COGNITIVE DISENGAGEMENT SYNDROME AND EXECUTIVE FUNCTIONS AMONG ADOLESCENTS WITH AUTISM

Submitted to

THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY, CHENNAI

Submitted in partial fulfillment of the requirements for the degree of

M.Phil. in Clinical Psychology

September 2023

Submitted by

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Hereby, it is certified that the dissertation titled **"COGNITIVE DISENGAGEMENT SYNDROME AND EXECUTIVE FUNCTIONS AMONG ADOLESCENTS WITH AUTISM"** is the original research work done by **NIVETHA.S (Register No. 154221104508)** submitted in partial fulfilment of requirements for the Degree of Master of Philosophy in Clinical Psychology and has not previously formed the basis of award for any other degree or diploma to the candidate.

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DECLARATION

I, **Nivetha.S** hereby declare that the thesis titled **"COGNITIVE DISENGAGEMENT SYNDROME AND EXECUTIVE FUNCTIONS AMONG ADOLESCENTS WITH AUTISM"** was carried out by me at NIEPMD, Chennai, during the year 2021-23, is an original research work carried out under the guidance and supervision of Ms. P. Kalaivani, Assistant Professor, Department of Clinical Psychology, NIEPMD (D), Chennai. This work has not formed the basis of award for any other degree.

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This institute is a central body funded by Department of Empowerment of Persons with Disabilities (Divyangjan), Ministry of Social Justice & Empowerment, and Government of India. The MPhil programme offered at NIEPMD is recognized by Rehabilitation Council of India (RCI), New Delhi, and affiliated with the Tamil Nadu Dr M.G.R. Medical University

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ACKNOWLEDGEMENT

I express my sincere gratitude to my guide Assistant Professor Department of Clinical Psychology, Ms. P. Kalaivani for her guidance and assistance.

I sincerely thank Ms. S.K. Anandhalakshmi and Ms. Srigowri Rajesh, Lecturers and Dr. Karthikeyan. S, Associate Professor & Head, Department of Clinical Psychology for their constant guidance and support.

I take this opportunity to extend my gratitude and thank the informants of the participants and the clients who have co-operated as well as referred more participants for my research. I sincerely thank my friends Ms. Poornima, Mr. Harish, Ms. Saranya, Ms. Vardhini Krishnamurthy and Ms. Hari Priyaa, for their constant and timely help, unwavering support and guidance and motivation. I express my sincere gratitude to my classmates and juniors especially Ms. Nazreen, Mr. Jacob, Ms. Shama, Ms. Aruna, Ms. Sri Nandhini, Ms. Gayathri, Ms. Poovarasi, Ms. Nuzhath, M. Adarsh, Ms. Tena, Ms. Harishma and Ms. Farisha for helping in the data collection procedure.

I express my sincere gratitude to my seniors and family for their support and encouragement in all my ways.

NIVETHA.S

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ABSTRACT

Cognitive Disengagement syndrome (CDS) refers to the set of behavioral and cognitive symptoms in which Behavioral symptoms are manifested as motor hypoactivity such as low levels of energy, lethargic, tiredness and sluggish movements whereas Cognitive disengagement symptoms include day dreaming, pre- occupation, staring blankly, getting lost in their own thoughts and slow processing. CDS has significant correlation with other disorders such as ADHD, Autism Spectrum disorder (ASD) and internalizing disorders. In addition, CDS is also associated with marked impairments in social, emotional, academic functioning and executive functioning. The aim of the present study is the aim of the study is to explore Cognitive Disengagement Syndrome in Adolescents with Mild autism and to understand the differences in EF among children with and without CDS. The purposive sample comprised of 43 adolescents both male and female age ranges from 10-16 years (M= 12.37 and SD= 2.127) with ASD. The individuals already diagnosed with ASD by licensed Clinical Psychologist having below average and average intellectual functioning on Standard Progressive Matrices were included in the study. CDS was measured using Cognitive Disengagement Syndrome parent rating scale and EF was measured by Stroop test, Porteous maze, Digit span, Letter Number sequencing and Colour trail test. The results of the study shows that 77% of sample has CDS among adolescents with Mild Autism. There exist significant deficits in the areas of working memory, inhibition and planning among children with Mild autism. There are significant differences in the cognitive domain of Autism between group with CDS and without CDS. The study also highlights the differences in the planning domain of EF between adolescents having high CDS and Low CDS. This is

important in designing interventions accordingly. Also, the results of this study emphasis the need for new strategies to manage individuals with CDS in academic setting and at home. Hence identifying CDS paves way for primary prevention. Longitudinal and intervention studies could be carried out in area of CDS and ASD.

Key words: Cognitive Disengagement Syndrome, Autism Spectrum Disorder, Executive functions

INTRODUCTION

Autism Spectrum Disorder

Autism spectrum disorder (ASD) is a complex neurodevelopmental condition, affecting approximately 1 in 54 individuals (1.85%) (Maenner et al., 2020). ICD-10 defines autism as a neurological developmental disorder characterized by qualitative impairments in social interaction and communication, as well as restricted and repetitive patterns of behaviour, interests, and activities. The difficulties in social and communication encompasses inability to initiate or sustain conversation with others, comprehending nonverbal cues and engaging in reciprocal communication. On the other hand, the restricted and repetitive behaviour domain includes a wide range of behaviours across motor, verbal, non-verbal, and sensory aspects, such as repetitive movements, Echolalia, Echopraxia, rigid adherence to routines, specific interests, and unusual responses to sensory stimuli. India, being a populous country with nearly 1.3 billion people, has a significant number of children aged 15 years or younger, making up around one-third of the population. It is estimated that over 2 million individuals may be affected by ASD in India (Krishnamurthy, 2008).

Neural theories of ASD

To understand the neurological basis of phenotypic traits in individuals diagnosed with autism spectrum disorders, researchers and theorists have developed various theories and models of the core traits of ASD. One of these sets of theories includes neural theories, which describe different regions of the brain that research confirms are involved in ASD. The different regions of the brain involved in ASD and most supported in the literature include the frontal lobe, cerebellum, and temporal lobe (Schroeder, J.H., Desrocher, M., Bebko, J.M. & Cappadocia, M.C., 2010).

Frontal lobe

According to Schroeder, frontal lobe is associated with various Executive functions such as planning, organization, set shifting and cognitive flexibility. All of the EF are found to have to deficient in children with autism. Frontal lobe is also associated with production of language. Children with autism exhibits difficulty in language and communication domain which mainly deals with understanding the pragmatism and reciprocity. Neuro imaging studies reveal that Children with autism show decreased frontal lobe size.

Cerebellum

Children with Autism have deficits in theory of mind which is difficulty in understanding and predicting social cues. These deficits are linked to cerebellum activity (Kelly et al., 2021). Cerebellum also extends its role in adaptation in social functioning which is seen in children with autism (Forgeot d'Arc et al., 2020). Reduction in the size of nuclei in the cerebellum and the reduced purkinjie cells. These structural anomalies result in the deficits in the motor, socio- communicative and executive function deficits among children with ASD (Hanaie et al., 2018).

Cognitive theories of ASD

Theory of mind (ToM)

Theory of Mind refers to individual's ability to comprehend others perspective, thoughts, beliefs and others internal states (Premack, D., & Woodruff, G. 1978). ToM also extends to reading between the lines in the social context, understanding the intent of communication and ability to create and identify deception (False belief) in the social situations. These arrays of skills typically develop from 14 months and continue develop throughout the childhood in various levels of development (Low & Perner, 2012). The course of development ranges from ability to track the moving objects, establishing joint attention, imitation, engaging in make

believe play, recognition of emotion and perspective taking abilities (Kimhi, 2014) (Fletcher-Watson et al., 2014). Individuals with Autism exhibit significant deficits in ToM especially in the tasks that examine false beliefs, conflict inhibition tasks (Carlson et al., 2002), appearance reality task and knowledge access task (Hamilton et al., 2016). Children with autism show atypical development of ToM in comparison with the typically developing children. Children with autism have difficulty in performing false belief task, although older children tend to pass this task but they exhibit difficulties in others areas as well and the level of difficulty varies according to the age.

Additionally, ToM has various other associations such as severity of Autistic symptoms especially in the areas of social communication and Restricted repetitive patterns of behaviours (Jones et al., 2018), Intellectual functioning (Baker et al., 2014), language acquisition (Steele et al., 2003) and executive functioning (Carlson et al., 2002).

Central coherence

Weak central coherence for ASD was first suggested by Frith and Hape in 1989 describing the atypical levels of processing observed in children with ASD. "Central coherence refers to the tendency to draw together diverse information to construct higher-level meaning in context" (Frith & Happe, 1994). Weak central coherence system reflected in the areas of perception and attention. This explains the reason behind better performance in Block design test among individuals with autism and significantly lower performance in central coherence task such as Sentence completion which could be attributed to the nature of processing of the task in which former task involves low level approach (analytical) and the latter requires high level processing (Jarrold & Russell, 1997). Weak central coherence is also reflected in other domains of ASD such as difficulty in generalising the social behaviours, understanding as well as applying social norms (Social information processing) (Plaisted, K. C., 2001), lack of

symbolic play, pragmatic language difficulties and difficulties in recognising emotion of others (Baron & Cohen, 1989).

Empathising and systematic theory

Empathising and systematic theory was proposed by Baron- Cohen in 2002 suggest that individuals with autism exhibits deficits in empathy, various aspects of social development and understanding others mind in relative to the individuals' mental age.

Empathy consists of two main components:

(a) the ability to attribute mental states to oneself and others, which is a natural way of understanding the actions of individuals,

(b) having emotional reactions that are appropriate to the mental states of others.

This understanding and emotional resonance with other's feelings are essential for social interactions and interpersonal relationships. The lack of empathizing ability is believed to be a key factor contributing to the social and communicative challenges experienced by children with autism. Researchers such as Baron-Cohen (1988) and Tager-Flusberg (1993) have suggested that this deficit in empathizing also affects their ability to imagine the thoughts and perspectives of others. These difficulties in empathizing, social interaction, and perspective-taking are often referred to as the "triad of deficits" in autism. Despite being often seen as a syndrome of deficits, individuals with autism can also exhibit remarkable cognitive strengths. These strengths are attributed to a concept called "systemizing," which refers to the drive to analyse objects and events to understand their structure and predict their behaviour. This process involves observing regularities in the behaviour of various systems, such as technical, natural, and abstract systems, and inferring the rules that govern them.

According to the empathizing-systemizing (E-S) theory, individuals with autism may have deficits in empathizing but excel in systemizing. Several studies have shown that systemizing abilities in autism are at least on par with their mental age or even superior. This strength in systemizing might underlie a different set of behavioural features in autism, which is referred to as the "triad of strengths". This suggests that while autism is associated with challenges in certain areas, it can also lead to cognitive advantages in specific domains, particularly those related to system analysis and understanding (Baron-Cohen & Belmonte, 2005)

Neurological aspects in ASD

Autism Spectrum Disorder (ASD) is primarily characterized by difficulties in social communication and repetitive behaviours/restricted interests. Alongside these core symptoms, individuals with ASD often experience additional challenges, such as sensory and cognitive impairments. These cognitive deficits may include problems with executive functioning, spatial reasoning, working memory, and episodic memory (Bangerter et al., 2017).

