DEVELOPMENT OF A SCREENING TOOL FOR ADOLESCENTS

WITH LEARNING DISABILITY

Ms. Bhoomika

Registration No: P01II21S0007

A Dissertation Submitted in Part Fulfilment of Degree of

Master of Science (Speech Language Pathology)

University of Mysore

ALL INDIA INSTITUTE OF SPEECH AND HEARING

MANASAGANGOTHRI, MYSURU-570006

SEPTEMBER, 2023

CERTIFICATE

This is to certify that this dissertation entitled "**DEVELOPMENT OF A SCREENING TOOL FOR ADOLESCENTS WITH LEARNING DISABILITY**" is a Bonafide work submitted in part fulfillment for the degree of Master of Science (Speech-Language Pathology) of the student Registration Number: P01II21S0007. This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other University for an award of any other diploma or degree.

Mysuru   Dr. M Pushpavathi

September 2023   Director

All India Institute of Speech and Hearing

Manasagangothri, Mysuru - 570006

CERTIFICATE

This is to certify that this dissertation entitled "**DEVELOPMENT OF A SCREENING TOOL FOR ADOLESCENTS WITH LEARNING DISABILITY**" is a bonafide work submitted in part fulfillment for degree of Master of Science (Speech-Language Pathology) of the student Registration Number: P01II21S0007. This has been carried out under my guidance and has not been submitted earlier to any other University for award of any other diploma or degree.

Mysuru

September 2023

Dr. Priya.M.B

Guide

Assistant Professor in Speech Pathology

Dept. of Speech Language Pathology

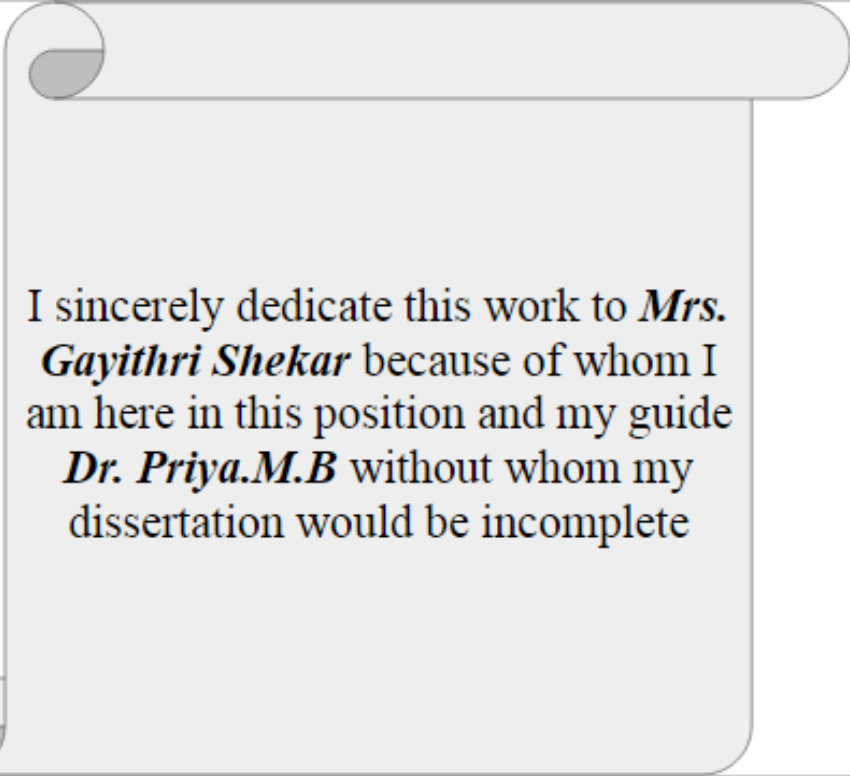All India Institute of Speech and Hearing

Manasagangothri, Mysuru - 570006

I sincerely dedicate this work to **_Mrs. Gayithri Shekar_** because of whom I am here in this position and my guide **_Dr. Priya.M.B_** without whom my dissertation would be incomplete

Acknowledgement

Acknowledging the good you have in your life is the foundation for all abundance. With this regard I would like to extend my gratitude to all those who have helped me reach this extent of being in an extraordinary profession of a speech language pathologist.

*First and foremost, I would like to thank my **amma, appa and doddamma** who believed in me when I did not believe myself and for constantly supporting me throughout my studies. Also, my brothers, **chari - lishi,** who always supports me when I want to do something, who guards me, guides me, who listens to all my silly talks and cheers me up. A big thank you to my sweetheart sister **somy,** you have been my cheergurl, who coverups for me at home and to my little princess **chaanu** for making my heart happy. **Thank you athe** and **mama** for helping me chose this course which immensely brought the best version of mine.*

*This dissertation of mine would not have been possible without your immense support and guidance of my guide, my inspiration, my lady crush **Dr. Priya.M.B**. You have been an amazing guide since my Journal Club till the completion of my dissertation. Your attitude of looking into things has always amazed me and inspired me. I have learnt a lot from you. Be it in attitude, be it in learning, be it in handling things at the last moment, be it the depth of your knowledge and analyzing skills each and everything has stunned me, Thank you mam for everything. My dissertation would not have been this smooth if I had not had you guys as my dissertation partners **Nithya** and **Divya**. Thank you for always standing by*

people (kastu, liki tom, kulli and chuppi) who stayed constantly with me in all my laughs, sorrows, ups & downs, tripping, dressing, doing things together. It would not have been this smooth without you guys. Be it tolerating me, be it matching my madness, be it taking good care of me, motivating me to complete tasks and what not. You guys were always there for me whenever I needed it the most. Thank you for always standing up for me throughout this journey. You guys were my 2nd home. Words are not enough to express my gratitude to kastu, for being my unpaid therapist and liki who has been my family from 6 years which started from room no. 113. kulli my technician, you know that u have played a major role in making my life at AIISH easier especially in academics; chuppi for always matching my madness level and helping me get permissions at schools. Also, I would like to thank all my girls from "hudgir adda" (kastu, liki, kulli, chuppi, manasa, rohini, varsha) for making AIISH a better place to live in. Thank you Sumanth, my pseudo dissertation partner and my constant irritator and my dearest friend for always reminding me about the works and care that you showed on me to complete my dissertation. You guys made my life at AIISH even more beautiful with unforgettable memories

I express my gratitude to my all-time constants "my school buddies". No matter how far apart we were, you guys were and are always there for me. I thank my best friend Manvith, one phone call from you has made me feel better, stronger, motivated me to perform even better. You have always been a person who understands me even without saying; Pavan, my well-wisher, my alarm clock and a good friend, you were there at my worst times, cheered me up and who listens always listens to my 'en aythu gotha'; Charan, for always being my lucky charm and saying positive things which has happened.

You guys made me feel special and lucky all the time. I also thank my belovable friend

shwetha *for always boosting my confidence.*

*I would like to thank all my seniors, my II MScs (**Anu akka, Shruthi akka, Suppu akka,***

***Chaithra akka, priyadarshini mam, Rakshith anna, Gowtham anna, Madhu anna, Sujan**)*

who introduced many aspects and cultures of AIISH which we even follow and cherish.

*I thank **Sujan**, my best ever person that I met in AIISH for teaching me many aspects,*

guiding me what is good and not and making me a stronger and better person to face the

hard reality of life.

*I would also thank my soul sister **Ankitha akka** for always supporting me, being there for*

me, for guiding me and for all the love that you showered on me. You have been a home

*to me. On demand and with love, I would like to thank my **roomie chandu** for making me*

feel better by providing moral support, cute talks and acts of yours.

I also would like to extend my gratitude to all batchmates and my pals from section A

*(especially **Manasa,** my partner in all the crimes that we do in the class and for always*

*asking 'bhomi enadru help beka', **Angeline and Getcy** for always making me feel normal*

*and relaxed, **Swalih** for being my Neighbour therapist) section B (**Thejas** for making me*

feel that we are in the same boat, Shashank for indirectly motivating me to work with

*your unnecessary and necessary works and **Rhea** for making me feel that I was not alone*

in completing data collection).

