where one is absorbed in oneself, which was introduced in psychiatry (Evan, 2013). In 1906, De Sanctis wrote his observations on two young children displaying developmental issues indulging in aimless activities, negativism, and stereotypical motor activities. He proposed that although this disorder had similarities to adults described in the book *Dementia Praecox* by Emil Kraepelin, a German psychiatrist, they showed few marked distinctions. Later, Eugene Blair elaborated further by introducing the concept of autism as one common symptom seen in one of his other concepts of ‘schizophrenia.’ He described it as a basic symptom, although not a primary one, showing “detachment from the reality together with a relative and absolute predominance of the inner life.” (Bleuler, 1911). Further, he extended the concept of “autistic thinking” as “infantile wishes,” which manifested as a tendency to disregard the resistance of reality

and indulge in fulfilling a person's innermost desires through fantasies that are perceived as real. Autistic thinking combined fantasy with reality without breaking any principles of physical causality (Bleuler, 1950). However, Bleuler emphasized thinking in his concept of autism, which overlooks certain characteristic behavioral patterns accompanied by such thinking in contrast to the present-day understanding of autism (Menolascino, 1965). In 1943, Leo Kanner, a child psychiatrist, reported in his landmark paper 'Autistic Disturbances of Affective Contact' based on his observations of eleven children presenting two major behavioral features. He named such children to have 'early infantile autism' extending from early infancy with suggestions of possible genetic disorders (Pearce, 2005). The marked behavioral singularities displayed by the children with ASD prompted a symptomatically descriptive definition of autism as a particular characteristic set of behaviors in children who exhibited severe issues in social interactions. Obsession with sameness, rigid stereotypical repetitions, and an overwhelming preference for their own company was also noted in the children (Kanner, 1943). The children also showed several other features: echolalia, pronoun reversal, mutism, and unusual prosody. However, the distinct features of lack of social communication and rigidity of sameness formed the important highlights of Kanner's findings which is applicable even in the present understanding of autism (Rosen, Lord, & Volkmar, 2020). A little later, in 1944, Hans Asperger, an Austrian physician, published his observations on four young boys similar to Kanner's autism and described it as *Autistischen Psychopathen* or "autistic psychopathy." The term psychopathy in German was only used to refer to a personality disorder (Donvan & Zucker, 2016). These children showed normal intelligence and adequate language development with distinct deficits in social interaction and communication with repetitive stereotypical behavior and activities. The word 'autism' carried the assumption of a subject's symbolic inner life that was not accessible to other observers until the 1960s. Over the years, the terms childhood schizophrenia, psychosis, and autism have been used with frequent interchangeability (Evans, 2013). In 1952, the Diagnostic Statistical Manual (DSM-II) defined autism as a psychiatric disorder considered a form of childhood schizophrenia characterized by detachment from reality (Rapoport et al., 2009). Later the 1960s and 1970s saw few major developments in the definition of autism, suggesting that autism was a separate concept (Rosen et al., 2021). A checklist was created for assessing the range of various symptoms associated with autism (Rimland, 1964; Rimland, 1968). Rutter proposed a new definition for autism: impaired social and language abilities and restricted and repetitive behaviors (Rutter, 1978). This definition influenced DSM-III changes (Rosen et al., 2021). The DSM-III, published in 1980, bestowed autism

its own identity and separate diagnosis calling it a Pervasive Developmental Disorder (PDDs) that was quite distinct from early schizophrenia. The specified criteria for autism included three features; pervasive lack of interest or response to people, impaired communication, and peculiar responses to the environment (DSM-III; APA,1980). Later, with further research, a revision in DSM -III shifted from ‘infantile autism’ to ‘autistic disorder’’, understanding that autism was not a single condition or a spectrum of various conditions. The DSM-III-R recognized three major dysfunctions that included impaired social interaction, social communication, and restricted, repetitive interests with a tendency to resist change (APA, 1987). Around this time, a high occurrence of autism in males was also observed compared to females (Fombonne, 1999). In 1981, Lorna Wing coined the term ‘Asperger’s syndrome’ for children and adults who had autistic features, adequate language and communication and were not socially withdrawn (Wing,1998). This condition was recognized as separate from autism (Happe & Frith, 2020). The psychological aspect of autism was given more focus in the 1980s, which was seen as a notable shift from previous research on only behavioral aspects with the emergence of the ‘Theory of Mind’(ToM) deficit hypothesis. The hypothesis propounded that the inability to meta (represent ) mental state in oneself and others is the underlying cause for the marked problem behaviors in autism, namely behavioral issues such as social communication and reciprocity (Happe & Frith, 2020). It instigated deeper research on autism by understanding the differences in social skills observed in the autism population.