The authors propose a link between the hippocampus and autism spectrum disorder (ASD) based on multiple lines of evidence. Firstly, the hippocampus is involved in various functions that are disrupted in ASD, particularly social interaction, memory, and spatial reasoning. Secondly, there is substantial evidence showing abnormal structure and function of the hippocampus in individuals with ASD. Thirdly, the developmental milestones of the hippocampus align with the typical age when ASD symptoms become more evident, around 2 years old (Banker et al., 2021).

Deficits in social behaviour, memory, and spatial reasoning may be interconnected in ASD due to an underlying impairment in complex cognitive mechanisms driven by the hippocampus. These mechanisms include cognitive mapping, affordance perception, and model-based planning. The hippocampus plays critical roles in social interaction, memory,

and spatial reasoning, all of which are affected in ASD. The hippocampus's involvement in social interaction, memory and spatial reasoning is through cognitive mapping, which organizes concepts and relational elements. A disruption in cognitive mapping may result in deficits in model-based planning and affordance perception, both of which are impaired in ASD. This can lead to difficulties in decision-making and integrating oneself with the environment. As a result, atypical hippocampal development could significantly contribute to impairments in social, memory, and spatial domains, thereby influencing the characteristics of ASD (Banker et al., 2021).

Executive function (EF)

EF comprises of broad range of purposeful higher order neuropsychological domains, including goal-directed behaviour, abstract reasoning, decision making and social regulation (Bigler, 2012). EF is essential for voluntary making of decisions. Executive functions were first identified from the case of Phineas Gage (Harlow, J. M.,1848). After the passage of iron rod in the frontal area Phineas Gage exhibited significant difficulties in the areas of planning, inhibition, self-regulation and emotional regulation. Following this there were studies that studies EF among children with ASD. The most studied neurocognitive process in EF is Working memory, inhibitory control and cognitive flexibility.

EF involves integrating various brain systems distributed throughout the cortex and subcortex areas. If any part of this widespread circuitry is disrupted, it can undermine an individual's ability to control their behaviour effectively. As a result, abnormalities in brain systems often impact both executive function and psychopathology. Neurodevelopmental disorders like autism may be particularly susceptible to these disruptions due to their intricate connection to executive function. While EF are traditionally linked to the prefrontal cortex (PFC), not all neurodevelopmental disorders impacting executive function solely involve the frontal lobe.

Instead, intact executive functioning may depend on flexible use of integrated brain networks. Executive abilities develop early in life, with ongoing improvements throughout childhood and adolescence, involving a wide network of areas and connectivity throughout the brain. Executive functions are pervasively affected in many neurodevelopmental disorders. In autism, specific components of executive function may be disrupted, such as response inhibition and working memory. Studies also indicates morphometric abnormalities in the brains of children with autism.

Executive attention theory

Executive attention theory was developed by Engle and Kane in the year 2004. This theory states that Measures of Working memory capacity (WMC) has a strong correlation with real word cognitive tasks. WMC tasks have shown relationship with general fluid intelligence. This involves both verbal and spatial tasks. Studies provide evidence that this construct reflects the ability to control attention, particularly when other elements in the internal and external environment try to divert attention away from the relevant task. This ability is termed as executive attention. Executive attention refers to involving the maintenance of stimulus and response elements in active memory, even in the presence of distracting events. Executive attention is crucial for actively maintaining information in memory and resolving conflicts arising from competition between appropriate and inappropriate responses or stimulus representations of varying strengths. This model aligns with current understanding, associating the prefrontal cortex with information maintenance and the anterior cingulate with conflict detection and resolution.

Types of Executive Functions

There are two types of EF: Hot EF and Cool EF as given by Metcalfe & Mischel, 1999. Cognitive Executive Function (EF), also known as “Cool EF”, refers to EF abilities

used in decontextualized, abstract, and logic-based situations. These abilities include inhibition, working memory, flexibility, and planning. On the other hand, affective Executive Function, or "Hot EF", pertains to EF in situations that involve emotions or motivational significance. Atypical processing of Hot and Cool EF was observed among children with ASD (Brunsdon et al., 2015) which is evident from the affected domains of ASD such as social communication, EF deficits, difficulties in self-regulation and inhibition (Yu et al., 2021).

The EF studies in the current study are Working memory, Focussed attention, Inhibitory control and Planning

Inhibitory control

It Refers to ability to regulate and override strong internal urges or external distractions, allowing individual to focus on more appropriate or necessary tasks, behaviours, thoughts, or emotions. Inhibition is a cognitive process involving three different types: inhibition of prepotent responses (suppressing dominant responses), resistance to interference (ignoring irrelevant information), and resistance to proactive interference (overcoming interference from previously learned information) (Friedman & Miyake, 2004) In typical development, inhibition improves from childhood to adulthood (Davidson et al., 2006). In individuals with ASD, deficits in inhibition have been observed in various studies, but the results have been somewhat inconsistent. Some studies report impairments in all three types of inhibition, while others show differences depending on the specific type and age group studied. For instance, prepotent response inhibition may improve with age in ASD, and difficulties with resistance to interference might lessen after the age of twelve (Christ et al., 2011). Additionally, proactive interference in individuals with ASD seems to follow a similar

developmental trajectory to typically developing individuals between the ages of 8 and 18 years (Christ et al., 2011).

Working memory: Working memory refers to the ability to temporary hold the information in mind and manipulate it. WM is categorized into two types based on the content: verbal WM, which deals with language-related information, and nonverbal (visual-spatial) WM, which involves visual and spatial information (Baddeley & Hitch, 1994). The main difference between Working memory (WM), and STM is nature of processing in which former involves holding and manipulating information in mind and the latter is solely about holding information in mind without manipulation. WM and STM rely on different neural subsystems (D'Esposito et al., 1999). Furthermore, WM and short-term memory follow different developmental progressions, with short-term memory developing earlier and more rapidly (Diamond, 2013). Working memory deficits is related to the deficits in socio- adaptive functioning in individuals with ASD. Deficits in socio- adaptive seen in the areas of communication and socialisation (Gilotty et al., 2002). Deficits in phonological and spatial working memory is seen in ASD (Habib et al., 2019).

Planning: Planning is a multifaceted and dynamic process in which a series of predetermined actions needs constant monitoring, re-evaluation, and adjustments as the situation evolves. In a study by Van Den Bergh et al., 2014 found that there was significant deficit in EF especially planning was found among children with ASD of age range 6-18 years.

Focussed attention:

Factors associated in EF Impairment in ASD

- Severity of ASD (Seng et al., 2021)
- High Restricted and repetitive patterns of behaviours is associated with poor EF performance (Seng et al., 2021)

- Presence of Co-morbidity such as Intellectual Disability or ADHD diagnosis (May & Kana, 2020)
- Verbal ability (May & Kana, 2020)
- Age (May & Kana, 2020)

Cognitive Disengagement Syndrome (CDS)

The term CDS was first observed in ADHD children in which DSM III classifies ADHD into two types. ADHD with Hyperactivity and ADHD without Hyperactivity. Individuals diagnosed as ADHD without hyperactivity exhibited symptoms of sluggishness, drowsiness and day dreaming. This had led to the development of SCT as a significant factor in diagnosis of ADHD. The term CDS was initially referred as Sluggish Cognitive tempo (SCT) and it was replaced as Cognitive Disengagement Syndrome (Becker et al., 2022) . SCT was first describe by Neeper and Lahey 1986 (Neeper & Lahey, 1986).

Although CDS is seen as co-morbidity of ADHD-IN (Inattention type). There is a significant difference between CDS and ADHD, the research findings suggest that, CDS exhibits unique symptom dimensions and different clinical correlations related to executive function deficits, psychosocial impairments, and professional diagnoses. This indicates that we should consider SCT as a separate condition when assessing clinical cases and not assume that all inattention is related to ADHD. There is a possibility of having only CDS without ADHD comorbidity, which could be misdiagnosed as mild ADHD. Unlike ADHD, CDS is not a primarily a disorder of EF. CDS is associated with different risks for Psychosocial impairments. (Barkley, 2013). Hence, it is important to distinguish CDS only cases and comorbidity because the latter has more severe and is associated with mor risks. (Barkley, 2013)

Cognitive disengagement syndrome – Definition

CDS refers to cluster of behaviors that includes cognitive disengagement and motor hypoactivity. The former is reflected as apathy, slow processing, excessive day dreaming, mental fogginess and the latter is reflected as hypoactivity, sluggishness and sleepiness (Barkley et al., 1990).

Prevalence of CDS

Prevalence rate of SCT in autism ranging from 30% (Reinvall et al., 2017) to 37% (Duncan et al., 2019). In population-based study by Mayes et al., 2023 the prevalence rate of CDS was found to be 32% in Autism, 27% in ADHD- IN type and 18% in ADHD- Combined type. The prevalence of CDS was 22% during preschool, 29% during early childhood, 41% during late childhood, and 50% during adolescence (Mayes et al., 2022). Indicating the importance of studying CDS during the adolescence phase.

Clinical implication of SCT

Although the origin of CDS has been derived from ADHD, several research studies have identified SCDS as a distinct factor by identifying it symptomology, neuro psychological functioning and meta cognitive deficits (Becker et al., 2016). Individuals with SCT have functional impairment (Becker, Leopold, et al., 2016), social (Becker, Withrow, et al., 2016; Marshall et al., 2014) and academic difficulties. Additionally, SCT is associated with several psychopathological domains such as higher risk for suicide (Becker et al., 2016), sleep disturbances, internalizing disorders such as anxiety or mood disorders (Coplan et al., 2013; Barkley 2006). The symptoms of SCT had significant impairment in the executive functioning such as slower processing speed, deficits in Working memory, vigilance, increased reaction time (Creque & Willcutt, 2021), Sustained attention (Wåhlstedt & Bohlin,

2010), errors in information processing, regulating wandering of mind (Adams et al., 2010) and intrinsic motivation (Barkley, 2012).

CDS and autism

The core symptoms of ASD include deficits in the area of social communication, lack of reciprocity, difficulty to understand and adjust to the social norms. This symptom was in line with CDS symptoms when identifying CDS only among typical children. The children in the study exhibited social impairments (Servera et al., 2016). Studies have found that SCT was associated with reduced activity in the Left superior Parietal lobe which is concerned with attention orientation network. Individuals with ASD also shows deficits in attention such as orienting, sustaining and shifting of attention. CDS symptoms has more social impairments such as social withdrawal, losing one's train of thoughts, difficulty in detecting and grasping social cues. In addition to social impairments, Executive function deficits in real world such as working memory, self-organisation, allocation of resources, manging one's own time effectively, intrinsic motivation (Barkley, 2013). The comorbidity of CDS in ASD was 37% (Duncan et al., 2019). There is a significant association between ASD and CDS symptoms when the co- variates such as Intellectual functioning and ADHD symptoms are controlled (Duncan et al., 2019) (Reinvall et al., 2017). These indicated that the need to identify CDS in individuals with ASD due to the impact it poses which in turn aids in effective implementation of intervention strategies such as teaching and implementing flexible instruction and learning styles at home and in the school setting.