I always thought that sports were not my cup of tea. But when I started with table tennis,

it made me feel so much better and boosted me. It became my stress burster. I thank all

*my TT mates (**Sujeeth, Manja, Dinesh, Vidya, Nishant, Mayank, Sumanth, Thejas, Aishwarya, Arun sir, Gowtham anna** etc) for indirectly contributing to my well-being. Special thanks to my TT partner and a good friend **Sujeeth** for all the drops and rides that you gave and for encouraging me to explore different food.*

*I express my gratitude to **Adhi** for being such a caring, loveable and special person who helped me get permissions from school authority, for always reminding me to work, for being an alarm clock and for comforting me. I thank **Manja** from being my best escortee who said 'akka ivathu olle ride madsthini' till accompanying me every day after TT matches, for the rides and for everything. You made it beautiful. I thank my first years (**Spurthy, Meghana, Vidya, Rakshitha, Nireeksha, Shashank, Chethan, Rajesh, Varshith, Kavan**) and my lovely juniors (**Ashi, Vidya, Deepthi, 2 feet, Dinesh, Aishu, Hithya**) juniors who contributed directly or indirectly by your talks and funny jokes that acted as stress bursters.*

*I thank **AIISH** for providing all this opportunity in terms of providing clinical training, library access and providing me with a hostel room with a beautiful view (my fav spot). I thank AIISH for all such memories that friends that it gifted me.*

*I thank **Kaveri akka and Prekshith bhava** for being my 2nd akka-bhava. I truly cherish it. Thank you, all the stress bursting rides, and talks.*

Finally, I'm gonna thank me who made all this possible from choosing a guide, finalizing the topic, developing the tool, following up regarding content validation, data collection, doing analysis, writing dissertation, for balancing classes, clinics, dissertation and my

personal happiness inspite of having all the odds. I may have made many mistakes in

carrying out these but definitely it will all add to my experience. Cheers to you **bhoomss...**

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Learning disability (LD) refers to a broad category of conditions marked by substantial difficulties in the acquisition and application of listening, speaking, reading, writing, thinking, or arithmetic skills. Using information from the National Survey of Children's Health, a lifetime prevalence study was conducted among individuals with LD in the US, which indicated a 9.7% lifetime prevalence rate among US children (Altarac & Saroha, 2007). A study carried out on 14,983 US children and teenagers aged 3 to 17 years who participated in the National Health Interview Survey (NHIS) in 2019 and 2020 revealed a prevalence rate of 6.4% (Yang et al., 2020). Similarly, 1-19% of school going children in India have LD (Kuriyan & James, 2018). A recent prevalence study in Ernakulum district of Kerala state among school going children revealed a 16.49% prevalence rate of LD; out of which 12.57% was attributed to reading difficulty, 15.6% to difficulty in writing and 9.93% to difficulty in mathematics (Chacko & Vidhukumar, 2020).

A positive correlation exists between language development and academic and social success (Nippold, 1993). In the recent past, awareness about LD has increased significantly consequent to which, there is a significant increase in the number of individuals being identified as LD. As a result, both the incidence and prevalence of LD is increasing day by day. Accurate diagnosis of LD requires a thorough examination of the features associated with them. However, the difficulties associated with LD vary across ages. LD is neurobiological in nature, and hence, the difficulties originating in early

childhood persist through adolescence and adulthood. The characteristic features observed in early childhood and school years take on a different form and represent different sets of traits in adolescence and adulthood, affecting a wide range of domains. There is evidence to substantiate that language and learning difficulties that originated in early childhood eventually result in negative effects on individuals' educational and psychosocial aspects (Wiig & Roach, 1975), making it necessary to identify the condition and intervene at the earliest possible.

Pre-school children at risk for LD have problems in listening skills, oral language skills, phonological awareness skills, verbal memory and early literacy, phonological awareness tasks, reading, writing and mathematical abilities (Shanbal et al., 2010). Difficulties in adolescents with LD affect a greater number of domains compared to younger children. Adolescents with LD are reported to have limited comprehension and expression of oral language, reduced speed and accuracy, naming and retrieval deficits, word finding difficulty, reduced phrase length and simplified grammatical form, delay in cognition growth, and limited concrete concepts (Wiig & Semel, 1975; Deshler et al., 1982), reduced syntactic and semantic skills, reduced adaptive social behavior, social imperceptions, reading and writing (Beach et al., 2015; Wiig & Semel, 1974). They are often reported to have listening problems, auditory discrimination auditory association problems, and auditory perception problems (Barwasser et al., 2021; Bateman, 1964; Faigel, 1973) in addition to difficulties in sequential memory, thinking, reasoning and judgement, executive functioning and metacognition (Deshler et al., 1982). In addition, behavioral problems like reduced motivation, anxiety, depression, suicidal thoughts and

poor self-regulatory behavior are common characteristics of this population (Bender et al., 1996; Huntington & Bender, 1993).

On the other hand, adults with dyslexia are reported to have difficulties in word finding, phonological processing skills, working memory, auditory abilities, visuo-motor skills, understanding of environmental stimulus, phonological representations, reading and writing (Cohen-Mimran, 2006; Laasonen et al., 2014; Ramus et al., 2003). Thus, various traits are observed across different stages of development, including preschool years, adolescence, and adulthood. Much of the research in LD has focused on problems faced by young children and their early identification. However, there is less evidence established for adolescents with LD and their assessment.

There are a good number of assessment tools available for children and adults with LD, both in the western context and Indian context. For example, 'Screening test for preschool children' (Age range: 3.5 to 4.5 years; Fawcett, Nicolson & Lee, 2003), the 'Dyslexia early screening test' (Age range: 4.5 to 6.5 years; Fawcett & Nicolson, 1995), the 'Dyslexia screening test – Junior' and 'Dyslexia screening test –Secondary' (Age range: 6.5 to 16.5 years; Fawcett and Nicolson, 1996, 2004a, 2004b) and the 'Dyslexia adult screening test' (Age range 16.5 to 65 years; Fawcett and Nicolson, 1998). In the Indian context, there are tools like Early Literacy Screening Tool (Age range: 3 to 6 years; Shanbal, 2010), Dyslexia Assessment Profile for Indian Children (Grade I-V; Kuppuraj & Shanbal, 2009); the 'Dyslexia assessment for languages of India – dyslexia assessment battery' (Grade I-V; Rao et al., 2021); 'A screening tool for bilingual/multilingual adults

with dyslexia (Age range: 16 to 21 years; Shilpa & Shyamala, 2013), updated NIMHANS Specific Learning Disability Battery (Grade I-X; Panicker et al., 2015). It is thus evident that very few of the available assessment tools cater to the adolescent age group. A recent study about the NIMHANS battery revealed that the battery is very brief and does not adequately illustrate the complexities of evaluation and interpretation in marginal and complex settings; thereby questioning its effectiveness in diagnosing Specific Learning Disability (Roopesh, 2021).

1.1   Need for the study

Adolescence is a sensitive phase of development that includes significant changes in biological as well as social aspects (Sawyer et al., 2018). During this stage, dynamic growth of biological processes results in a host of hormonal changes. Owing to the physical and hormonal changes during this stage, adolescents are at greater risk for acquiring deviant behaviors and mental problems throughout their lifetime that are further attributed to the sensitivity of the developing adolescent brain (Tate et al., 2020). Also, this is a phase where development of emotional regulation takes place. Adolescence is the time when psychopathology, which is defined by problems with emotion control, first appears or gets worse (Silvers, 2022).

Although difficulties in skills such as naming and phonological awareness faced by adolescents with LD remain the same as that of younger children, additional problems related to behavior arise. Behavioral problems like lack of motivation, lack of confidence, low self-esteem, presence of anxiousness and lack of self-regulatory behavior develop

during adolescent age (Huntington & Bender, 1993). In view of this, it is quite evident that adolescents are a challenging demographic to assess. This challenge is further aggravated by the lack of suitable assessment tools to identify the difficulties faced by this population, especially in the Indian scenario.

Although early identification of LD is emphasized and several attempts are made in this direction, in the clinical scenario, it is not uncommon to encounter adolescents referred with reading and writing problems during secondary school age. Despite having numerous difficulties in adolescents with LD, there is no proper tool to assess adolescents with LD in the Indian context.

Considering the time and resources required, it is challenging to conduct a thorough evaluation for every adolescent who complains of poor academic performance and poor learning skills. Therefore, availability of a screening tool to identify adolescents at risk for LD will be of significant help in early identification of the problem and in reducing over-referrals. Those individuals who fail the screening test can then be referred for a more thorough and detailed diagnostic evaluation.

1.2 Aim of the study

The aim of the study was to develop and validate a screening tool for adolescents with LD from Grade VI to Grade X.

1.3   Objectives of the study

The objectives of the study were as follows:

1. To develop and validate a screening tool for adolescents with LD.

2. To compare the performance of typically developing (TD) adolescent groups and adolescents with LD in Grade VI to Grade X.

1.4   Hypotheses of the study

Null hypotheses were assumed for each of the objectives of the study as follows.

1. There is no significant difference across the scores of typically developing adolescents in the grade range of VI to X on different domains (language, cognition, academics, auditory abilities and behavior) of the tool developed.

2. There is no significant difference between the scores of typically developing adolescents and adolescents with LD in the grade range of VI to X on different domains of the screening tool.

.

CHAPTER 2

REVIEW OF LITERATURE

Learning is a dynamic process that occurs throughout life and is mediated by numerous structural and functional changes occurring in the brain starting from the day of zygote formation. Structures related to language and learning appears to develop drastically during the first few years of life. It continues to undergo certain modifications during adolescence period due to the influence of puberty before the ability for new learning decelerates in adulthood. As a result of these changes, the ability of learning language and academic aspects differ from infancy through adolescence and adulthood. Furthermore, the presence of developmental disorders will alter the course of learning, leading to delays and deviations in the abilities of such individuals.