The World Health Organization’s International Classification of Diseases, 10<sup>th</sup> edition (ICD-10) decided to acknowledge other disorders such as Asperger syndrome, Rett’s disorder, and childhood disintegrative disorder (Volkmar et al.,2014). Subsequently, in 1994, the DSM-IV presented autism as a spectrum of conditions, including Pervasive Developmental Disorder- Not Otherwise Specified (PDD-NOS), Asperger’s disorder, Rett’s disorder, and childhood disintegrative disorder (CDD). Further, more recent research saw a significant shift in DSM-V in the concept of autism having a single diagnostic criterion from multiple categories having several dimensions, thus considering the heterogeneity of autism. The DSM-V defines autism as having core symptoms with the severity levels determined by the levels of support needed for the individual's functioning in terms of social deficits, language impairments, and other accompanying medical and psychiatric conditions. The term ‘spectrum’ received recognition in DSM-V, changing the previous categories of subgroups of disorders into a single ‘umbrella term’ into ‘Autism Spectrum Disorder’ (ASD) (APA, 2013). The DSM-V defines ASD into two behavioral domains or dual-core symptoms of distinctive difficulties

in social communication and interaction along with restrictive, repetitive interests that were further elucidated by a severity scale along the spectrum (Lai et al.,2013).

Over the years, several concepts have emerged with various perspectives to understand ASD that manifested in the form of significant heterogeneity of symptoms on a behavioral, cognitive, and genetic level. It was done with the aim of creating appropriate treatments for this disorder. One such theory is the ‘Bayesian brain’ perspective that puts forward the theory that the core symptoms of ASD are present in the perceptual aberrations created due to an imbalance in the precision of prediction errors or ‘sensory noise’ relative to the precision of predictions taken as ‘prior beliefs.’ Consequently, the precepts are dominated by sensory inputs with sensory dysfunctions that make it challenging to segregate meaningful sensory inputs (Haker et al., 2016). Another theory terms ASD as a polysemous concept where the meaning of autism is perceived to possess various meanings or layers where one cannot be reduced to the other. The concept suggests multiple ways of defining autism apart from the dual diagnostic behavioral characteristics extending to different theories explaining the extensive heterogeneity across the spectrum (Hens, 2019).

#### **1.4 YOGA**

*Yoga* is an ancient tradition hailing from India as a holistic mind-body practice promoting an individual's physical, physiological, and psychological well-being (Nagarathna & Nagendra, 2011; Woodyard, 2011). *Yoga* means to ‘unite,’ ‘coordinate,’ or ‘energize.’ It is a systematic process fostering a union between the mind, body, and spirit. *Maharishi Patanjali*, the great seer, defined *yoga* as a conscious process of gaining mastery over the mind. *Yoga* is an indigenous part of the Indian culture and is deeply entrenched in day-to-day living. It emphasizes unity which forms the crux of the Indian culture and brings a sense of cohesiveness to its diversity. The existence of *yoga* can be traced back to the Vedic times, with its description mentioned in several important ancient scriptures. The greatest of our philosophical epics, the *Bhagavad Gita*, declares *yoga* as a ‘skill in action’ comprising techniques for improving the skill of body, mind, and emotions in an integrated manner, thus providing a complete philosophy of living. The *Upanishads* herald *yoga* as an essential path for achieving happiness through control of the mind directed by intellect with further control of senses, leading an individual to accomplish the spiritual goal successfully. The history of *yoga* as a spiritual tradition is remarkable in its unbroken entirety and development through the