REVIEW OF LITERATURE

Prevalence of Autism

Worldwide Prevalence of Autism was 1 in 100 children has Autism (WHO, 2023). The overall estimated Prevalence of Autism in world was and the regional prevalence of ASD in Asia, America, Europe, Africa and Australia was 0.4%, 1%, 0.5%, 1% and 1.7 % (Salari et al., 2022). The pooled prevalence rate of Autism in the meta-analysis study conducted among 2,195,497 subjects among Asian population was 0.36 % with highest prevalence seen in males 0.45%. It also indicates the regional differences in Asia. The estimated Prevalence in East Asia was 0.51%, South Asia was 0.31% and west Asia was 0.35%. (Qiu et al., 2020). (Salari et al., 2022)

The estimated Prevalence of Autism is relative to the sample and geographical area of the study chosen. Prevalence of ASD in Kancheepuram India was found to be 0.6% in which ASD was most prevalent among boys (0.9%) rather than girls (0.2%) (Santhosh Raj. P, 2021). In a meta-analysis by Chauhan et al., 2019 found that the pooled prevalence rate in urban for children age range 1-18 years was found to be 0.11 and the pooled percentage prevalence of autism in rural children aged 0-15 years was 0.09. Prevalence of Autism was found to be 2.25 per 1000 children aged 1.5 years to 10 years among children in Chandigarh (Arun & Chavan, 2021). Incidence of Autism was 10 out of 100 children age ranges from 5-10 years among in a village (Mudichur) in India (Sankar., U.G & Monisha, R. 2020). There are several studies that suggest increase in Prevalence of ASD which could be due to improved recognition and identification, changes in the diagnostic criteria, early identification (reducing the age of diagnosis), improved health care access and awareness of ASD among general public (Raina et al., 2017; Fombonne, 2008).

Autism Spectrum disorder

Williams et al., 2005 investigate the auditory and visual memory of high-functioning adults with autism and group-matched normal controls using the Wechsler Memory Scale-III (WMS-III) among 29 high functioning adults with autism and 34 matched typical children. The results of the study shows that individuals with autism performed similarly to the controls in immediate and delayed memory tasks involving word pairs, stories, and verbal working memory. However, the autism group exhibited impairments in immediate and delayed recall of faces and family scenes, indicating difficulties with memory for common social scenes and visual/spatial stimuli. Additionally, spatial working memory was also impaired in the autism group.

Green et al., 2009 examined the extent of movement skill impairments in children with ASD who have a wide range of IQ scores. The researchers used the Movement Assessment Battery for Children (M-ABC) to measure movement skills in a large group of children (n=101) with childhood autism and broader ASD, with ages ranging from 10 to 14 years. The results showed that 79% of children with ASD had definite movement impairments based on the M-ABC assessment, and an additional 10% had borderline problems. Children with childhood autism exhibited more severe impairments in movement skills compared to children with broader ASD. Moreover, children with lower IQ scores (less than 70) were more impaired in movement skills than those with higher IQ scores (more than 70). This suggests that movement impairments may be associated with more severe neurological impairments that can also contribute to intellectual disability and more severe autism. Additionally, the study found that movement impairments were not related to everyday adaptive behaviour once the influence of IQ was controlled.

Cardillo et al., 2021 studied extensively on Pragmatic language among children and adolescents with autism spectrum disorder and to understand the mediating role of Theory of Mind (TOM) and Executive functions. The participants of the study (N= 143; 73 with ASD and 70 Typical children) were completed measures related to Executive functions, Intellectual functioning, theory of mind and pragmatic language. The results of the study showed that individuals with ASD exhibited significant difficulties in Pragmatic language. Age and ToM abilities were found to be significant predictor for Pragmatic language.

McQuaid et al., 2021 studied the Gap between IQ and Adaptive Functioning in Autism Spectrum Disorder with the sample comprising of 355 youth in which 117 individuals diagnosed with ASD (102 males and 75 females) and 178 Typically developing children (87 female and 91 males) age ranging from 8- 17 years. Individuals obtaining IQ of greater than 70 was chosen in the study. This study focused on examining adaptive functioning in individuals with ASD compared to typically developing (TD) individuals, with a specific focus on sex differences. The results showed that even in the absence of co-occurring intellectual disability, individuals with ASD demonstrated significant difficulties in adaptive functioning. Average intellectual functioning individuals with ASD also exhibited a notable gap between their IQ and adaptive skills, which increased with age. This discrepancy was more pronounced in ASD youth compared to their same-sex TD peers. The results showed that even in the absence of co-occurring intellectual disability, individuals with ASD demonstrated significant difficulties in adaptive functioning. Cognitively-able individuals with ASD also exhibited a notable gap between their IQ and adaptive skills, which increased with age. This discrepancy was more pronounced in ASD youth compared to their same-sex TD peers.

Executive functions and its association

Fernandez-Prieto et al., 2021 conducted a study that explored the mediating link between Executive functioning, sensory processing and behaviour among 79 children and adolescents with autism. The informant of the selected sample was given Child Sensory Profile (CSP-2), Child Behaviour Checklist (CBCL) and three executive function domains derived from CBCL was used in the study. The three Executive function domains were working memory, planning, emotion regulation and control. The results of the study indicates that there is a significant association between Working memory and repetitive/obsessive behaviour and aggressive behaviours. There was a strong mediation effect of EF concerning how sensory processing and behavioural outcomes interact. Specifically, Executive functions, particularly in the domain of emotion regulation and control, played a mediating role in the relationship between sensory processing abnormalities and behavioural problems.

Yu et al., 2021 studied the mediating role of Cool EF and verbal comprehension in explaining the relationship between affective Executive Function (EF) and Theory of Mind (ToM) among children with ASD average intellectual functioning. The sample comprises of 97 children with ASD aged 6 to 12 years. The researchers measured the children's cool EF, hot EF, and verbal comprehension using specific tasks, and assessed ToM with the Theory of Mind Task Battery. The results shows that there was a significant correlation between Hot EF and ToM which is reflected in the ASD core symptom such impaired perspective taking ability, emotional dysregulation which is manifester as inappropriate emotional response, exaggeration of emotions. Additionally, the mediation analysis, showed that cool EF and verbal comprehension played a mediating role in the link between hot EF and ToM.

In a study by Erostarbe-Pérez et al., 2022 to analyse the relationship between EF and Intellectual functioning among 106 children age ranging from 11-18 years found that there is

a significant difference in EF functioning among children with ID and borderline intellectual functioning.

ASD and EF

The case study by Steel et al., 1984 was the first among the literature to reveal the Executive functions deficits in a 29-year-old male who is diagnosed with Autism. The Neuropsychological test battery reveals that the patient had significant difficulties in the areas of planning and problem solving. Executive functions comprise a group of frontal lobe functions that deals with planning, working memory, mental flexibility and inhibition. Executive functions are the higher order cognitive process.

Van Den Bergh et al., 2014 studied the difference in EF with respect to age in daily life among 155 children and adolescence with Autism age ranging from 6 to 28 years. The study used behavioural rating Inventory Executive Function (BRIEF) to rate the executive function and Autism Diagnostic Observation Scale to assess the severity of autism. The results of the study indicates that there exists a significant age-related difference in executive functions. When comparing the 6- to 8-year-olds with older children and adolescents, inhibition problems were less frequently reported in the older age group. However, for planning abilities, an opposite trend was observed. In 12- to 14-year-olds, more planning problems were observed compared to the 9- to 11-year-olds.

Faja & Nelson Darling, 2019 studied the relationship between inhibition, flexibility, and specific behavioural characteristics in 102 school-aged children (between 7 – 11 years) with autism spectrum disorder (ASD) who had average or above-average cognitive abilities. The assessments to assess intellectual functioning, executive functions and behaviour rating scale was administered. The results of the study indicated a inverse relationship between Restricted and Repetitive patterns of behaviour and Executive function deficits in the areas of

inhibition and set shifting. Moreover, the study found that the ability to proactively slow down reaction time to respond more carefully was linked to sensorimotor restricted and repetitive behaviours. These results emphasize the importance of differentiating between higher-order and sensorimotor symptoms in ASD, as they have distinct relationships with executive functioning abilities

In a meta-analysis by Benallie et al., 2021 in EF of Children with ASD and the comorbid diagnosis of ID and ADHD. The analysis was done in 26 studies from 24 journals. The results of the study reveal that severity of deficits in EF was high among comorbid diagnosis of ASD rather than ASD itself. Children with ASD and ADHD displayed deficits in flexibility and shifting, inhibition, and attention, which were distinct from children with ASD and ID. Among children with ASD and ID, differences were observed in planning and organizing, flexibility and shifting, attention, behaviour regulation, and global EF skills compared to control groups. However, these findings varied depending on the type of assessment used.

Gentil-Gutiérrez et al., 2022 conducted a study that compares the Executive Functioning deficits of children and adolescents diagnosed with Autism and neurotypical children in the school context. The population of the study comprises of professionals in the field of education were the informants for the children and adolescents age 6 to 18 years. The study participants worked in a regulated centre of primary and secondary education. The sample comprises of 121 participants in which 70 participants were professionals working with children with autism and 51 were teachers working with neurotypical children. The results of the study indicates that individuals diagnosed as autism had significant higher scores on Behaviour Rating inventory of executive function (BRIEF) in comparison with neurotypical children. The study confirms the hypothesis that children and adolescents with

autism experience greater challenges in EF such as cognitive flexibility, planning, working memory and inhibition.

Cognitive disengagement Syndrome

In a study by Barkley, 2013 which aims to distinguish SCT from ADHD among 1800 children and adolescents age ranging from 6 -17 years indicates that comparatively ADHD had more severe and pervasive deficits than SCT alone however SCT symptoms had significant impairment in the self-organization domains. Additionally, impairment was significant higher in ADHD comorbid with SCT sample rather than SCT only or ADHD only group.

In a study done by Mayes et al., 2023 which compares the components of CDS among children with ASD and ADHD among 665 children age ranging from 6 to 12 years have found that the prevalence of SCT was highest (32%) among children with Autism followed by Children with ADHD -Inattentive type (27%). The manifestation of SCT symptoms was lowest among children with above average intellectual functioning.

Cognitive functioning associated with CDS

In a meta-analysis by Becker et al., 2016, it was found that SCT increase with age and is associated with lower socio- economic status. While there is a modest correlation between SCT symptoms and gender in children (higher in males than females), this association is not evident in adults.