2.1 Brain development from infancy through adulthood

The development of brain structures is rapid in the first two years of life following which the process of development continues gradually. The development occurs both structurally and functionally including brain volume and cognitive functions that significantly rise in the early years of life and undergo changes through adolescence and adulthood. Analysis of data on head and brain development revealed statistically significant peaks in the growth rates of human brains at ages 11 and 15 (Epstein, 1986). Despite the presence of majority of neurons at birth, synaptogenesis occurs during which the brain's activity patterns alter and the majority of myelination occurs postnatally for various parts of the brain and these changes happen at various times until adulthood.

Functionally considered, cognitive activities undergo a drastic development from reaching for an obscured object (up to 9 months) to noticing a change in an object as it passes behind a surface, young infants to master certain skills of cognition over years. Visual object processing does not seem to fully mature until the second year of life (Johnson, 2001).

Neurogenesis is the first step in the development of the brain, followed by neural migration, maturation, synaptogenesis, pruning, and myelination. There are eight fundamental concepts of brain plasticity. Most neurogenesis is finished by five months. One significant exception is cells in the hippocampus, which continue to generate neurons throughout life. As soon as a cell reaches its goal, it starts to mature by growing dendrites to create surface area for synapses with other cells and by extending axons to the right destinations to start synapse formation. When a baby is born, dendrites first appear as separate processes that protrude from the cell body. Over the course of the next two years, they are elaborated. Synaptic pruning in cortex is seen in caudal rostral gradient that begins at the age of 2 years till 20 years of age which is associated with the development of some of the language processes. CNS axons reach maturity only after myelination gets complete that is after 18 years of life in areas responsible for language and cognition development. According to MRI studies, improved phonological processing is linked to a thickening of the left inferior frontal cortex (Broca's region) and there exists a relationship between the cortical thickness and behavioral development (Nelson & Luciana, 2008). Brain development is influenced by sensory motor experience, drugs, hormones, parent-child relationship, peer interactions, stress and diet (Kold & Gibb, 2011).

2.2 Brain development during adolescence

Adolescence is a transitional period that occurs between childhood and adulhood. The release of pubertal hormones initiate the process of sexual maturation during this period leading to a variety of physical and biological changes including increased growth and metabolic rate, changes to fat and muscle, development of the breast and genitalia and the emergence of secondary sex characteristics. Adolescents undergo significant changes in their social, emotional, and cognitive functions. Neurodevelopment is a potential mediator of the association between biochemical and psychosocial changes, and thus between puberty and adolescence. This has led to the conceptualization of puberty as referring to biological changes and adolescence as referring to social changes (Vijayakumar et al., 2018).

The pubertal hormones are also known to influence functional brain development. A meta-analysis reviewing the existing 28 studies critically evaluated four major functional domains i.e., reward processing, facial emotion processing, social information processing and cognitive processing. The findings indicated that only the facial emotion processing showed a consistent directionality and amygdala as a neural region, gets activated during the processing of emotions. The two processes indicated a neutral effect (Dain & Scherf, 2019).

2.3 Skills developed during adolescence

Development of any skill depends on the growth and maturation of structures associated with it (Malina, 2008). A variety of changes occurring in physical and biological

aspects during adolescence, which has an impact on the later adulthood. Certain skills that develop or undergo changes during this phase are discussed below.

2.3.1 Motor skills

The development of specific visuomotor skills during childhood and adolescence are indicators of cortical development during these stages of development. (Lustenberger et al., 2017). Motor skill discrepancies may be explained by variances in maturational age for a given chronological age and concomitant assumptions about body size (Branta et al., 1984). Throughout adolescence, several facets of sensorimotor function continue to develop (Quatman et al., 2012)

2.3.2 Language skills

Developmental changes during adolescence include advanced language and cognitive ability. This period exposes an individual to a range of new social interaction situations leading to the development of skills related to social roles (de Armas & Kelly, 1989). Over the past 20 years, there has been a progressive growth in research on the language development of adolescents, partially as a result of the discovery that reading and writing have solid linguistic foundations. Researchers have begun to doubt the widely held belief that language development is essentially finished by the time children reach the fifth or sixth grade due to the clear increase in those areas during the elementary school years. As a result, it is generally understood that language development continues into adulthood as well as throughout childhood and adolescence. Language development in this period is marked by fine changes in terms of components of language, increased vocabulary and

expression of figurative language, abstract meanings. Additionally, adolescents become more adept at using interpersonal negotiation techniques and increase their understanding of peer-used dialect of language. The speed, salience, and content of early language acquisition are not present in the developmental markers of adolescent language. However, an adolescent who lacks these markers has substantial social and academic disadvantages (Nippold et.al., 1993).

2.3.3 Cognitive skills

According to a longitudinal research, 73.9% of adults with mental disorders had a diagnosis made before the age of 18, and 50% had one made before the age of 15 indicating a higher prevalence rate in adolescent age (Kim-cohen et.al., 2003). The prefrontal cortex, which is responsible for higher cognitive tasks tends to develop and mature during adolescence (Luciana et.al., 2005). High demands are placed on the executive systems during adolescence, as well as on the interaction between cognitive and emotion-related processes that is crucial for processing the verbal and non-verbal cues during peer interactions (Paus, 2005). Older adolescents tend to have better ability of higher order thinking, reasoning, problem solving, decision making and better memory when compared to younger adolescents. In addition, younger adolescents appear to have a less constructivist, metacognitive, and reflective knowledge of the mind than older adolescents and adults (Byrns, 2006). The idea that adolescence is a sensitive time for specific developmental areas is compatible with evidence for memory plasticity, the impacts of social stress, and drug use (Fuhrmann et.al., 2015). According to Miller and Byrnes (2001), older adolescent girls often have a higher level of decision-making ability than younger

adolescent girls and younger and older adolescent boys. Therefore, there is some evidence to support the claim that older adolescent girls make more self-controlled decisions than older adolescent guys (Miller & Byrnes, 2001).

2.3.4 Academic skills

The best indicators of academic achievement behavior are academic aspirations and self-control abilities in decision-making. Self-esteem is a predictor of academic postponement and shares an inversely proportional relationship (Yang et.al., 2021). There are several factors influencing better academic performance. Younger children who are skilled in employing study methods should be better equipped for success in higher grades indicating a better academic performance in higher grades compared to lower grades (Thomas, 1993). Academic mastery of high school students differed substantially from that of middle school students (Bong, 2001)

2.3.5 Auditory ability skills

Some particular features of central auditory processing exhibit continual growth from early childhood till puberty (Kühnle et.al., 2012). There are evidences suggesting that the capacity of the auditory system to retrieve spectro-temporal cues in the presence of background noise are crucial for better academic performance, especially for school-going (Chandni et.al., 2020)

2.3.6 Behavior skills

The hormones released during adolescence period induces changes in the limbic system that alters the emotional aspects which in turn influences the social role of an individual (Nelson et al., 2005). During this period, there could either be an enhancement or decline in the expected behaviors of individuals. Owing to the physical and hormonal changes during this stage, adolescents are at greater risk for acquiring deviant behaviors and mental problems throughout their lifetime that are further attributed to the sensitivity of the developing adolescent brain (Tate et al., 2020). It is possible that regulatory attention and a sensation of power are the mechanisms that explain how self-control is connected to risky behavior (Zi-quin et al., 2022).

2.4 Learning disability in adolescence

Learning Disability (LD) is a neurobiological disorder that persists from childhood and continues through the adolescence and adulthood. The problems associated with LD varies across their developmental stages, be it in childhood, adolescence or adulthood. The characteristics of children with LD are widely reported across different stage of development. Early literacy, phonological awareness activities, reading, writing, and mathematics abilities are all problematic for preschoolers with LD. They also struggle with listening skills, oral language skills, phonological awareness skills, verbal memory, and early literacy (Eisenmajor et al., 2005; Shanbal et al., 2010). Additionally, children with LD can have attentional problems and withdrawal dependent behaviors (McKinney et al., 1989).

Similarly, characteristics of adults with LD reported in the literature include deficits in word finding, phonological processing and representations, memory, auditory skills, visuomotor skills, reading and writing (Cohen-Mimran, 2006; Laasonen et al., 2014; Ramus et al., 2003). But there are fewer studies that addresses the problems of adolescents with LD. The difficulties faced by adolescents with LD are described as follows.

2.4.1 Language skills in adolescents with LD

Wiig & Semel (1975) compared 32 typically developing adolescents and 32 adolescents with LD on a battery of tests and the results indicated that LD adolescents differed from typical adolescents in terms of reduced phrase length and simplified grammatical form. Adolescents who are typically developing outperformed those with LD on all assessments in terms of speed and accuracy. The authors concluded that indicated that adolescents with LD can have expressive language deficits, delayed development of cognition in terms of convergent and divergent production of semantically related words, retrieval problems in terms of naming and producing syntactic structure, reduced speed and accuracy in overall tasks, all of which suggest oral language and cognitive difficulties. Further, verbal paraphasias and visual representation deficits associated with confrontation naming were reported. In controlled association subtest, LD adolescents named very few items compared to typically developing adolescents and lack a categorization strategy reflecting delay in cognition growth was noted. LD adolescents had difficulty in producing syntactically complex sentences and delayed response time, as they tend to rehearse the stimuli overtly. They also showed poorer scores on defining words task, particularly abstract words. The findings of the rating subtest indicated that length of the phrase, its

grammatical form, word finding difficulty and paraphasia can act as screening components for early identification of productive language deficits.