centuries. Sir Aurobindo, the great yogic philosopher, acclaimed *yoga* as a methodical process that could awaken the latent potentialities of an individual, fostering overall personality development. The unique tools of the human body, the mind, body, breath, and speech, are used in *yoga* to transform one's life (Shashidhara, 2020). *Yoga*, as a science, fosters the self-development and self-realization of an individual to acquire one's full potential. As a way of life in society, *yoga* leads to equanimity, tranquility, health, happiness, balance, and peace.

*Yoga* is an integrative therapy that works at the mind and body levels. The yogic philosophy propounds the 'Panca Kośa' concept or the five layers or sheaths as our innate identification. These form the *Annamaya Kośa* (Physical sheath), *Pranamaya Kośa* (Energy sheath), *Manomaya Kośa* (Mental Sheath), *Vijnanamaya Kośa* (Intellectual Sheath), and *Anandamaya Kośa* (Nagendra & Nagarathna, 2011). These encompass the physical, sensory, emotional, mental, and spiritual sheaths to bring inner harmony and balance to mind and body. There is a continuous interaction between the five *kośa*, and any change in one manifests in other *kośa*. *Yoga* positively impacts all five interdependent levels for nurturing a healthy holistic personality. *Yoga* thus works on this principle to alleviate different disorders addressing all the *kośa* to bring about optimal health and well-being.

*Yoga* is a mind-body intervention that applies movement, breathing, and relaxation to nurture holistic well-being in children (Hagen & Nayar, 2014; Nagarathna & Nagendra, 2011). It offers multiple benefits to children with a regular practice contributing to their physical and mental well-being with improved muscular strength and flexibility, cardiovascular and respiratory function, emotional regulation, stress reduction, and equanimity of mind (Galatino et al., 2008; Hagen & Nayar, 2014). The fundamental principle underlying *yoga* as a therapeutic modality is an effective balance of the autonomic nervous system, which offers psychophysiological benefits to an improved quality of life in an individual (Stephens, 2017). According to IAYT (International Association of *Yoga* Therapy), *yoga* is a scientific way of self-investigation, self-transformation, and self-realization that includes all aspects of breath, body, mind, intellect, and emotions. The therapeutic results of yogic practices enable one to relax both in body and mind, inducing better sleep quality, promoting digestion, and activating circulation for improved health, harmony, and well-being (Nagarathna & Nagendra, 2011).

#### **1.4.1 YOGA FOR CHILDREN WITH ASD**



*Yoga* is increasingly emerging as one of the most promising therapies that address the needs of children with ASD. *Yoga* as a mind-body intervention is one of the well-known alternative therapeutic practices used for the well-being of children with ASD. It is recognized as a complementary and alternative medicine (CAM), especially for children with ASD (Gwynette et al., 2015). *Yoga* is perceived as a holistic movement therapy that teaches children to quieten minds, foster focus, and build balance, flexibility, and strength. As a systematic approach, *yoga* aids children towards effective self-regulation and well-being through its postures, breathing, and relaxation fostering mindfulness and bringing forth physical, mental, and emotional harmony in children with special needs (Goldberg, 2013). Children with ASD tend to communicate through different gestures and vocalizations. *Yoga* practices can soothe and calm children with ASD and help them regulate themselves. Children with ASD show an innate tendency toward high-stress hormones causing dysregulation of their vagal system and creating difficulties in self-regulation. *Yoga* works well for children with ASD by encouraging different gross motor imitations of postures (Kenny, 2002). It is also a therapeutic process supporting reducing and managing autistic symptoms, creating improved functioning, health, and well-being (Goldberg, 2013).