Leopold et al., 2016 conducted a longitudinal study to investigate SCT and ADHD over a period of 10 year conducted among that included 489 individuals from 224 monozygotic (MZ) twin pairs (identical twins) and 265 dizygotic (DZ) twin pairs (fraternal twins). The researchers used confirmatory factor analysis to assess the temporal invariance of ADHD and SCT symptoms at different developmental stages from preschool to ninth grade.

The results indicated that both ADHD and SCT symptoms were highly stable across the ten-year period and showed a consistent pattern of inter-factor relationships. It was found that symptoms of SCT was significantly increased as the demands increased over time.

CDS and ASD

Reinvall et al., 2017 conducted a study on SCT among children and adolescent with high functioning Autism. The sample comprises of 55 individuals with high functioning autism age ranging from 5 years to 15 years which is divided into 3 group based on severity of SCT symptoms and used rating scales for measuring Autism, SCT, internalizing and externalizing symptoms. The results shows that moderate and high levels of SCT group showed significant difficulties in social functioning such as reduced attention orientation and perception to social cues.

In a Study by Duncan et al., 2019 conducted among 52 adolescents with autism (without intellectual disability) age 13-18 years to differentiate impact of CDS on ASD and ADHD, SCT symptoms had significant correlation with ASD symptoms not ADHD symptoms. Internalizing behaviours was correlated with ASD and Externalizing behaviours with ADHD. With respect to metacognitive deficits both ADHD and SCT had significant deficits.

Brewe et al., 2020 studied the clinical correlates for adults' autism among 57 adults (16-25 years) to analyse the disorder specific relationship and to identify the relationship between SCT and Executive functioning impairments among adults with autism. The results of the study indicates that SCT was associated with internalizing symptoms. The results of the association between EF impairments and SCT was not clear which could be attributed to nature of test administration. Performance test of EF in this study yielded mixed results.

Studies on Neuropsychological functioning of SCT revealed that the slower processing speed among children exhibiting high SCT, difficulties in sustained attention (Willcutt et al., 2014), decreased inhibition, working memory difficulties, increased reaction time even after controlling ADHD symptoms (Creque & Willcutt, 2021), mild deficits in self-organization (Barkley, 2013). However, the studies lack methodological limitation such as using rating scales to measure Executive functions, low ecological validity, small sample size.

METHOD

3.1 Aim

The aim of the study is to explore Cognitive Disengagement Syndrome in Adolescents with Mild autism and to understand the differences in EF among children with and without CDS.

3.2 Objective

1. To explore presence of CDS among Adolescents with mild Autism.
2. To study Executive functions of Adolescents with mild autism
3. To study the difference in Executive functions of adolescents with Mild Autism having CDS and not having CDS.
4. To study the relationship between CDS and Symptoms of Autism.

3.3 Hypotheses

H01: There will be no CDS among adolescents with Mild Autism.

H02: There will be no deficits in Working memory of adolescents with Mild Autism

H03: There will be no deficits in Inhibition among adolescents with Mild Autism.

H04: There will be no deficits in Focused Attention and higher focused attention of adolescents with Mild Autism

H05: There will be no deficits in Planning of adolescents with Mild Autism

H06: There will be no difference in Planning of adolescents having autism with CDS and without CDS

H07: There will be no be difference in Cognitive flexibility domain of adolescents having autism with CDS and without CDS

H08: There will be no difference in Inhibitory control of adolescents having autism with CDS and without CDS

H09: There will be no difference in focused attention of adolescents having autism with CDS and without CDS

H10: There will be no difference in working memory of adolescents having autism with CDS and without CDS

H11: There will be no relationship between CDS and Social relationship and reciprocity

H12: There will be no relationship between CDS and Emotional responsiveness

H13: There will be no relationship between CDS and speech – language communication

H14: There will be no relationship between CDS and behavior patterns

H15: There will be no relationship between CDS and sensory aspects

H16: There will be no relationship between CDS and cognitive component

H17: There will be no significant difference between adolescents having CDS and not having CDS on Social relationship and reciprocity

H18: There will be no significant difference between adolescents having CDS and not having CDS on emotional responsiveness

H19: There will be no significant difference between adolescents having CDS and not having CDS Speech- language communication

H20: There will be no significant difference between adolescents having CDS and not having CDS on Behavior patterns

H21: There will be no significant difference between adolescents having CDS and not having CDS on sensory aspect

H22: There will be no significant difference between adolescents having CDS and not having CDS on cognitive component

3.4 Sample

Participants were adolescent already diagnosed as ASD by a Clinical Psychologist who came to avail services from the Department of Clinical Psychology, NIEPMD. The purposive sample comprised of 43 adolescents both male and female age ranges from 10-16 years with ASD. The adolescent who meets the Inclusion criteria and consent provided by the parents were included in the research.

3.5 Variables

3.5.1 Domains of Indian Scale for Assessment of Autism

- Social relationship and reciprocity
- Emotional responsiveness
- Speech- Language and communication
- Behavior patterns
- Sensory Aspects
- Cognitive component

3.5.2 Cognitive Disengagement Syndrome

3.5.3 Executive Function

The following shows the domains and the tool used in the study

- Working memory was measured by Digit span and Letter Number Sequencing of WISC-IV
- Inhibition was measured by Stroop test
- Focused Attention was measured by Color Trails Test
- Planning was measured by Porteus Maze

3.6 Operational definition

3.6.1 Social relationship and reciprocity: Social relationship and reciprocity refers to ability to interact with others, adequate eye contact, social smile, body language, taking turns in a social interaction and ability to mingle with peers.

3.6.2 Emotional responsiveness: Emotional responsiveness defined as ability to react and respond according to the environment

3.6.3 Speech- Language and communication: Speech- Language and communication refers to the ability to express their or others need verbally or non-verbally, understanding nonverbal cues, ability to comprehend and respond to speech appropriately, reciprocity in communication, ability to read between lines and ability understand jokes.

3.6.4 Behavior patterns: Behavior patterns refers to the set of motor mannerisms such as hand flapping, body rocking, restlessness, aggression towards oneself or others and adopting to change.

3.6.5 Sensory Aspects: Sensory Aspects includes hyper or hypo sensitivity to visual, acoustic, tactual and olfactory stimuli and responding to it without inhibition.

3.6.6 Cognitive component: Cognitive component refers to ability to sustain attention, delayed name calling response and remarkable cognitive strength in one area or more areas.

3.6.7 Working memory: Working memory refers to the ability to temporarily hold the information and manipulate it

3.6.8 Inhibition: Refers to ability to regulate and override strong internal urges or external distractions, allowing individual to focus on more appropriate or necessary tasks, behaviours, thoughts, or emotions

3.6.9 Cognitive flexibility: Cognitive flexibility refers to the ability to switch between each task and adopt it accordingly.

3.6.10 Focused Attention: Focused Attention refers to the ability to focus the task in hand

3.6.11 Planning: Planning refers to series of predetermined actions that needs monitoring, self-feedback and readjustment according to the stimulus presented.

3.7 Sampling and sampling techniques

3.6.1 Sampling Method

The method of Purposive Sampling was used for the current study.

3.6.2 Inclusion Criterion

- Age: 10-16 years
- Adolescents with Mild autism who have below average or average or above average intellectual functioning in any standard IQ assessment.
- Both Male and female gender

3.6.3 Exclusion Criterion

- Adolescents with autism who scored grade v, intellectually impaired in SPM.
- Adolescents with autism who has co-morbidity of any physical or mental illness.
- Adolescents with Sensory Impairment (Visual and hearing impairment)
- Adolescents with any other co-morbid disability
- Adolescents diagnosed as Asperger's.
- Adolescents who are not co-operative for the assessment
- Adolescents with autism who has history of seizure.
- Adolescents with autism who is currently under pharmacological intervention for addressing specific cognitive mechanisms
- Adolescents with autism who was and currently undergoing cognitive remediation programs

3.8 Tools used

Before Administration

Consent Form: The consent form comprising of explanation the research process was given to the Informant. It had information regarding their right to withdraw at any point of time, availability of no material or concessional benefits, maintenance of confidentiality and anonymity in coding the data. Only when the informant agreed to give consent, further details were collected and the research process was started.

Socio-Demographic Profile: The profile form was constructed by the researcher so as to collect demographic information of the samples, including name or initials, age, gender, education, residence, Role of the informant, Presence of Co-morbidity, presence of any sensory impairment, medication for specific cognitive mechanisms, had a history of epilepsy and the client had or has undergone cognitive remediation. Finally, the declaration was received from the informant.

3.8.1 Indian Scale for Assessment of Autism (ISAA)

Indian Scale for Assessment of Autism was developed by National Institute for Mentally Handicapped (NIMH) in the year 2009. It consists of 40 items rated on a 5-point rating scale ranging from 1 for “Never” to 5 for “Always”. The rating is done based on frequency, intensity and degree of behaviours that is observed at different areas of functioning. The 40 items are further divided into 6 domains: Social relationship and reciprocity, Emotional responsiveness, Speech- Language and communication, Behavior patterns, Sensory Aspects and Cognitive component. For the purpose of the study, domain wise scoring is done which is sum of items in each domain. However, overall score is also calculated by using sum of all

the items in the test. Scores which are ranging from 70 to 106 was classified as Mild Autism. The scale has good internal consistency of 0.93 ($p< 0.001$).

3.8.2 Standard Progressive Matrices (SPM)

Standard Progressive Matrices was developed by John C. Raven and published in 1938. The booklet comprises 60 items in five sets (A to E) of 12 items each (e.g., A1 through A12), with items within a set becoming increasingly complex, requiring ever greater cognitive capacity to encode and analyse information. It has a good reliability of 0.81 and an internal consistency of 0.92 (Asia, 2021). The tool was used to assess the intellectual functioning of the participants of the current study.

3.8.3 Sluggish Cognitive Tempo Scale

Sluggish Cognitive Tempo Scale was developed by Penny et al., in 2009 with the good reliability of 0.80 and internal consistency of 0.86. The scale comprises of 21 items with a 4 point Likert rating scale ranging from 0 “not at all” to 3 “very much”. The cut off score was by obtaining averaging each data. The cut off score for Sluggish Cognitive Tempo Scale was 1.5 (Penny et al., 2009).

3.8.4 Digit Span

Digit Span subtest is a core subtest of WISIC-IV. Digit Span has two tasks: Digit Span Forwards and Digit Span Backwards. Each trail composed of two trails. For each trail, score 1 was given for a correct response. Digit span score is the sum of the item scores for both digit span forwards and digit span backwards. The obtained raw scores are converted to Scaled score.

3.8.5 Letter Number sequencing

The client has to listen to a sequence of alphanumeric characters and then verbally repeating them following a specific pattern. The client has to recall the number in ascending order and

recite the alphabets in alphabetical order. The task's difficulty progressively escalates, commencing with strings containing 2 alphanumeric characters and culminating with strings containing 8 characters. There are a total of 21 items, distributed with 3 items for each string length. It's crucial to emphasize that in each item, there are no instances of repeated letters or numbers, signifying that every character within the string is distinct. Participants are awarded one point for delivering an entirely accurate response, and the highest achievable score is 21.