Productive language deficits can lead to pronounced difficulties at the academic level. A study by Johnson & Myklebust (1964) stresses that adequate oral language is necessary for reading and writing to be acquired successfully. It is also understood that productive language deficits maybe related to deficits in language processing ability in LD adolescents.

Wiig and Harris (1974) conducted a study comparing 17-year-old typically developing female adolescent and 17-year-old adolescent with LD on nonverbal expressions like embarrassment, joy, love, anger, fear and frustration. The results revealed that adolescents with LD tend to misinterpret the affective cues related to visual motor organization ability that is often correlated with social imperception and poor adaptive social behaviors. Wiig and Semel (1974) compared 50 logico-grammatical sentence comprehension ability across 30 LD adolescents and age matched typically developing adolescents which revealed lower scores in LD across all the tasks i.e., auditory association, auditory perception, sequential memory and manual expression indicating deficits in processing linguistic concepts by adolescents with LD.

LD adolescents are reported to have significantly poor immediate verbatim recall of syntactically and semantically varied sentences i.e., syntactically correct semantically incorrect sentences and complex syntactic sentences (Wiig & Roach, 1975). The study also

indicated that LD adolescents showed poor scores on semantically consistent and syntactically complex sentences. The errors that LD adolescents made were similar to that of beginners. LD adolescents tend to misplace the 'subject' and 'object' position but retained the sentence sequence in passive sentences. Further, LD adolescents were able to identify the semantic category that a word belonged to but failed to identify the particular intended word. Immediate recall deficiencies reflect short-term memory deficiencies, while semantic category deficiencies are indicative of long-term memory deficiencies (Wiig & Roach, 1975).

2.5.2 Cognitive skills in adolescents with LD

Adolescents with LD exhibit deficits not only in language abilities but also in their thinking, reasoning abilities and judgmental skills. LD adolescents are involved less in logical, strategic and problem-solving approach, exhibit immature executive functioning compared to their normal peers (Deshler et al., 1982). The authors proposed two hypotheses with respect to cognitive processes in adolescents with LD. Firstly, LD adolescents have developmental delay in executive functioning (initial job monitoring, plan creation, and assessment of plan implementation) and second, lack of motivation among LD adolescents to rehearse tasks requiring higher cognitive function. Delayed development of cognition in LD adolescents are also reflected in the convergent and divergent production of semantically related words and their retrieval problems (Wiig & Roach, 1975; Wiig & Semel, 1974; 1975).

2.5.3 Academic skills in adolescents with LD

LD adolescents exhibit lower performance in academic related tasks like reading, writing and math calculations (Deshler et al., 1982) . LD adolescents have problems related to decoding and encoding of words and their comprehension abilities. Studies indicated that adolescents with LD have lesser academic vocabulary. Academic vocabulary is correlated positively with reading fluency and reading comprehension skill (Abbott et al., 2017; Beach et al., 2015; Faggella-Luby & Deshler, 2008). A systematic review about the expository text comprehension in adolescents with LD explains the straightforward view of reading, according to which vocabulary, syntactic structure, inference, and the capacity to create mental reading schemas all contribute to reading comprehension, while a combination of skills, including phonics, phonological awareness, and word recognition, contribute to fluent decoding (Hall-Mills & Marante, 2020). LD adolescents also exhibit difficulty in performing various math calculations (Barwasser et al., 2021). They are also reported to have lower scores on academic self-concept compared to global self-concept (Huntington & Bender, 1993).

2.5.4 Auditory abilities in adolescents with LD

Some studies reveal that LD individuals experience difficulties with learning to reading and that language is associated with problems encountered at the level of listening and listening comprehension (Faigel, 1973). These individuals often perform poorly on tasks of central auditory processing (Ferre & Wilber, 1986). Results of a study in which phonological training was carried out to work on phonetic sequential-memorization skills

revealed that phonological training does not improve the skill among the LD individuals with associated auditory processing disorders (Khasawneh & Alkhawaldeh, 2020).

2.5.5 Behavior skills in adolescents with LD

Behavioral problems are one of the most prevalent problem during the adolescence period. This is especially true with respect to LD adolescents. Adolescents with LD has less motivation to perform tasks related to academics (Deshler et al., 1982). Further, anxiety and depression are reported in these adolescents along with mood changes, reduced concept of self, reduced self-regulatory behaviors and suicidal thoughts in some cases (Beauchemin et al., 2008; Maag & Reid, 2006; Klassen, 2010).

The behavioral characteristics in adolescents with LD could reflect their difficulties in language and cognition. Behavioral traits of dyslexic adolescents in China were examined using a 52- reading related behavioral characteristics questionnaire named Behavior Checklist for Junior Secondary School Students (BCL-JS). The BCL-JS was administered along with Hong Kong Tests of specific learning difficulties in reading and writing for secondary school students (HKT-JS) (Chung et al., 2007) which is a standardized test done in Hong Kong to identify dyslexic adolescents. (Ching et al., 2012). The checklist was administered by teachers and responses were rated on a 5-point scale. Behavioral indicators for reading, writing, memory and organization were significant in adolescents compared to typical children. The internalizing and externalizing behaviors were significantly different in adolescents with LD. In general, adolescents with LD had lower concept related to self, interpersonal relationship issues, lower levels of socialization

and poor perception about their academic performance. The authors concluded that behavioral indicators such as externalizing behaviors and internalizing behaviors were very important to identify individuals with LD.

Investigations on the behavioral traits of adolescents with LD have indicated the need for psychotherapy either in isolation or in combination with other therapeutic approaches suggesting that as individuals enter into adolescence, problems related to behavioral aspects arise which has to be treated with psychotherapy in addition to other co-existing problems (Gardner & Sperry, 1964). Adolescents with LD adolescents attribute success more internally and failures more externally which reflects poor self-esteem. Additionally, they differ in terms of anxiety levels, showing that individuals with LD have higher levels of anxiety than their typical peers. They are also at risk for thoughts of depression and suicidal thoughts that are life threatening (Bender et al., 1996; Cohen, 1986; Huntington & Bender, 1993). Behavioral issues in LD adolescents also include problems related to conduct, withdrawal/shyness and distractibility (Bender & Smith, 1990).

An investigation into the behavioral issues in individuals with LD and typically developing peers in the age range of 6-14 years in the Indian context revealed behavioral problems in the LD group in the form of aggression, hyperactivity and certain personality problems (Melekoglu, 2011). The behavioral issues observed in adolescents with LD were also found to be different between the two genders. While boys showed more sensation seeking and school maladjustment, girls had higher emotional symptoms index, social stress, and depression T scores (Maag & Reid, 2006; Martínez & Semrud-Clikeman, 2004).

2.6 Assessment of adolescents with LD

Review of the characteristics in adolescents with LD indicate that several domains are affected in this group. Language difficulties, auditory perception problems, difficulty in integration of auditory and visual stimuli, and problems with comprehension of spatial relationship, reading, writing and spelling abilities are commonly reported (Faigel, 1973, Clemens et al., 2021). Thus, a comprehensive assessment of LD should include all relevant aspects in order to obtain a complete understanding of the strengths and weaknesses of these individuals.

Various tools are available for the assessment of LD across different age groups. The major components assessed by these test materials include rapid naming, one minute reading, two-minute spelling, phoneme segmentation, backward digit span, one-minute writing, verbal fluency, semantic fluency, listening comprehension, non-word reading, reading comprehension, non-verbal reasoning, memory and phonological skill. However, tools that assess abilities across domains affected in LD are limited. Generally, standardized tests in the respective domains are used to profile the abilities of individuals with LD with specific reference to the skill. For example – Tests of reading, tests of spelling, tests of phonological awareness, tests of writing, etc.

2.7 Assessment of LD in Indian context

Few tools are available in the Indian context for the assessment of LD across different age groups. The various tools available for assessment of learning disability in the Indian context are listed in Table 2.1.

Table 2.1

Available Indian tools for the assessment of learning disability

Name of the tool	Author and year
Early Literacy Screening Tool	Shanbal et al., 2010
Dyslexia Assessment Profile for Indian Children	Kuppuraj & Shanbal, 2009
Dyslexia assessment for languages of India – Dyslexia Assessment Battery	Rao et al., 2021
A screening tool for bilingual/multilingual adults with dyslexia	Shilpa & Shyamala, 2013
NIMHANS Specific Learning Disability Battery	Panicker et al., 2015

As observed, the assessment tools available for the assessment of LD covers the preschool children and adulthood. There are very few tools available for the adolescent age group. One of the assessment tools available for the adolescent age group is the "NIMHANS Specific Learning Disability Battery". However, the effectiveness of this tool is questionable owing to the inadequacies with respect to evaluation and interpretation in marginal and complex settings (Roopesh, 2021).