*Yoga* for children with ASD integrates different body movements, breathing practices, and relaxation within a safe, non-competitive environment (Fan, 2005; Kenny, 2002). *Yoga* in school environments for children with special needs is a whole brain-body education, with its different movements creating neural pathways in the brain, enhancing their learning potential (Wenig, 2013). *Yoga* practices meet the learning requirements of children through various visual, kinaesthetic, auditory, and tactile inputs. It improves resilience by nurturing a sense of harmony and strength with reduced impulsivity (Goldberg, 2013). Regular *yoga* in school environments can also aid children with ASD through its effective inclusion in the daily school curriculum (Goldberg, 2016).

## **1.5 SPECIAL SCHOOLS**

Special schools in India are primarily small independent private schools with a capacity to accommodate around 30 -40 children with different disabilities. These include students with autism spectrum disorders, learning disabilities, cerebral palsy, and Down's syndrome. The children are imparted various skills in a focused and supportive environment by trained teachers or special educators. Such skills include basic functional, daily living, communication, and academic skills

(Dasgupta, 2002). In a school environment, children with ASD often face challenges in understanding and responding appropriately to instructions, coping with task transitions, social skills deficits, poor motor proficiency, and frequently exhibiting specific interests and various problem behaviors (Grandisson et al., 2020).

## **1.6 NEED FOR STUDY**

The present research scenario has witnessed the emergence of various studies with different interventions to alleviate the distressing symptoms of children with ASD. Children with ASD face many issues, struggle with their inability to communicate needs, and have limited social interaction. Further, these are worsened by physiological symptoms such as poor motor proficiency, food and digestion problems, and sleep disorders. Such challenges often manifest in the form of various maladaptive behaviors that further limit their social peer interaction. Children with ASD often undergo many expensive therapies to mitigate different autism symptoms. Often the child exhausted from long hours at school is taken to multiple therapies by parents seeking solutions. *Yoga* is increasingly emerging as an effective non-invasive therapy benefitting children with ASD. *Yoga* as a mind-body intervention promotes holistic physical, physiological, and psychological well-being in children with ASD. *Yoga* sessions for children with ASD can be conducted within familiar and conducive special school environments to benefit the children as it does not specifically require one-to-one intervention. *Yoga* as a therapeutic modality can be taught in groups without specialized equipment or props for all types of disabilities. It can be accommodated as an inclusive practice in special school environments (Ramanathan & Bhavanani, 2018). With the rise of several special schools in India, many children, notwithstanding the autism severity, are provided with an opportunity to attend a school where various functional and academic skills are imparted based on their strengths and limitations. A school environment is thus a crucial part of the children's life where they spend many hours learning and developing different skills. As a daily intervention in a special school environment, *yoga* can be implemented in a group setting for children with ASD with structured lessons adapted and designed appropriately to their needs and challenges (Koenig et al., 2012; Ehleringer, 2010). For children with ASD, *yoga* is considered a therapeutic tool having several beneficial effects on managing various aspects of autism (Artchoudane et al., 2019).

### **1.6.1 AUTISM SEVERITY**

Autism severity is considered as the various aspects of autism apart from the core diagnostic symptoms that include different functional measures such as adaptive functioning, communication ability, intelligence, cognitive impairments, language acquisition and deficits, problem behaviors, psychopathology, and other health conditions (Mehling & Tassé, 2016). These include various autism-related symptoms displayed as a wide range of significant heterogeneity in ASD with impairments and deficits across communication, sociability, sensory and cognitive awareness. Autism severity ranges from mild to severe and delineates an individual's various support and requirements with ASD.