3.8.6 Stroop test

Stroop task was developed by Stroop in the year 1935. The Stroop task involves three task: reading the word, reading the colour and reading the coloured word within 45 seconds for each task. In the word task, the individual is expected to read as many as words in the page possible. In the colour task, the individual is expected to name as many as colours in the page. In the colour word task, the individual is expected to name the colour of the ink the words are printed in, ignoring the word printed for each item. The test has reliability of 0.86, 0.82 and 0.73 for individual forms.

3.8.7 National Institute of Mental Health and Neuro Sciences – Neuropsychological Battery (NIMHANS – NB)

2 subtests chosen – overall battery has a good reliability of 0.97 and good validity of 0.84 (Karnataka, 2013). It was developed by S. L. Rao et al, in 2004 in

NIMHANS to identify the different brain areas and functionality.

Attention	1. Focussed attention -- Colour Trails Test
Executive functioning	2. Planning -- Porteus Maze

Colour trail test: The Colour trail test was developed by World Health Organisation (WHO) in the year 1996 to measure focussed attention. The test consists of two trails. First trail has a set of numbers 1 to 25 randomly spread in which odd numbers circled in pink and even

numbers circled in yellow colour. Second trail has two sets of numbers from 1 to 25 randomly spread, one of the sets is circled in pink and another set of the same number circled in yellow. The individual has to alternate between each colour starting from number 1 circled in pink. Time taken was noted for each trail. The cut off scores for this test was equal to or more than 95th percentile in NIMHANS Neuro battery for children (for sample age ranging from 10-15). The cut off score for this test was below 15th percentile in NIMHANS Neuro battery for adults (for sample age: 16).

Porteus Maze: Porteous Maze was developed by Porteus in the year 1965 to measure planning. The test consists of 12 different mazes with increasing difficulty level. The individuals are required to trace the maze from the starting point to the goal without entering the blind alley and without lifting the hand. The individual is given two trails from the maze 5 years to 9 years. Error on both trail is considered as failure. The test is discontinued after failure on 3 successive ages. Basal age for the test was assumed to be 4 years, success on first trail gets an additional of one year from basal age but success on second trail gets an additional of half year from basal age. Corresponding percentile to each age was calculated. The cut off scores for porteous maze was equal to or less than 5th percentile.

3.9 Study duration

Each sample was collected individually by the researcher and 7 months was taken to collect data. The data was collected in a single session, each session lasted for 1 hour (adequate breaks for the client was given whenever required). 30 minutes for psychoeducation.

3.10 Procedure

After getting approval by the Institute's Ethical Committee, the data was collected at NIEPMD who avail services from the Department of Clinical Psychology in a span of 7

months from January 2023 to July 2023. Parents of the participants were first presented with information about the study and given the opportunity to ask questions about it, in order to clear any doubts. After getting informed consent, demographic information was collected. The current severity of Autism was assessed by using Indian Scale of Assessment of Autism (ISAA) and level of intellectual functioning was assessed using Standard Progressive Matrices. Further, Sluggish Cognitive Tempo Scale was administered to the parent by the researcher. Adolescents who obtained grade V in SPM was excluded from the study. Further, to assess the EF Colour Trail test, Stroop test, Letter Number sequencing, digit span and Porteus maze were administered individually. These tests took 30 minutes in total. After the test conducted, Parents were Psychoeducated regarding the subject's level of intellectual functioning, overall scores of Autism and the results of Executive functions. Home based strategies was provided for each client in the improve areas of deficits.

3.11 Statistical Analysis & Study Design

Data was analysed using Statistical Package for Social Sciences (SPSS 20). Results of the study were based on the descriptive statistics done. It is a correlational study design. The sample was subjected to independent sample t-test identify the significant differences between the variables.

3.12 Ethical Considerations

An official permission was obtained from Institutional Ethical Committee. Informed consent was voluntarily sought from the participants, after clarifying the aim of the study, methods and duration of the study was explained the language the parent preferred (English/ Tamil). Informant consent was obtained in the written format. Confidentiality of data was ensured and data was only accessed by the researcher. Study participants had the right to withdraw from the study at any time without giving reasons and without negatively affecting

their medical care. If the subject was uncooperative, crying or didn't want to continue the test the test would be terminated. One subject was crying through the session hence the session was terminated and the sample was not taken in the study. The researcher and guide declared that they had no competing interests. During the data collection, when any participant had psychological disturbances, those issues were attended to, first, at the earliest. However, none was reported.

RESULTS

As proposed in the previous chapters the main aim of this research is to explore presence of CDS among Adolescents with mild Autism. The researcher tries to study Executive functions of Adolescents with mild autism. It also aims to study the difference in Executive functions of adolescents with Mild Autism having CDS and not having CDS. In addition, it also studies the relationship between CDS and Symptoms of Autism. The previous chapter laid out the methodology employed for the current study. The present chapter looks into the analysis for the results obtained.

Table1 shows the descriptive statistics of socio-demographic variables

Variables	**Participants demographics**		
Age	10 years [a]	14	32.6%
	11 years [a]	4	9.3 %
	12 years [a]	5	11.6 %
	13 years [a]	4	9.3%
	14 years [a]	8	18.6 %
	15 years [a]	4	9.3 %
	16 years [a]	4	9.3 %
	Age [b]	12.37	2.127
Gender	Male [a]	37	86%
	Female [a]	6	14%
Intellectual functioning	Average Intellectual functioning [a]	25	58.1%

	Above average Intellectual functioning [a]	1	2.3%
	Definitely below average Intellectual functioning [a]	17	39.5 %

[a] -expressed as Frequency and percentage; [b] -expressed as Mean and Standard deviation

Table 1 shows the demographic details of the 43 participants in which 86% were male and 14% were female. The sample's minimum age was 10 years and maximum age was 16 years in which 33% were 10 years, 9 % were 11 years, 12 % were 12 years, 9 % were 13 years, 19 % were 14 years, 9 % were 15 years and 9 % were 15 years of age. Most of the participants had Average Intellectual functioning (58.1%), followed by 40% Definitely below average Intellectual functioning and 2.3% above average Intellectual functioning.

Table 2 shows the Frequency of EF scores among adolescents with Mild Autism

Variables		**Frequency**	**Percent (Expressed in %)**
CDS	High CDS	33	76.7
	Low CDS	10	23.3
Focussed attention	Impaired	19	44.2
	Intact	24	55.8
Higher Focussed attention	Impaired	14	32.6
	Intact	29	67.4
Working memory	Impaired LNS	30	69.8
	Intact LNS	13	30.2

		Impaired DB	38	88.4
		Intact DB	5	11.6
Inhibition	Reading words	Impaired	16	37.2
		Borderline	12	27.9
		Intact	15	34.9
	Reading colour	Impaired	19	44.2
		Borderline	16	37.2
		Intact	8	18.6
	Colour word	Impaired	21	48.8
		Borderline	14	32.6
		Intact	8	18.6
Planning		Impaired	42	97.67
		Intact	1	2.3

The cut off scores used in the study was 1.5 above which is considered as High and below 1.5 is considered as low. The percentage of participants obtaining high scores on CDS was 77% and percentage of participants obtaining low scores on CDS was 23%. Working memory was measured using Digit Backwards and Letter number sequencing. The raw score of Digit Span was converted into Scaled score. The scaled score ranges from 1-19. Scaled score of 10 indicated Average performance of a given age group. Scaled scores 7 and 4 are 1 SD and 2 SD below the mean, hence scaled score below 10 is taken as Impaired and Vice versa. 70% of participants have impaired Working memory in Letter Number Sequencing sub test and 30% of participants have intact Working memory in Letter Number Sequencing sub test. 88% of participants have impaired Working memory in Digit span sub test and 12% of participants have intact Working memory in Digit span sub test. Focused Attention and higher focussed

attention were calculated using the time taken to complete the tasks and it is converted into percentile to understand the performance of the subjects relative to children of respective age. 44% of sample have scored below the percentile indicating Impairment in focused attention and 56 % of sample have scored above the 95th percentile indicating intact focused attention. 33% of sample have scored below the percentile indicating Impairment in higher focused attention and 67% of sample have scored below the percentile indicating Intact higher focused attention. In planning domain, the current performance will be obtained in years, it is converted into percentile for the respective ages. The cut off scores for porteous maze (measures Planning) was equal to or less than 5th percentile and it is considered as impaired and above 5th percentile is considered as not impaired. 98% of sample have impaired Planning skills and 2% of sample have intact planning skills.

Table 3: shows the Descriptive Statistics for all variables of the study

Variables		Mean	Std. Deviation
Domains of Autism	Social relationship and reciprocity	21.12	4.484
	Emotional responsiveness	9.77	2.245
	Speech- Language and communication	17.44	3.769
	Behavior patterns	12.37	3.008
	Sensory Aspects	8.98	1.793
	Cognitive component	8.44	2.594

Mild Autism	Overall score of ISAA domains Autism	78.12	9.315
CDS	CDS raw score	24.07	12.686
	Cutoff scores of CDS	1.09	0.61
Working Memory	Digit Backwards	11.74	5.988
	Letter number - Sequencing	7.84	6.810
Focused Attention	Colour Trail test-1	126.33	71.970
(Higher)Focused Attention	Colour Trail Test -2	194.70	93.742
Inhibition	Stroop Word score	48.51	19.389
	Stroop colour score	36.42	15.429
	Stroop colour word score	22.00	9.434
Planning	Maze	6.84	1.745

The mean scores for social relationship and reciprocity was 21.12 ± 4.484, emotional responsiveness was 9.77 ± 2.24, speech-language and communication was 17.44 ± 3.76, behaviour patterns was 12.37 ± 3.00, sensory aspects was 8.98 ± 1.79, and cognitive component was 8.44 ± 2.59. The mean scores for overall score of ISAA domains autism was 78.12 ± 9. 315. The mean for the overall scores of cognitive disengagement syndrome was 24.07 ± 12. 68. The mean scores for the cut off scores of cognitive disengagement syndrome

was 1.09 ± 0.61 indicating Presence of CDS among children with Mild ASD. Digit span is a sum of item scores on Digit span forwards and Digit span backwards. The mean for digit span was 11.74 ± 5.9. Letter number -Sequencing is calculated using summation of scores on tht three trails for that item and each item has a score of 3. The mean for Letter number - Sequencing was 7.84 ± 6.8. Raw scores for Stroop test was calculated as number of correctly read items in all the three tasks. The mean for the word task was 48.51 with the Standard Deviation of 19.39. The mean for the word task and colour word task was 36.42 and 22 with the Standard Deviation of 15.42 and 9.43. Focused Attention was calculated using the time taken to complete the tasks provided in the Colour Trials Test with focused attention being the first trial with 126.33 seconds mean time, and 71.970 standard deviation, while the higher focused attention being the complex second trial with 194.70 seconds mean time, and 93.74 standard deviation.