2.8 Assessment of adolescents with LD

The knowledge gap with respect to LD in adolescence extends to assessment procedures, as there is limited understanding of effective methods and a shortage of standardized tools. Overall, more research and development are needed in this area to improve assessment and intervention practices. Even though adolescents with LD face

many challenges, there is no suitable method to evaluate them in the Indian context. Screening is crucial in identifying those who have LD. It is difficult to carry out a full evaluation for every adolescent who complains of poor academic performance and poor learning skills, given the time and resources needed. Therefore, it is important to have a screening tool available that can aid in identifying adolescents with LD.

It is thus evident that the difficulties faced by adolescents with LD are different from that of children with LD, both quantitatively and qualitatively. The domains of assessment for a holistic understanding of the extent of difficulties in adolescents with LD vary from that of children and adults. However, there are limited resources for assessment of LD in adolescence, particularly in the Indian context. Hence, the present study was taken up with an aim of developing and validating a screening tool for adolescents with LD in the grade range of VI to X.

CHAPTER 3

METHOD

The primary aim of the study was to develop and validate a screening tool for adolescents with Learning Disability (LD) from Grade VI to Grade X.

3.1 Objectives of the study

The specific objectives of the study were:

1. To develop and validate a screening tool for adolescents with LD

2. To compare the performance of typically developing (TD) adolescents and adolescents with LD in the Grades VI to X.

3.2 Study Design

A cross-sectional, descriptive research method was used to develop the screening tool and obtain normatives for the same. A standard group comparison was used to achieve the objective of comparing typically developing adolescent groups with that of LD.

3.3 Participants

A total number of 100 typically developing adolescents between grades VI and X studying in schools in the urban ambient environment of Mysore city were selected using a random sampling technique. They were further divided into 5 groups based on their grades (grade VI, grade VII, grade VIII, grade IX and grade X) with 20 participants (10 males: 10 females) in each group.

3.3.1 Participant selection criteria

The participants were selected if they fulfilled the following inclusionary criteria:

- Normal speech, language and hearing abilities (as screened using the International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY) checklist (WHO Work group, 2004))

- Average intelligence quotient

- Studying in schools with English as the medium of instruction and have similar methods of teaching

- Belonged to middle socio-economic status

The participants with the following characteristics were excluded from the study:

- Presence of comorbid conditions

- History of psychological disorders, academic difficulty, slow learner, below average intelligence

- History of change in medium of instruction or repeating any class

3.4 Procedure

The study was carried out in three phases as follows:

Phase 1- Developing a screening tool

Phase 2- Validation of the screening tool

Phase 3- Field testing the developed screening tool

3.4.1   *Phase 1- Developing a screening Tool*

As part of developing the screening tool, a thorough review of literature was carried out to identify the problems and difficulties faced by adolescents with LD. The sources for reviewing the literature included books, test materials, journal articles, dissertations, e-books etc. After a thorough review, the problems and difficulties faced by adolescents with LD that are relevant for grade range of VI-X were listed and then grouped under 5 major domains namely language, behavioral, cognition, academic, and auditory. This was followed by development of tasks relevant to each of the domains. Approximately, three to four tasks were included under each domain depending on the subcomponents involved. A section pertaining to obtaining basic information was also included before commencement of the tasks.

3.4.2 *Phase 2- Validation of the screening tool*

Content validation of the developed screening tool was done by three speech-language pathologists, two psychologists, one teacher and one special educator who had a minimum of five years of experience in their respective fields. They were provided with the validation questionnaire, adapted from the Feedback Rating Questionnaire in Field Testing of Manual for Adult Aphasia Therapy in Kannada (Goswami et al., 2012). The validation questionnaire consisted of various parameters. The experts rated the overall checklist for 12 different parameters (relevance, coverage of parameters, simplicity, presentation, volume, accessibility, flexibility, feasibility, scope of practice, scoring pattern, publications, outcomes and developers, coverage of tasks under each domain) on a 3- point rating scale as suited for each parameter. (E.g: For the parameter of relevance, 0 - not relevant, 1- relevant but needs modification, 2- relevant). The number of experts who

rated the overall checklist from 0 to 2 for each of the parameters is summarized in Table 3.1. Those parameters that received a score of '1' by more than 50% of the experts were reconsidered by incorporating relevant modifications until the score of '2' was given.

Table 3.1

Ratings given by the experts for the overall checklist on different parameters

Sl No.	Parameters	Scores		
		0	1	2
1.	Relevancy		1	6
2.	Coverage of parameters		1	6
3.	Simplicity		1	6
4.	presentation		2	4
5.	Volume		2	4
6.	Accessibility		1	6
7.	Flexibility		1	6
8.	Feasibility			7
9.	Scope of practice			7
10.	Scoring pattern		2	5
11.	Publications, outcomes and developers (professional background)		Not aware-3, aware-5	
12.	Coverage of tasks under each domain		2	5

Note: Values in each cell indicates the number of experts who gave the respective rating

In addition to validation of the overall checklist, the experts also rated each individual stimulus on a 3-point rating scale for four parameters namely appropriateness (0= not appropriate, 1= appropriate but needs modification, 2= appropriate); familiarity (0= not familiar, 1= familiar but needs modification, 2= familiar); relevancy (0= not

relevant, 1= relevant but needs modification, 2= relevant); and ambiguity (0= ambiguous, 1= not ambiguous but needs modification, 2= not ambiguous). Most of the stimuli received a rating of '2' none was rated as '0'. Suitable modifications were incorporated in the stimuli that were given a rating of '1' by at least 50% of the experts until a rating of '2' was obtained.

The experts were also asked to rate the picture stimuli included in the tool on a 3-point rating scale for four parameters namely size of the picture (0= not appropriate, 1= appropriate but needs modification, 2= appropriate); color and appearance (0= not appropriate, 1= appropriate but needs modification, 2= appropriate); iconicity (0= not recognizable and representational, 1= recognizable and representational but needs modification, 2= recognizable and representational); arrangement (0= not appropriate, 1= appropriate but needs modification, 2= appropriate). The picture stimuli that were rated as '1' were suitable modified and then included in the final tool.

In addition to the ratings, suggestions/remarks from the experts were also taken into consideration and necessary modifications were incorporated, before finalizing the screening tool. The final tool consisted of 5 domains with 18 tasks in total (Refer to Appendix I). The details of the five domains included in the screening tool are given below.

Domain I- Language

This includes four tasks that assesses both language reception and language expression. The tasks are detailed below:

1. *Following instruction*

<u>Description and instruction of the task:</u> This task is used to check the comprehension of syntax. A multi-step command was provided and the individual is asked to perform the same. One repetition was provided if requested by the individual.

<u>Scoring:</u> A score of '1' was given if the individual completes the task, score of '0.5' was given for partial completion of the task and a score of '0' was given if the task was not completed.

2. *Phoneme Fluency*

<u>Description and instruction of the task:</u> The individual was asked to quickly name as many meaningful words as possible starting from the phoneme /k/ in one minute excluding proper names, places or words in different forms. Practice trial with phoneme /t/ was given.

<u>Scoring:</u> A score of '1' was given if the individual names >10 words, a score of '0.5' was given if the individual names 5-10 words, and a score of '0' was given if <5 words are named.

3. *Two-minute picture description*

<u>Description and instruction of the task:</u> A picture is shown to the individual and he/she is asked to describe it using appropriate grammatical markers. The paramaters assessed are as follows:

3.1	Is the individual able to describe the whole picture in two minutes?

3.2	Usage of plural forms For ex: **Children are** playing in the park

3.3	Usage of tense forms
	• Present tense can be elicited during descriptions
	    • For example: **Some are sitting and some are playing**
	• Future tense can be elicited by questioning
	    • For example: what will the children do after playing?
	    • **The answer can be 'they will go home'**
	• Past tense can be elicited by questioning
	    • For example: where do you think they have come from?
	    • **The answer can be 'they might have come from home or school'**

3.4	Usage of comparatives and conjunctions For ex: • The boy is going **faster** than the girl • There are few children **and** few animals

3.5	Usage of appropriate case markers For ex: They are playing in the park

3.6	Usage of appropriate PNG markers For ex: He is sitting They are sitting

3.7	Word finding difficulty

3.8	Coherence (systematic or logical connection between the spoken sentences)

3.9	Topic management (initiation, maintenance and shift)

3.10	Revision behaviors (the changing of something to correct or improve it)

3.11	Fluency, style (accent and way of production) and intonation

3.12	Organization of description

3.13	Vocabulary usage

3.14	Information adequacy (at word level, sentence level)/Information content

Scoring: For the sections 3.1 to 3.11, a score of '1' was given if the individual describes the pictures using appropriate grammatical markers, a score of '0.5' was given if the individual describes the pictures using partially correct grammatical markers and a score of '0' was given if the individual describes the pictures using inappropriate grammatical markers.

For the sections 3.12, 3.13, and 3.14, the responses were rated on a 3-point scale where '0' represents fair description, '0.5' represents good description and '1' represents excellent description.