### **1.6.2 SOCIAL SKILLS DEFICITS**

Social skills deficits with challenges in social communication and social interaction are among the core characteristics of children with ASD (American Psychiatric Association, 2013). Social skills are generally identified as specific abilities that allow children to respond to social requests appropriately, which fall into a triad of deficits in social interaction, social communication, limited social imagination, with rigidity in behavior (Yeo & Teng, 2015). The social skills deficits commonly observed in children with ASD include a lack of non-verbal and gestural communication, eye contact, empathy, reciprocal conversation, peer interaction, and different speech patterns, affecting their social responsiveness. The triad of social skills impairments in ASD children identifies them as difficulties in social interaction (indifferent to people), social communication (difficulty in interpreting common gestures, facial expressions, and voice tones), and social imagination (limited range of imagination and rigid repetition of activities (Judith & Gould, 2016). Social skills deficits in the autism population have been attributed to deficits in cognitive components and metacognitive processes such as initiation and planning (Frye, 2018). Such children tend to show social withdrawal with less interaction with their peers as they fail to initiate social communication, compounded further by more non-social behaviors such as less eye contact, self-stimulation, and cooing (Zhou et al.,2021). Children face difficulties cultivating social relationships and struggle to establish appropriate social communication, emotional responsiveness, and sharing mutual interests. Their social issues arise due to poor or no eye contact, lack of proper facial expressions, improper conversational skills, fewer gestures, lack of play, and restrictive and

repetitive behaviors. Heightened sensitivity to sounds and touch can also impair social interaction. This developmental disorder interferes with the effective integration of body and mind, feelings, and emotions, creating challenges in social functioning, and making social skills deficits a significant challenge for children with ASD (Fombonne, 2003). These skills form an essential aspect of a school environment, with such deficits often recognized in children with ASD affecting school performance, peer interaction, and participation in school activities (Murray, 2015; Runcharoen, 2014).

### **1.6.3 PROBLEM BEHAVIORS**

Children with ASD commonly experience various emotional and behavioral problems, generally indicated as ‘problem behaviors.’ Such problem behaviors include internalizing and externalizing behaviors such as physical aggression, self-injury, inattention, hyperactivity, anxiety, depression, withdrawal, and self-stimulatory behaviors such as hand flapping, rocking, and spinning (Lindor et al., 2019; Williams et al., 2018). Exhibition of temper tantrums, impulsiveness, and non-compliance is also seen frequently in children with ASD with either motoric or vocal expressions of frustration, anger, and extreme distress. Such problem behaviors interfere with children’s optimal development, functioning, social interactions, and relationships (McGuire, 2016). The self-injurious behavior exhibited mainly by children with ASD is self-hitting or headbanging. Aggression can be physical or verbal; the former is seen as hitting, biting, or throwing objects at others, and the latter as screaming and threatening others (Steenfeldt-Kristensen et al., 2020).

Children with ASD frequently display stereotypical, compulsive, and repetitive behaviors. The DSM -5 defines stereotypic and repetitive behaviors in ASD as unusual repetitive body movements, movement with objects, or repetitive vocalizations (APA, 2013). Stereotypic behaviors (SB) and restricted, repetitive behaviors (RRBs) are the primary symptoms of autism, forming a significant feature of behavioral patterns shown by children with ASD. It is considered a core diagnostic feature of autism and constitutes a significant range of behavior patterns exhibited by children with ASD. Such repetitive behaviors are prevalent in ASD, forming a host of behavioral, motor, and cognitive abnormalities. They can appear independent of social communication symptoms, another predominant feature of this disorder (Grossi et al., 2021). RRBs thus constitute a separate domain of impairment in the DSM -5 (APA, 2013). These repetitive behaviors can also arise due to sensory

processing issues commonly associated with ASD children, with a conceptual overlap in the DSM - 5 between unusual sensory issues and stereotypical and repetitive behaviors. Though both are perceived as two distinct groups of symptoms, they are included comprehensively under the restricted and repetitive group of symptoms (Wolff et al., 2018).

Although not a core symptom of ASD, problem behaviors can be highly taxing on the parents and caregivers of children with ASD (Tathgur & Kang, 2021). These are major challenges associated with ASD children, which arise due to several contributory factors, such as a lack of communication and social interaction, creating an inability to communicate their needs. Stereotypic behaviors create challenges for children with ASD regarding their daily functioning and ability to learn and respond to their environment. It can interfere with the development of adequate social communication skills and is known to have a ‘cascading’ effect, worsening their lack of social skills. Such behaviors can cause many difficulties in daily living, and these pervasive behaviors create many barriers to conducive academic learning and optimal social development (Lindor et al., 2019). Social skills deficits and problem behaviors can be major contributing factors significantly impacting effective learning for children with ASD in a school environment (Fluery et al., 2014; Murray, 2015).