Table: 4 Independent Sample t-test based on Symptoms of Autism

Variables		**t**	***df***	**Sig. (2-tailed)**	**Mean Difference**
Social relationship and reciprocity	Equal variances assumed	-1.034	41	.307	-1.673
Emotional responsiveness	Equal variances assumed	.107	41	.915	.088

Speech-Language and communication	Equal variances assumed	.803	41	.427	1.097
Behavior patterns	Equal variances assumed	.323	41	.748	.355
Sensory Aspects	Equal variances assumed	-1.264	41	.213	-.812
Cognitive component	Equal variances not assumed	3.613	22.202	.002	2.530

As the independent samples t-test assumption, i.e. homogeneity of variances was violated in some instances but maintained in other instances as seen on Levene's test for equality of variances, the equal variances assumed and equal variances not assumed statistic have both been considered based on the instance of each. The independent sample t test analysis showed that there were significant differences on social relationship and reciprocity, emotional responsiveness, speech-language and communication, behaviour patterns, and sensory aspects among adolescents having autism with CDS and without CDS. There is a significant difference in the cognitive component $t(22.202) = 3.613$, $p < 0.01$ among adolescents having autism with CDS and without CDS. From the descriptive statistic (Table 5) it was observed that adolescents having CDS had higher scores in cognitive component (9.03 ± 2.543) than adolescents not having CDS (6.50 ± 1.71).

Table 5 Descriptive statistics for the Domains of ISAA grouping variable – high CDS and Low CDS.

Variables		N	Mean	Standard deviation
Social relationship and reciprocity	High CDS	33	20.73	4.632
	Low CDS	10	22.40	3.893
Emotional responsiveness	High CDS	33	9.79	2.247
	Low CDS	10	9.70	2.359
Speech- Language and communication	High CDS	33	17.70	4.004
	Low CDS	10	16.60	2.875
Behavior patterns	High CDS	33	12.45	3.123
	Low CDS	10	12.10	2.726
Sensory Aspects	High CDS	33	8.79	1.654
	Low CDS	10	9.60	2.171
Cognitive component	High CDS	33	9.03	2.543
	Low CDS	10	6.50	1.716

Table 6 shows the Independent Sample t-test for EF

Variables			t	df	Sig. (2-tailed)	Mean Difference
Working memory	Letter Number sequencing	Equal variances assumed	.705	41	.485	1.742
	Digit backwards	Equal variances assumed	.086	41	.932	.188
Focussed attention	CTT -IA	Equal variances assumed	-1.789	41	.081	-45.312
Higher focussed attention	CTT-B	Equal variances assumed	-1.096	41	.279	-37.009
Inhibition	Stroop W	Equal variances assumed	.113	41	.911	.797
	Stroop-C	Equal variances assumed	-.623	41	.537	-3.494

	Stroop-CW	Equal variances assumed	1.152	41	.256	3.909
Planning	Maze	Equal variances not assumed	2.169	14.150	.048	1.352

As the independent samples t-test assumption, i.e. homogeneity of variances was violated in some instances but maintained in other instances as seen on Levene's test for equality of variances, the equal variances assumed and equal variances not assumed statistic have both been considered based on the instance of each. The independent sample t test analysis showed that there were no significant differences on working memory, focussed attention and Inhibition among adolescents having autism with CDS and without CDS. There is a significant difference in the planning ability t (2.169) = 2.169, $p < 0.05$ among adolescents having autism with CDS and without CDS. From the descriptive statistic (Table 7) it was observed that adolescents having CDS had lower mean age in planning (9.03±2.543) than adolescents not having CDS (6.50± 1.71).

Table 7 shows the descriptive statistics for Executive Functions based on the grouping variable – high CDS and Low CDS.

	Cutt off variables		**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
	Scaled DB	High CDS	33	4.45	3.866	.673

Working		Low CDS	10	4.50	3.689	1.167
Memory	LNS	High CDS	33	8.24	6.562	1.142
		Low CDS	10	6.50	7.792	2.464
	Score	High CDS	33	11.79	5.846	1.018
		Low CDS	10	11.60	6.769	2.141
	Scaled LNS	High CDS	33	3.21	2.848	.496
		Low CDS	10	2.20	2.440	.772
	Sum of scaled scores	High CDS	33	7.67	5.743	1.000
		Low CDS	10	6.70	5.229	1.654
Focussed attention	CTT -IA	High CDS	33	115.79	66.772	11.623
		Low CDS	10	161.10	81.047	25.629
Higher Focussed attention	CTT-B	High CDS	33	186.09	78.932	13.740
		Low CDS	10	223.10	132.997	42.057
Inhibition	Stroop W	High CDS	33	48.70	17.114	2.979
		Low CDS	10	47.90	26.689	8.440
	Stroop-C	High CDS	33	35.61	14.186	2.469
		Low CDS	10	39.10	19.621	6.205
	Stroop-CW	High CDS	33	22.91	9.224	1.606
		Low CDS	10	19.00	9.989	3.159
Planning	MAZE	High CDS	33	7.15	1.642	.286
		Low CDS	10	5.80	1.751	.554

Table 8 shows the Pearson Correlation statistics of Domains of ISAA and CDS.

Domains of Autism		**CDS**
	Pearson Correlation	Sig. (2-tailed)
Social relationship and reciprocity	.102	.513
Emotional responsiveness	-.038	.809
Speech- Language and communication	-.146	.350
Behavior patterns	-.169	.278
Sensory Aspects	.231	.135
Cognitive component	-.201	.195

The above table (Table 8) show the correlation for the study variables. The findings of the analysis are discussed here. The analysis revealed that there is no correlation between social relationship and reciprocity, emotional responsiveness, speech-language and communication, behaviour patterns, sensory aspects and Cognitive component of ISAA and CDS.

DISCUSSION

As proposed in the previous chapters the main aim of this research is to explore presence of CDS among Adolescents with mild Autism and to study Executive functions of Adolescents with mild autism. In addition, it also aims to study the difference in Executive functions of adolescents with Mild Autism having CDS and not having CDS. It also studies the relationship between CDS and Symptoms of Autism. The results of the study shows that 77% of sample has CDS among adolescents with Mild Autism. Prior studies indicates that the prevalence of CDS was 50% during adolescence (Mayes et al., 2022). Presence of CDS as a comorbidity in the diagnosis of ASD results in more impairment in social, academic and poses heightened risk for internalizing disorders (Barkley, 2018).

The study hypothesized that there are no deficits in the areas of Executive functioning among adolescents with ASD. The results obtained were contradictory to the previous studies which have indicated deficits in focused attention among children with autism. The current study results did not support the evidence, the reason could be attributed to that most of the children had intact intellectual functioning. The similar result and finding has been revealed in one of the studies done by Pascualvaca et al., 1998. The study done by Lundervold et al., 2016 have also supported the finding of our current study and he has explained that intellectual functioning could act as a protective factor against developing clinically significant impairment in focused attention. Up to 30% of sample only showed impairment in higher focused attention which could be due to failure of the test to produce significant level of task difficulty and the current findings does not necessarily indicate intact higher focused attention. The study has failed to reject the null hypothesis in the area of Working memory. 70% to 80% of sample had impairment in Working memory. The results of the study are in line with the studies by Bennetto et al., 1996; Mayes & Calhoun, 2008; Geurts & Vissers,

2012; Gilotty et al., 2002. In the study by Mayes & Calhoun, 2008 used digit span and Letter number sequences of WISC-IV to measured WM among high functioning autism. The study revealed Working memory index was two standard deviations below the mean indicating impairment in WM. Although Children with autism have deficits in communication, the deficits in WM could not be attributed to the verbal nature of the test. Because of lack of proficiency in employing verbal strategies to enhance their working memory capacity and, consequently, they struggle to regulate their actions effectively (Joseph et al., 2005). However, when both performances based working memory task and verbal WM given there was no improvement in the performance WM (Joseph et al., 2005). In the digit span task, some of subjects were able to recall the numbers but not in the said sequence was observed by the researcher. The same is observed in the study by Schuh & Eigsti, 2012. The difficulty in recalling sequences is due to impaired temporal processing (Schuh & Eigsti, 2012). Deficits in working memory will have an effect in the daily living. There is a direct relationship between working memory deficits and adaptive functioning (Gilotty et al., 2002). Deficits in WM results in difficulty in everyday functioning such as performing multiple tasks, having a track of things that one needs to be done and task completion (Schuh & Eigsti, 2012).

The study has failed to reject the null hypothesis in the area of Planning. The study also hypothesised that there will be no difference in Executive functioning of adolescents having autism with CDS and without CDS. Failure to reject the null hypothesis in the area of Planning. These results are in line with the previous studies by Russell, 1997; Demetriou et al., 2018; Low et al., 2009; Ozonoff & McEvoy, 1994. In addition, review of literature reveals that deficits in the area of Executive function especially planning is linked to deficits in theory of mind which is manifested in the form of impaired ability to explain the individuals' affective states (Kimhi et al., 2014). Planning is also reflected in the areas of

academic performance such as timely initiation and completion of the task, planning and executing the study timings, prioritizing and allocating resources accordingly and not getting stuck if the plan did not go in the anticipated manner. One of the features of CDS include initiating the tasks and timely completion of assignments, this could be due to deficits in the area of planning (Reno, A. J., 2012). The planning deficits was more seen among adolescent children with autism because of the increased expectation from the parents and increased environmental demands from school and home as their chronological age increase (Rosenthal et al., 2013; Van Den Bergh et al., 2014). Further, there was no correlation found between mild level of autism and planning deficits (Van Den Bergh et al., 2014). In this study, maze was used to measure planning ability. During the assessment of maze task, some of the children got stuck in the blind alley in the first trail and when given second trail they impulsively traced the same route and redrew in the same path. This reflects the individuals with deficits in planning and difficulty in visualising the path visuo-spatially (Reno, A. J., 2012).

The study has failed to reject the null hypothesis in the area of Inhibition. The distribution of scores in the three tasks reveals that the sample exhibited reading difficulties and reading comprehension. The results are in line with the studies by Merchán-Naranjo et al., 2016; (Katagiri et al., 2013; (Bíró & Russell, 2001). This could be due to increased activation in the brain in the area of left insula (Schmitz et al., 2006). In daily living reduced inhibition results in increased restricted and repetitive behaviours in a situation that is more involves more ambiguity.