4. Phoneme deletion

Description and instruction of the task: The individual was presented with 3 stimuli and was asked to say it by deleting a specific phoneme in that word. Examples were provided initially and then moved on to the target stimuli.

Scoring: A score of 1 was given for a correct response, a score of 0.5 was given for partial correct response and a score of 0 was given for an incorrect response.

Domain II- Cognition

The three tasks included in the cognitive domain are detailed below:

5. Non-verbal reasoning

<u>Description and instruction of the task:</u> The individual was presented with a picture and instructed to count the total number of triangles.

<u>Scoring:</u> A score of '1' was given if the individual's response is 8, a score of '0.5' was given if the individual's response is between 5-7 and a score of '0' was given if the individual's response is <4.

6. Backward digit span

<u>Description and instruction of the task:</u> The individual was presented with a series of 8 digits and then asked to repeat back, in reverse order.

<u>Scoring:</u> A score of '1' was given if the individual was able to repeat all the 8 digits correctly in the reverse order, a score of '0.5' was given if the individual was able to say all the digits but not in order or misses 1 digit and a score of '0' was given if the individual was able to repeat < 7 digits.

7. Overlapping test

<u>Description and instruction of the task:</u> The individual was presented with an image with 10 hidden items and asked to identify the hidden items.

<u>Scoring:</u> A score of '1' was given if the individual named 7-10 items, a score of '0.5' was given if the individual named 5-7 items, and a score of '0' was given if <5 items are named.

Domain III- Academics

This domain included a total of four tasks as detailed below:

8. Reading fluency and comprehension

<u>Description and instruction of the task:</u> The individual was asked to read the presented sentence loudly and interpret the two meanings. The first interpretation was that the man was holding the binocular and second being the man was seen through a binocular.

<u>Scoring:</u> Scoring was carried out for both reading fluency and reading comprehension.

Reading fluency: A score of '1' was given for reading the complete sentence fluently, a score of '0.5' was given for reading the sentence partially fluently, and '0' for not reading the sentence fluently.

Reading comprehension: A score of '2' was given for correctly interpreting two meanings, a score of '1' for correct interpretation of one meaning, and a score of '0' was given for incorrect interpretation.

9. One-minute reading

<u>Description and instruction of the task:</u> The individual was presented with a list of 20 items (16 words & 4 non-words), and asked to read aloud.

<u>Scoring:</u> A score of '1' was given if all items in the list were read correctly, a score of '0.5' was given if 50-99% of the list were read correctly, and a score of '0' was given if <50% of the list was correctly read.

10. Two-minute spelling

Description and instruction of the task: The individual was presented with a series of 20 items (16 words & 4 non-words) one after the other, and asked to spell the words and non-words.

Scoring: A score of '1' was given if all items in the list were spelt correctly, score of '0.5' was given if 50-99% of the items in the list were spelt correctly, and a score of '0' was given if <50% of the list was correctly spelt.

11. Two-minute writing

Description and instruction of the task: The individual was asked to write an essay for 2 minutes on the topic "My summer vacation". The written response was assessed for the following parameters.

11.1	Shows disinterest or lack of motivation to carry out writing task	No
11.2	Writes complete sentences	Yes
11.3	Uses inappropriate vocabulary	No
11.4	Presence of regularizing the irregular words.	No
11.5	Uses incorrect word endings or inappropriate grammar	No
11.6	Appropriate Punctuation	Yes
11.7	Offline writing	No
11.8	Poor spacing	No
11.9	Presence of mirror writing	No

11.10	Left to right progression	Yes
11.11	Clumsily written letters	No
11.12	Fragments words into letters in writing	No
11.13	Uses appropriate capitalization	Yes
11.14	Mixes upper- and lower-case forms	No
11.15	Overlapped letters	No

Scoring: For each of the parameters, a score of '1' was given for expected response, a score of '0.5' was given for partial presence of expected response, and a score of '0' was given for the absence of expected response.

Domain IV- Auditory Abilities

This domain included three tasks as listed below:

12. Auditory Discrimination

Description and instruction of the task: The individual was presented with three pairs of words auditorily, one after the other. They were instructed to carefully listen and say whether the two words were same or different.

Scoring: A score of '1' was given for the correct response, a score of '0' was given for incorrect response.

13. Auditory memory and sequencing task

Description and instruction of the task: The individual was presented with a series of eight words and asked to repeat the words in the same order.

Scoring: A score of '1' was given if the individual was able to repeat all the eight words correctly in the same order, a score of '0.5' was given if the individual was able to repeat all the digits but not in order or missed one digit, and a score of '0' was given if the individual was able to repeat < 7 words.

14. Phoneme-grapheme correspondence – This task included eight subtasks as explained below.

Description and instruction of the task:

14.1-The individual was presented with a series of 4 words and asked to put a '/' on the response sheet if the words started from the sound /b/.

14.2- The individual was presented with a series of 4 words and asked to put a '/' on the response sheet if the words ended with the sound /n/.

14.3 to 14.8- The individual was presented with 6 words and asked to write the first two letters of the words.

Scoring: A score of '1' was given for correct response, a score of '0.5' was given for partially correct response, and a score of '0' was given for an incorrect response.

Domain V- Behavior

15. Ask the individual to describe about their school and their studies. In particular, they were asked to describe the positive and negative (difficulties) aspects about how they feel about school and studies. This domain included three subscales (Ching et al., 2018) as follows:

16. Learning motivation subscale

16.1	Need others' reminders to finish homework.
16.2	Get distracted easily
16.3	Make mistakes because of not paying attention
16.4	Have no expectations in school performances
16.5	Believe that s/he cannot do well even without much effort.
16.6	Have no interest in classroom activities
16.7	Dare not to ask questions when problems arise.
16.8	Do not reflect on their problems in learning.
16.9	Do not try to learn new things.

17. Internalizing behavior subscale

17.1	Get depressed easily.
17.2	Have low self-esteem and lack confidence.
17.3	Get anxious easily.
17.4	Prefers to be alone, not sociable.

18. Externalizing behavior subscale

18.1	Have swinging moods.
18.2	Skip schools without reasons.
18.3	Likes to be the center of attraction

| 18.4 | Have conduct problem ex: difficulty in following rules and behaving violent |
| 18.5 | Not obedient and rebel against teachers/seniors |

<u>Scoring:</u> The parameters on the above three subscales are scored on the basis of the individual's response to the task of describing about their school and studies. In addition, general information obtained through conversation with the individual and observation of their performance on other tasks of the tool were considered for scoring.

A score of '1' was given for a positive behavior, a score of '0.5' was given for a partially positive behavior, and a score of '0' was given for a negative behavior.

Table 3.2 summarizes the tasks and number of stimuli or parameter assessed under each domain of the screening tool.

Table 3.2

Summary of the tasks and number of stimuli or parameter assessed under each domain

Domains	Tasks	No. of items
I. Language	1. Following instruction	1
	2. Phoneme Fluency	1
	3. 2-minute Picture Description	14
	4. Phoneme Deletion	3
II. Cognition	5. Non-verbal reasoning	1
	6. Backward digit span	1
	7. Overlapping test	1
III. Academics	8. Reading fluency and comprehension	1
	9. One-minute reading	20
	10. Two-minute spelling	20
	11. Two- minute writing	15
IV. Auditory abilities	12. Auditory Discrimination	3
	13. Auditory memory and sequencing	1
	14. Phoneme-grapheme correspondence	8
V. Behavior	15. Description on school and studies	
	16. Learning motivation scale	9
	17. Internalizing behavior scale	4
	18. Externalizing behavior scale	5

3.4.3 Phase 3- Administration of the developed checklist

The study was carried out adhering to the ethical guidelines of the institutional review board (Venkatesan, 2009). The screening tool developed was administered on 100 typically developing adolescents (50 boys:50 girls) between grades VI and grade X. The participants were tested individually in a quiet, noise-free set-up during school hours. The

approximate time required to administer the screening tool was about 15-20 minutes. Information about the purpose of the study, the nature of the task and the total time required for the interview was provided to the authorities of the schools in which the participants were studying and a written informed consent was obtained from them. An informed written assent was also obtained from the participants themselves.

The screening tool was then administered on adolescents with LD between grade VI and grade X to check for the clinical utility of the screening tool. A total of 10 adolescents with a clinical diagnosis of LD based on evaluations by a multidisciplinary team consisting of Speech Language Pathologist, Clinical Psychologist and Special Educator were recruited for the study. The responses of the participants were noted down by the examiner.

3.5 Test- retest reliability

In order to assess test-retest reliability of the developed screening tool, the examiner repeated the administration of the tool on 10% of the participants. Two participants were chosen randomly from each grade of typically developing adolescents and the tool was re-administrated on them after a period of one week from the initial testing. The responses obtained on various domains of the tool on the two occasions were compared and subjected to suitable statistical analysis to establish test- retest reliability.