#### **1.6.4 MOTOR PROFICIENCY**

One significant challenge for children with ASD is the lack of motor proficiency, affecting various gross and fine motor skills deficits (Fournier et al., 2010; Gkotzia et al., 2017). Motor proficiency can be defined as the sum of best performances observed across different motor tasks or situations, with a tendency to increase with age. Motor skills are essential for performing basic motor actions such as different postures, movement, grasping, and manipulating objects (Lourenço et al., 2020). Lack of motor proficiency can manifest as difficulties in imitation, eye-hand coordination, postural control, and gait with poor body and fine motor coordination (Kruger et al., 2019; Provost et al., 2007). Motor difficulties are frequently associated with children with ASD showing motor skills proficiency delays compared to typically developing (TD) children (Gkotzia et al., 2017; Fournier et al., 2010).

Such motor skills issues seen in children with ASD can interfere with basic movements involved in the various day-to-day physical activities like walking, running, jumping, and catching that apply the gross motor skills (Mac Donald et al., 2013). Fine motor skills also form a critical factor for

learning in schools and are often used to predict the school readiness of the children (Cameron et al., 2012). It can interfere with the performance of basic functional tasks and the quality of life for children with ASD. Such motor skills difficulties impact various areas of development in children. They can act as contributors to other autism-related symptoms such as difficulties in speech and language, social communication, and problem behaviors (Fulceri et al., 2019; MacDonald et al., 2013; Mody et al., 2017). These can also give rise to compensatory problem behaviors recognized as one of the significant challenges associated with ASD (Lord & MacGee, 2001).

### **1.6.5 FOOD AND DIGESTION PROBLEMS**

In his seminal paper on ‘infantile autism’ in 11 children, Leo Kanner reported various food and digestion problems in 7 children with intense gastrointestinal (GI) distress as significant medical comorbidity associated with autism (Kanner, 1968). Vast variability is seen across multiple studies on food and digestion issues in the autism population spreading over 9% to 91%, with similar broad-ranging patterns present, particularly for specific GI symptoms of diarrhea, chronic constipation, and abdominal distress in children with ASD (Ibrahim et al., 2009). More than 70% of children with ASD have gastrointestinal issues compared to children with other developmental disorders and typically developing (TD) children (Buie et al., 2010). Digestion issues are most frequently occurring diarrhea, chronic constipation, abdominal pain, gastroesophageal reflux, vomiting, gastritis, nausea with altered dietary problems, and food sensitivities and allergies (Coury et al., 2012). Food selectivity is a major problem in children with ASD raising concerns about inadequate nutrition, reluctance to eat certain foods, excessive or restrictive eating habits, and sensitivity to many food textures (Cermack et al., 2010). Children often show problem behaviors in the form of self-injurious behavior or vocal and motor stereotypies to alleviate abdominal discomfort (Buie et al., 2010). Multiple food and digestion problems can further exacerbate core symptoms of autism, problem behaviors, social skill deficits, and RRBs (Chakraborty et al., 2021; McElhanon et al., 2014).

### **1.6.6 SLEEP DISORDERS**

Sleep disorders are prevalent, affecting around 40%-80 % of children with ASD. Various sleep disorders are delayed sleep latency, less sleep duration, inability to maintain sleep with night

waking, early morning waking, reluctance to sleep, and daytime drowsiness. Sleep disorders in children with ASD fall into three categories: insomnia, reduced sleep duration, and parasomnia. Parasomnias included walking or talking in sleep, bruxism, and restless leg syndrome (Hermann, 2016). Chronic sleep disorders can trigger the exhibition of problem behaviors, negatively impact social interaction, and worsen autism severity. It affects the day-to-day functioning of the children and is associated with increased parental disrupted sleep and stress. Certain medical conditions, medications, gastrointestinal distress, and food allergies contribute to sleep disorders in children with ASD (Devnani & Hegde, 2015). Chronic sleep disorders affect the overall quality of life, health, and psychosocial functioning in children with ASD.