The study hypothesized that there is no significant difference in domains of ISAA among adolescents with Mild Autism having CDS and not having CDS. Null hypothesis is accepted in the domains of social relationship and reciprocity, Emotional responsiveness, speech – language communication, behavior patterns and sensory domains of ISAA among

adolescents with Mild Autism having CDS and not having CDS. It could be attributed to attributed to nature of sample that is selected in the study i.e age. From childhood to adolescents, there could be improvement in the social relationship and reciprocity; and speech language communication but the progress does not nullify the symptoms. However, the co-morbidity of Intellectual disability accounts for the poor prognosis, increased severity in relative to individuals with better communication ability (Shattuck et al., 2007); intellectual functioning (Maenner et al., 2020) and age of the sample (Shattuck et al., 2007). However, the results of this study in the domain of Emotional responsiveness is contradicting the results of the study by Barkley, 2012 which shows that individuals with SCT have no deficts in regulating one's own emotion. Challenging behaviour patterns was more frequently observed in co-morbid condition of Intellectual disability (Maenner et al., 2020). Restricted and repetitive patterns of behaviours was found to be improved over the period from childhood to adolescents (Shattuck et al., 2007 The sample in the current study comprises of Below average and Average intellectual functioning adolescents with ASD. Hence, there was no significant differences in behaviour patterns of adolescents having CDS and not having CDS.

The study results shows that there are significant differences in the cognitive domain of Autism between group with CDS and without CDS. The salient feature of Cognitive Disengagement Syndrome is decoupling of attention, getting easily distracted and day dreaming. Inattention was found to be a significant predictor of CDS (Mayes et al., 2022). In addition, needing support to sustain the attention and orienting the attention is associated with CDS (Penny et al., 2009). Pace of cognitive processing is related to CDS and the individuals with high CDS and ASD might require more time to cognitively process the information than ASD only group. Results from the study by Creque & Willcutt., 2021 indicated that CDS is associated with slower reaction time. Individuals with ASD have significant impairment in

the ability to adjust to the environment but ASD and CDS poses heightened risk for maladjustment in the social functioning. Hence, there exists a significant difference (t= 3.613, $P<0.05$) in cognitive component of adolescents having CDS and not having CDS. Ther are no significant differences in other domains other than Cognitive aspects of ISAA between two group. This study highlights the need for identifying CDS and need to tailorize the interventions strategies accordingly in various areas of functioning such as home, school and community.

Limitations

The results of the study cannot be generalized to other non-clinical and clinical group of population. The Sluggish Cognitive Tempo scale was rated by parents hence the information might be exaggerated or understated or biased. The SCT was measured only in the home setting, future studies could integrate teachers rating scales as well. As it might provide a comprehensive view about the child in different setting. The sample size of the study is small, hence estimating between and within group difference might not depict the population of ASD. The study did not estimate the gender difference as the sample comprises mostly of male subjects. Different types of attention could have provided a detailed view on attention rather than derived conclusion from one type of attention only. The current study did not assess the other cognitive functions such as visual, spatial WM, sustained attention, and cognitive flexibility which can also be studied in detail to understand their impact on CDS among children with ASD. CDS is a predictor of sleep problems and internalizing behaviours. Adolescence is a crucial phase and high vulnerability for developing sleep disturbances and internalizing behaviours. These variables were not studied in the current study.

SUMMARY & CONCLUSION

The study identified the presence of CDS in ASD and identify the deficits in the EF such as Inhibition, working memory and planning area. The study also highlights the differences in the planning domain of EF between adolescents having high CDS and Low CDS. This is important in designing interventions accordingly. Also, the results of this study emphasis the need for new strategies to manage individuals with CDS in academic setting and at home. The impairment in planning domain is very significant in the study. Planning is essential for everyday activities also in selecting their career after their formal education. Assessing, Acknowledging and appreciating the strengths in ASD is more essential for development of self esteem and quality of life. CDS is a predictor for internalizing disorders. Hence identifying CDS paves way for primary prevention. Longitudinal and intervention studies could be carried out in area of CDS and ASD.

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APPENDICES

Annexure: 1

Informed Consent Form English

National Institute for Empowerment of Persons with Multiple Disability (NIEPMD)
Ministry of Social Justice and Empowerment, Govt. of. India
Muttukadu, ECR Road, Chennai – 603 112
Ph: 70940 93184, NIEPMD PHONE NO. 044-27472113, 27472046;

E-mail: nivethashanmugam1399@gmail.com

COGNITIVE DISENGAGEMENT SYNDROME AND EXECUTIVE FUNCTIONS AMONG ADOLESCENTS WITH AUTISM

STUDY INFORMATION SHEET

Cognitive disengagement syndrome was commonly seen in adolescent with Autism. Identifying significance of Cognitive Disengagement Syndrome in autism diagnosis paves way for greater understanding of the symptoms and aids in renewed intervention plan

Voluntary Participation:

Your participation in this study is completely voluntary and you can refuse to participate at any point of time.

Withdraw from the study:

You are free to choose whether or not you want to be a part of this study. Saying "NO" will not affect your relationship with the researcher or the institute and your child will be receiving standard treatment.

Confidentiality:

The personal information given by you will be kept confidential. Only members of the research team will know your name and details. Your name will not appear in any report or publication. However, the overall results of the study will be published in the research journals.

Mode of session & Video Recording:

All the sessions will be conducted in a room setting. The sessions will not be audio or video recorded.

Undertaking by the researcher

Your consent to participate in the above research by Ms Kalaivani and Ms.Nivetha, Department of Clinical Psychology, NIEPMD, Chennai is sought. You have the right to refuse consent or withdraw the same during any part of the research without giving any reason. In such an event, your child will still receive the best possible treatment, without prejudice. If you have any

doubts about the research, please feel free to clarify the same. Even during the research, you are free to contact the researcher (Ms. P. Kalaivani or Ms. Nivetha). The information provided by you will be kept strictly confidential.

CONSENT TO PARTICIPATE IN THE RESEARCH STUDY

	YES/NO
I confirm that I have had an adequate explanation and have clearly understood the information sheet of the study and have had the opportunity to ask questions.	
I understand that my participation is voluntary and that I am free to withdraw from the study at any time without giving a reason, without my treatment being affected.	
I understand that all personal informations I shared will be kept confidential and will not be shared with anyone other than those involved in the research study.	
I agree to take part in the above study voluntarily	
I have received a copy of the study information sheet and consent form	

Name of the Informant: Signature:

Date:

Name of the researcher: Nivetha Signature:

Date:

Annexure: 2

Informed consent form Tamil

ஒன்றுக்கும் மேற்பட்ட ஊனமுற்றோரின் மேம்பாட்டிற்கான தேசிய நிறுவனம் (NIEPMD)

சமூக நீதி மற்றும் அதிகாரம் வழங்கல் அமைச்சகம், இந்திய அரசு

முட்டுக்காடு, கிழக்கு கடற்கறை சாலை, சென்னை – 603 112

தொ.பே:7094093184, NIEPMD தொ.பே: 044-27472113, 27472046

மின்னஞ்சல்: nivethashanmugam1399@gmail.com

தலைப்பு: பருவ வயது ஆடிஸம் உள்ள குழந்தைகளிடையே காக்ணிடிவ் டிஸ்ஏங்கேஜ்மன்ட் சின்டரோம் மற்றும் முன்மூளை செய்யல்பாடுகள் பற்றிய ஆய்வு

ஆய்வு தகவல் தாள்

காக்ணிடிவ் டிஸ்ஏங்கேஜ்மன்ட் சின்டரோம் (Cognitive disengagement syndrome) பொதுவாக ஆடிஸம் உள்ள குழந்தைகளிடையே காணப்படுகிறது. ஆடிஸம் உள்ள இளம் பருவ குழந்தைகளுகளிடையே அடையாளம் காண்பது இன்றியமையாதது ஏனெனில் இந்த ஆய்வு அறிகுறிகளைப் பற்றிய கூடுதல் புரிதலுக்கு வழி வகுக்கிறது. மேலும், புதுப்பிக்கப்பட்ட தடுப்பு திட்டத்திற்கு வழிவகுகின்றது.

இந்த ஆய்வில் ஏதேனும் செலவுகள் உள்ளதா?

இல்லை, இதில் எந்த செலவும் இல்லை.

இது சட்டப்படி அமலாக்கப்படுமா?

இல்லை, இது சட்டப்பூர்வ ஆவணம் அல்ல. இது ஒரு ஆய்வு ஆவணம்.

நான் பங்கேற்றால் ஏதேனும் எதிர்மறையான விளைவுகள் ஏற்படுமா?

இல்லை, இந்த ஆய்வில் பங்கேற்பது எதிர்மறையான விளைவுகளுக்கு வழிவகுக்காது.

ஆய்வில் பங்கேற்க ஏதேனும் அடிப்படைத் தேவைகள் உள்ளதா?

இல்லை.

தன்னார்வ பங்கேற்பு:

இந்த ஆய்வில் நீங்கள் பங்கேற்பது முற்றிலும் தன்னார்வமானது மற்றும் நீங்கள் பங்கேற்க மறுக்கலாம்.

படிப்பில் இருந்து விலக:

இந்த ஆய்வின் ஒரு பகுதியாக நீங்கள் இருக்க விரும்புகிறீர்களா இல்லையா என்பதைத் தேர்வுசெய்ய உங்களுக்கு சுதந்திரம் உள்ளது. "இல்லை" என்று கூறுவது ஆராய்ச்சியாளர் அல்லது நிறுவனத்துடனான உங்கள் உறவைப் பாதிக்காது, மேலும் உங்கள் குழந்தை நிலையான சிகிச்சையைப் பெறும்.

இரகசியத்தன்மை:

நீங்கள் அளிக்கும் தனிப்பட்ட தகவல்கள் ரகசியமாக வைக்கப்படும். ஆராய்ச்சி குழுவில் உள்ளவர்கள் மட்டுமே உங்கள் பெயர் மற்றும் விவரங்களை அறிவார்கள். உங்கள் பெயர் எந்த அறிக்கையிலும் அல்லது வெளியீட்டிலும் தோன்றாது. இருப்பினும், ஆய்வின் ஒட்டுமொத்த முடிவுகள் ஆய்வு இதழ்களில் வெளியிடப்படும்.

ஆய்வாளரால் மேற்கொள்ளப்படுகிறது

திருமதி எஸ்.கே அவர்களின் மேற்கூறிய ஆராய்ச்சியில் பங்கேற்க உங்கள் ஒப்புதல் திருமதி **கலைவாணி** மற்றும் திருமதி **நிவேதா**, மருத்துவ உளவியல் துறை, NIEPMD, சென்னை தேடப்படுகிறது. ஆராய்ச்சியின் எந்தப் பகுதியிலும் எந்த காரணமும் கூறாமல் சம்மதத்தை மறுக்கவோ அல்லது திரும்பப் பெறவோ உங்களுக்கு உரிமை உண்டு. இதுபோன்ற ஒரு நிகழ்வில், உங்கள் பிள்ளை பாரபட்சமின்றி, சிறந்த சிகிச்சையைப் பெறுவார். ஆராய்ச்சியில் ஏதேனும் சந்தேகம் இருந்தால், அதைத் தெளிவுபடுத்தவும். ஆராய்ச்சியின் போது கூட, ஆய்வாளரைத் (திருமதி. வர்தினி கிருஷ்ணமூர்த்தி அல்லது திருமதி. எஸ்.கே. ஆனந்தலட்சுமி) நீங்கள் தொடர்புகொள்ளலாம். நீங்கள் வழங்கிய தகவல்கள் கண்டிப்பாக ரகசியமாக வைக்கப்படும்.