3.6 Scoring and analyses

The responses of individual participants were recorded on a response sheet and scored as described under each domain of the screening tool. The scores obtained under the individual domains were totaled to obtain domain wise scores. The maximum possible scores of each domain were as follows: Language-19; Cognition- 3; Academics- 58; Auditory ability- 12; Behavior- 18. Thus, the maximum possible score of the overall screening tool was 110.

The raw scores for each domain and the summed up total scores were tabulated for individual participants in each of the two groups. The scores of typically developing adolescents were compiled and tabulated across the five grades and two genders for each individual stimulus, the domain totals, and the overall total score.

3.7 Statistical Analyses

Data were analyzed using SPSS (statistical package for social sciences) software, version 26. The data were initially analyzed to check for normal distribution. As some of the variables were not conforming to normality, non- parametric tests were carried out for further analysis.

In typically developing adolescents, two types of analysis were carried out - numerical and categorical. For numerical analysis, descriptive statistics was carried out to compute the mean, median, standard deviation and interquartile ranges for the scores obtained by the two groups of participants on different domains of the screening tool.

Mann-Whitney U test was used to compare the scores between the two genders. Kruskal-Wallis test was done to investigate the effect of grade on the scores on different domains, followed by pairwise comparisons using adjusted Bonferroni's correction. Categorical analysis was carried out using chi-square test. Mann-Whitney U test was carried out for comparison of scores of typically developing adolescents and adolescents with LD on different domains of the tool. The level of statistical significance considered for all tests were $p<0.05$.

CHAPTER 4

RESULTS

The primary objective of the study was to develop and validate a screening tool for adolescents with Learning Disability (LD) from grade VI to grade X. Further, an attempt was also made to compare the performance of typically developing (TD) adolescents and adolescents with LD in the grade range of VI to X on the developed tool.

The screening tool developed and validated by experts in the area were administered on 100 TD adolescents in the grade range of VI to X with 20 participants (10 boys and 10 girls) in each grade. The tool was also administered on 10 10 adolescents with LD in the same grades to assess the clinical utility.

The data collected from the participants were subjected to statistical analysis using SPSS software (version 26). The data were subjected to two types of analysis: numerical analysis and categorical analysis.

i) *Numerical analysis*: This was carried out for tasks that consisted of more than one stimulus or more than one assessment parameter. Certain tasks in the domains of language (picture description, phoneme deletion), academics (one-minute reading, two-minute spelling, two-minute writing), auditory abilities (auditory discrimination, phoneme-grapheme correspondence), and behavioral domain (learning motivation subscale, internalizing behavior subscale, externalizing behavior subscale) were analyzed numerically.

ii) *Categorical analysis*: This type of analysis was carried out for stimulus with yes/no types of responses and present/absent responses. Responses obtained on few of the tasks in the domains of language (Following instruction, Phoneme fluency), cognition (non-verbal reasoning, backward digit span, overlapping test), academics (Reading fluency and comprehension) and auditory abilities (Auditory memory and sequencing) were subjected to categorical analysis.

iii) Further, domain-wise total scores and overall total scores were considered for numerical analysis. Details of the type of analyses carried out with respect to each task on the screening tool are given in the table 4.1.

- Shapiro wilk's test of normality was used to test the data distribution and the results indicated non-normal distribution (p<0.05). Hence, non-parametric tests were carried out.

The results of the non-parametric tests are discussed under the following sections:

4.1 Comparison of scores on different domains of the screening tool between TD adolescent boys and girls

4.2 Comparison of scores on different domains of the screening tool across grades of TD adolescents

4.3 Comparison of scores on different domains of the screening tool between TD adolescents and adolescents with LD

4.4 Test-retest reliability

Table 4.1

Details of the type of analyses carried out with respect to each task on the screening tool

	Type of analysis	
Domains	**Numerical**	**Categorical**
Language	Picture description	Following instruction
	Phoneme deletion	Phoneme fluency
Cognition	**-**	Non-verbal reasoning
		Backward digit span
		Overlapping test
Academics	One-minute reading	Reading fluency and comprehension
	Two-minute spelling	
	Two-minute writing	
Auditory abilities	Auditory discrimination	Auditory memory and sequencing
	Phoneme-grapheme correspondence	
Behavior	Learning motivation subscale	-
	Internalizing behavior subscale	
	Externalizing behavior subscale	-
	Totals of each domain	-
	Overall score	

4.1 Comparison of scores on different domains of the screening tool between TD adolescent boys and girls

Descriptive statistics were done to calculate means, standard deviations, medians, and interquartile ranges of the scores obtained by TD adolescent boys and girls on different domains of the screening tool. The means, standard deviations, medians and interquartile

ranges of the scores obtained for both the genders across grades are depicted in the table 4.2. From the table, it may be observed that the scores obtained by both boys and girls on tasks in different domains are similar. This pattern is consistently seen in each of the five grades of TD adolescent participants.

Table 4.2

Means, Medians, Standard Deviations (SD) and Interquartile ranges (IQR) of the scores obtained by TD adolescents boys and girls across grades

Task	Grades	Mean		SD		Median		IQR	
		Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
		Domain – Language							
Pic Des	VI	12.50	12.70	0.41	0.48	12.50	12.50	0.13	0.13
	VII	12.60	12.45	0.21	0.60	12.50	12.50	0.13	0.63
	VIII	12.30	12.45	0.71	0.90	12.50	12.50	0.50	1.38
	IX	12.75	12.75	0.54	0.59	12.50	12.50	0.25	0.63
	X	12.75	12.75	0.49	0.49	12.50	12.50	0.50	0.50
PD	VI	2.75	2.35	0.42	1.00	3.00	2.75	0.63	1.00
	VII	2.50	2.70	0.67	0.48	2.75	3.00	1.00	0.50
	VIII	2.85	2.80	0.24	0.35	3.00	3.00	0.50	0.50
	IX	2.70	2.80	0.63	0.42	3.00	3.00	0.50	0.25
	X	2.80	3.00	0.35	0.00	3.00	3.00	0.50	0.00
Totals*	VI	16.90	16.80	1.05	1.25	17.00	17.00	1.25	1.50
	VII	16.65	16.75	0.75	0.86	16.75	17.00	0.75	1.25
	VIII	16.95	16.95	0.86	1.01	17.25	17.25	1.25	1.38
	IX	17.25	17.40	1.09	0.94	17.25	17.50	0.88	1.63
	X	17.35	17.50	0.75	0.67	17.25	17.50	0.75	0.63
		Domain – Cognition							
Totals*	VI	1.85	1.30	0.69	0.79	2.00	1.00	1.13	1.13
	VII	1.35	1.45	0.47	0.55	1.50	1.50	0.63	0.63

	VIII	1.60	1.90	0.52	0.61	1.50	2.00	1.00	0.75
	IX	2.25	1.95	0.54	0.95	2.00	1.75	1.00	2.00
	X	2.70	2.20	0.48	0.75	3.00	2.00	1.00	1.50
Domain – Academics									
OMR	VI	14.85	13.50	6.45	5.04	17.75	14.5	10.00	8.63
	VII	14.30	17.75	6.38	1.83	17.75	18.00	11.00	3.75
	VIII	15.85	18.60	6.56	1.82	18.50	19.50	5.13	1.25
	IX	17.9	19.00	3.64	1.20	19.75	19.25	3.00	1.50
	X	19.65	19.85	0.78	0.24	20.00	20.00	0.50	0.50
TMS	VI	12.75	11.05	4.46	4.86	14.25	10.75	6.00	7.38
	VII	10.10	15.40	5.58	2.85	10.25	14.75	10.38	4.00
	VIII	13.65	16.65	5.12	1.79	15.75	16.5	3.50	2.38
	IX	17.40	16.25	3.43	5.14	18.75	19.00	3.25	8.63
	X	18.25	18.65	2.70	1.42	19.50	18.75	2.88	2.00
TMW	VI	12.50	12.30	0.85	1.89	13.00	12.50	1.25	3.25
	VII	11.6	13.20	2.91	1.62	12.00	13.00	6.25	3.00
	VIII	12.00	13.60	2.50	0.97	12.5	14.00	5.00	1.25
	IX	12.55	13.35	2.59	1.00	13.00	13.00	4.00	1.38
	X	14.35	13.95	0.88	1.26	15.00	14.00	1.63	1.63
Totals*	VI	42.4	38.75	10.44	11.30	47.25	38.25	15.38	16.38
	VII	38.00	48.75	14.33	5.26	44.50	48.25	23.50	8.00
	VIII	43.85	51.70	13.89	3.72	50.75	52.50	11.88	5.13
	IX	50.45	50.95	9.52	7.00	54.25	53.75	10.13	9.88
	X	54.95	54.85	4.05	1.90	56.25	55.25	4.88	2.88
Domain - Auditory Ability									
AD	VI	3.00	3.00	0.00	0.00	3.00	3.00	0.00	0.00
	VII	2.90	3.00	0.32	0.00	3.00	3.00	0.00	0.00
	VIII	3.00	3.00	0.00	0.00	3.00	3.00	0.00	0.00
	IX	3.00	3.00	0.00	0.00	3.00	3.00	0.00	0.00
	X	3.00	3.00	0.00	0.00	3.00	3.00	0.00	0.00
PGC	VI	7.70	7.100	0.48	1.10	8.00	7.50	1.00	2.00
	VII	7.20	8.00	0.79	0.00	7.00	8.00	1.25	0.00
	VIII	7.50	7.40	0.97	1.90	8.00	8.00	1.00	0.00