ஆராய்ச்சி ஆய்வில் பங்கேற்க ஒப்புதல்

	ஆம் /இல்லை
என்னிடம் போதுமான விளக்கமும், ஆய்வின் தகவல் தாளைத் தெளிவாகப் புரிந்து கொண்டு கேள்விகள் கேட்கும் வாய்ப்பும் கிடைத்துள்ளது என்பதை உறுதிப்படுத்துகிறேன்.	
எனது பங்கேற்பு தன்னார்வமானது என்பதையும், எந்த நேரத்திலும் காரணம் கூறாமல் படிப்பில் இருந்து விலகிக் கொள்ளலாம் என்பதையும் புரிந்துகொள்கிறேன்.	
நான் பகிரும் அனைத்து தனிப்பட்ட தகவல்களும் ரகசியமாக வைக்கப்படும் என்பதையும், ஆராய்ச்சி ஆய்வில் ஈடுபட்டுள்ளவர்களைத் தவிர வேறு யாருடனும் பகிரப்படமாட்டாது என்பதையும் புரிந்துகொள்கிறேன்.	
மேலே உள்ள ஆய்வில் தானாக முன்வந்து பங்கேற்க ஒப்புக்கொள்கிறேன்	
ஆய்வு தகவல் தாள் மற்றும் ஒப்புதல் படிவத்தின் நகல் எனக்கு கிடைத்துள்ளது	

பங்கேற்பாளரின் பெயர்: கையொப்பம்:

தேதி:

ஆய்வாளரின் பெயர்: நிவேதா கையொப்பம்:

தேதி:

Annexure: 3

Socio demographic details

Name:

Reg number:

Age:

Gender:

DOB:

School:

Education:

Place:

Contact number:

Informant:

Co- morbidity (Physical, mental and neurological): P/A

Sensory impairment: P/A

Co-operative: Y/N

Is the client under any pharmacological intervention for specific cognitive mechanisms:

Has the client ever under gone cognitive remediation programs in the past or in the present:

Annexure: 4

SCT Scale (Penny et al., 2009)

_____

Child's Initials: Gender: Education:
Age: DOB: __ /__ /____ Name of the examiner:
Today's Date: Contact number of the informant:
Form completed by (circle one): Mother Father Homeroom Teacher Other_____

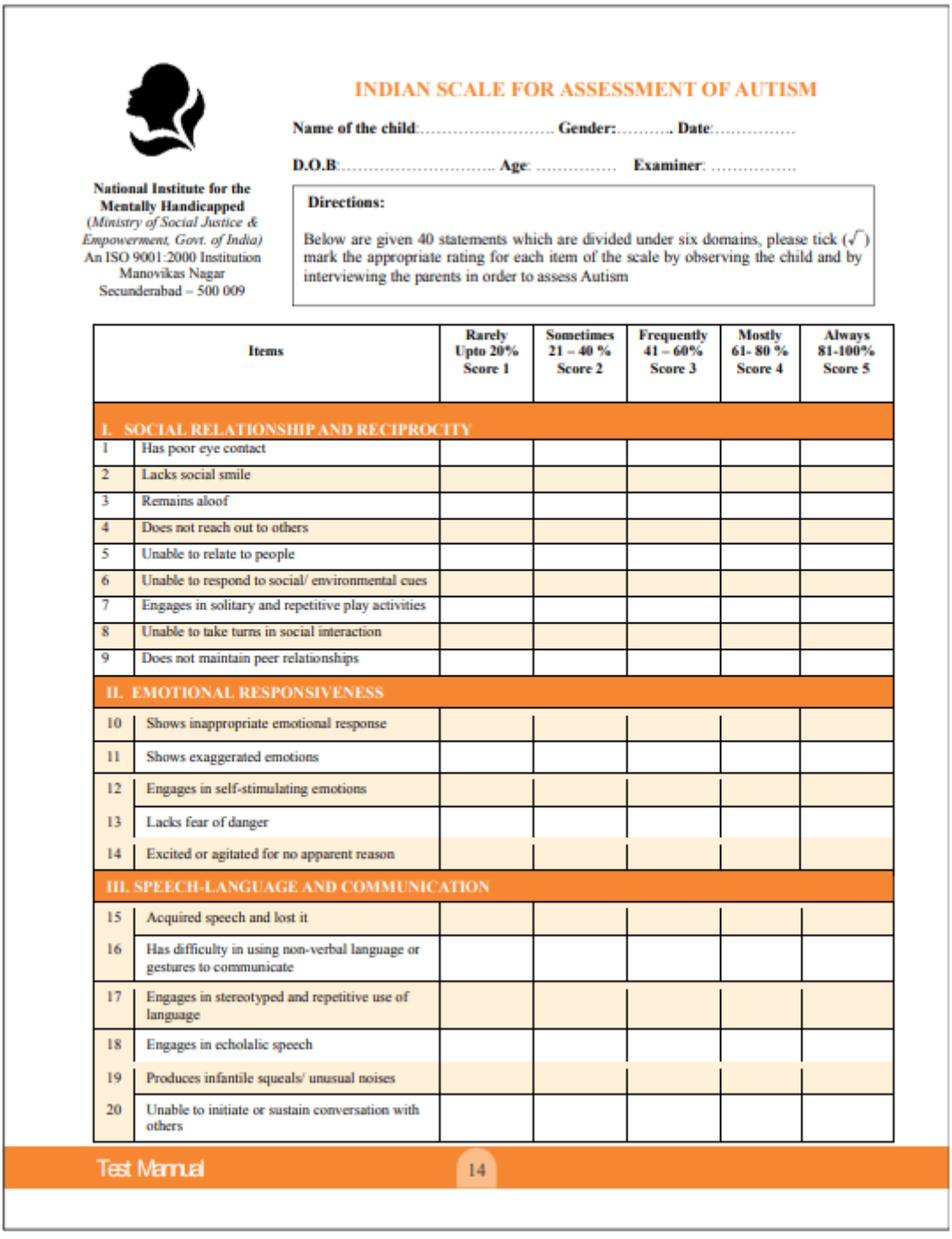
INSTRUCTIONS: Check the column that best describes this child at this time.

Statements	*Not At All (0)*	*Just A Little (1)*	*Pretty Much (2)*	*Very Much (3)*
1. Is apathetic; shows little interest in things or activities	0	1	2	3
2. Is slow or delayed in completing tasks	0	1	2	3
3. Is unmotivated	0	1	2	3
4. Appears to be sluggish (Sluggish- Moving or walking more slowly)	0	1	2	3
5. Seems drowsy	0	1	2	3
6. Stares blankly	0	1	2	3
7. Daydreams	0	1	2	3
8. Appears tired; lethargic	0	1	2	3
9. Gets lost is his or her own thoughts	0	1	2	3
10. Lacks initiative to complete work	0	1	2	3
11. Needs reminders to get started or keep working on assignments	0	1	2	3
12. Seems to be in a world of his or her own	0	1	2	3
13. Effort on tasks fades quickly	0	1	2	3
14. Is easily sidetracked (Sidetracked- to direct a person's attention away from an activity towards another one that is less important)	0	1	2	3
15. When trying to listen, misses some information	0	1	2	3
16. Needs reminders to pay attention	0	1	2	3
17. Has a yawning, stretching, sleepy-eyed appearance	0	1	2	3
18. Needs extra time for assignments	0	1	2	3
19. Is underactive, slow moving, or lacks energy	0	1	2	3
20. Does not complete tasks	0	1	2	3
21. Loses place in activities and conversations	0	1	2	3

Penny, A. M., Waschbusch, D. A., Klein, R. M., Corkum, P., & Eskes, G. (2009). Developing a measure of sluggish cognitive tempo for children: Content validity, factor structure, and reliability. *Psychological Assessment, 21*(3), 380-389. doi: 10.1037/a0016600

Annexure: 5

Indian Scale for Assessment of Autism (ISAA)



National Institute for the Mentally Handicapped
(Ministry of Social Justice & Empowerment, Govt. of India)
An ISO 9001:2000 Institution
Manovikas Nagar
Secunderabad – 500 009

INDIAN SCALE FOR ASSESSMENT OF AUTISM

Name of the child..... **Gender:**..... **Date**:.....

D.O.B:..... **Age**: ..... **Examiner**: .....

Directions:

Below are given 40 statements which are divided under six domains, please tick (√) mark the appropriate rating for each item of the scale by observing the child and by interviewing the parents in order to assess Autism

	Items	Rarely Upto 20% Score 1	Sometimes 21 – 40 % Score 2	Frequently 41 – 60% Score 3	Mostly 61- 80 % Score 4	Always 81-100% Score 5
I. SOCIAL RELATIONSHIP AND RECIPROCITY						
1	Has poor eye contact					
2	Lacks social smile					
3	Remains aloof					
4	Does not reach out to others					
5	Unable to relate to people					
6	Unable to respond to social/ environmental cues					
7	Engages in solitary and repetitive play activities					
8	Unable to take turns in social interaction					
9	Does not maintain peer relationships					
II. EMOTIONAL RESPONSIVENESS						
10	Shows inappropriate emotional response					
11	Shows exaggerated emotions					
12	Engages in self-stimulating emotions					
13	Lacks fear of danger					
14	Excited or agitated for no apparent reason					
III. SPEECH-LANGUAGE AND COMMUNICATION						
15	Acquired speech and lost it					
16	Has difficulty in using non-verbal language or gestures to communicate					
17	Engages in stereotyped and repetitive use of language					
18	Engages in echolalic speech					
19	Produces infantile squeals/ unusual noises					
20	Unable to initiate or sustain conversation with others					

Test Manual 14

	Items	Rarely Upto 20% Score 1	Sometimes 21 – 40 % Score 2	Frequently 41 – 60% Score 3	Mostly 61- 80 % Score 4	Always 81-100% Score 5
21	Uses jargon or meaningless words					
22	Uses pronoun reversals					
23	Unable to grasp pragmatics of communication (real meaning)					
IV. BEHAVIOUR PATTERNS						
24	Engages in stereotyped and repetitive motor mannerisms					
25	Shows attachment to inanimate objects					
26	Shows hyperactivity/ restlessness					
27	Exhibits aggressive behavior					
28	Throws temper tantrums					
29	Engages in self-injurious behavior					
30	Insists on sameness					
V. SENSORY ASPECTS						
31	Unusually sensitive to sensory stimuli					
32	Stares into space for long periods of time					
33	Has difficulty in tracking objects					
34	Has unusual vision					
35	Insensitive to pain					
36	Responds to objects/people unusually by smelling, touching or tasting					
VI. COGNITIVE COMPONENT						
37	Inconsistent attention and concentration					
38	Shows delay in responding					
39	Has unusual memory of some kind					
40	Has 'savant' ability					

Classification	No Autism < 70	Mild Autism 70 to 106	Moderate Autism 107 to 153	Severe Autism > 153
Total score				