	IX	7.70	7.20	0.67	1.14	8.00	8.00	0.25	2.00
	X	8.00	8.00	0.00	0.00	8.00	8.00	0.00	0.00
Totals*	VI	10.80	10.25	0.59	1.25	11.00	10.50	1.13	2.50
	VII	10.55	11.30	1.09	0.42	10.75	11.00	1.88	0.63
	VIII	10.90	10.80	1.26	2.10	11.25	11.00	2.00	1.00
	IX	10.90	10.50	0.84	1.22	11.00	11.00	0.75	2.00
	X	11.30	11.20	0.42	0.42	11.00	11.00	0.63	0.25

Domain - Behavior

LMS	VI	8.55	9.00	1.42	0.00	9.00	9.00	0.00	0.00
	VII	8.60	8.90	1.26	0.32	9.00	9.00	0.00	0.00
	VIII	9.00	9.00	0.00	0.00	9.00	9.00	0.00	0.00
	IX	9.00	8.75	0.00	0.80	9.00	9.00	0.00	0.00
	X	9.00	9.00	0.00	0.00	9.00	9.00	0.00	0.00
IBS	VI	4.00	4.00	0.00	0.00	4.00	4.00	0.00	0.00
	VII	3.80	3.60	0.63	0.70	4.00	4.00	0.00	1.00
	VIII	4.00	4.00	0.00	0.00	4.00	4.00	0.00	0.00
	IX	4.00	3.80	0.00	0.63	4.00	4.00	0.00	0.00
	X	4.00	3.70	0.00	0.95	4.00	4.00	0.00	0.00
EBS	VI	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00
	VII	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00
	VIII	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00
	IX	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00
	X	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00
Totals*	VI	17.55	18.00	1.42	0.00	18.00	18.00	0.00	0.00
	VII	17.40	17.50	1.90	0.85	18.00	18.00	0.00	1.25
	VIII	18.00	18.00	0.00	0.00	18.00	18.00	0.00	0.00
	IX	18.00	17.55	0.00	1.42	18.00	18.00	0.00	0.00
	X	18.00	17.70	0.00	0.95	18.00	18.00	0.00	0.00

Grand total

Overall score	VI	89.50	85.10	12.29	13.40	95.50	86.50	17.13	19.13
	VII	83.95	95.75	16.50	5.32	90.50	95.50	28.63	8.25
	VIII	91.30	99.35	15.33	5.15	99.50	102.00	13.00	7.88
	IX	98.85	98.35	10.34	9.70	103.00	100.50	11.63	12.88

	X	104.30	103.45	4.84	3.57	105.50	103.25	5.13	4.63

Note: Totals*- domain total score, Pic Des- Picture Description, PD- Phoneme deletion, OMR- one-minute reading, TMS- two-minute spelling, TMW- two-minute writing task, AD- Auditory Discrimination, PGC- Phoneme-Grapheme Correspondence, LMS- Learning motivation Subscale, IBS- Internalizing Behavior Subscale, EBS- Externalizing Behavior Subscale

To verify these observations statistically, Mann-Whitney U test was performed to compare the scores between the two genders in each of the five grades on different tasks on the screening tool. The results of Mann-Whitney U test did not reveal significant gender difference (p>0.05) in the scores obtained on any of the tasks across grades in the tool. This is further substantiated by the extremely low standard deviation values observed in each of the tasks. Hence, the scores of boys and girls are combined for further analysis.

4.2   Comparison of scores on different domains of the screening tool across grades of TD adolescents

Descriptive statistics were done to calculate means, standard deviations, medians, and interquartile ranges for the scores of TD adolescents across grades for each of the task of different domains of the tool. The results in this section are presented separately for each domain in the following sections.

4.2.1 Language domain

The means, medians, standard deviations, and interquartile ranges of the scores obtained by TD adolescents across grades for each task in the language domain are given in the Table 4.3. From Table 4.3, it can be observed that the mean and median scores for tasks in this domain as well as the total score for the domain are similar across grades. The

medians of the total scores obtained in the language domain by TD participants across grades is depicted in Figure 4.1.

Table 4.3

Means, Medians, Standard Deviations (SD) and Interquartile ranges (IQR) of the scores obtained by TD adolescents across grades for tasks in the language domain

Task	Grades	Mean	SD	Median	IQR
Picture description (Max. score = 14)	VI	12.6	0.45	12.5	0
	VII	12.53	0.44	12.5	0.38
	VIII	12.38	0.79	12.5	0.88
	IX	12.75	0.55	12.5	0.38
	X	12.75	0.47	12.5	0.5
Phoneme Deletion (Max. score = 3)	VI	2.55	0.78	3	0.5
	VII	2.6	0.58	3	0.5
	VIII	2.83	0.30	3	0.5
	IX	2.75	0.53	3	0.38
	X	2.9	0.26	3	0
Total scores (Max. score =19)	VI	16.85	1.13	17	1
	VII	16.7	0.78	17	0.88
	VIII	16.95	0.92	17.25	1
	IX	17.33	0.10	17.5	1.25
	X	17.43	0.69	17.5	0.5

Figure 4.1

Medians of the total scores obtained in the language domain by TD participants across grades
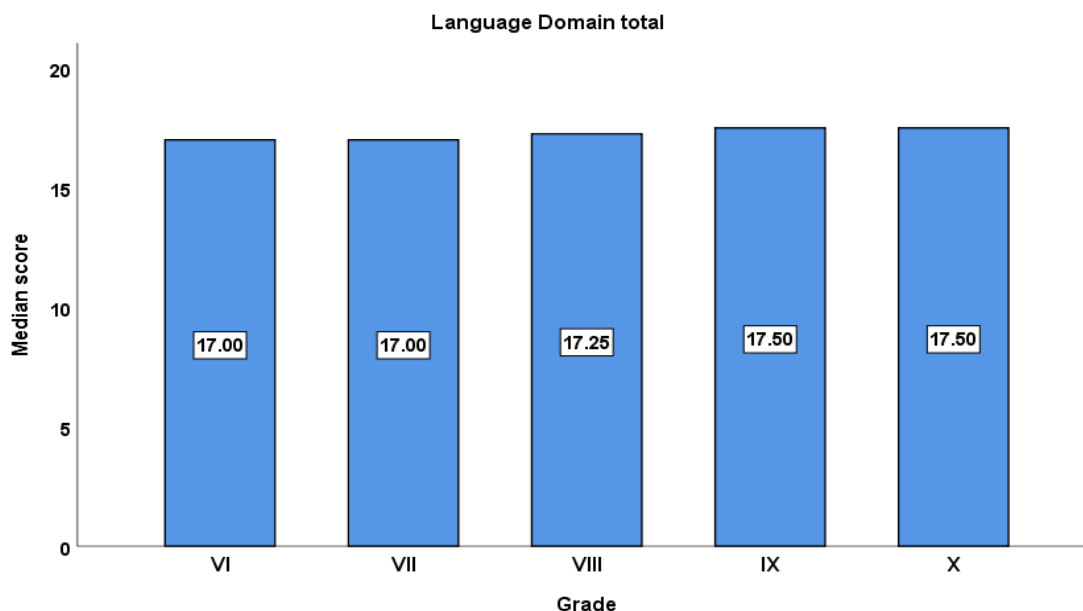
The effect of grade on the total score obtained by TD adolescents in the language domain and also each of the tasks in the domain was tested using Kruskal Wallis test. The results did not reveal an effect of grade on the total scores of the language domain ($\chi2$ (4) = 7.728, p= 0.102). Further, grade effect was not significant for the individual tasks of picture description ($\chi2$ (4) = 2.043, p= 0.728) and phoneme deletion ($\chi2$ (4) = 5.648, p= 0.227). Therefore, the scores obtained by TD adolescents on tasks in the language domain was similar across grades VI to X.

4.2.2 Cognitive domain

The means, medians, standard deviations, and interquartile ranges of the total scores obtained by TD adolescents across grades in the cognitive domain are given in the

Table 4.4. As can be observed from the table, the mean scores increased with increase in grade indicating that children in higher grades obtained higher scores compared to those in the lower grades. The medians of the total scores obtained in the cognitive domain by TD participants across grades is depicted in Figure 4.2.

Table 4.4

Means, Medians, Standard Deviations (SD) and Interquartile ranges (IQR) of the total scores obtained by TD adolescents across grades in the cognitive domain

	Grades	**Mean**	**SD**	**Median**	**IQR**
	VI	1.58	0.77	1.5	1
Total score	VII	1.4	0.50	1.5	0.5
(Max. score = 3)	VIII	1.75	0.57	2	0.88
	IX	2.1	0.77	2	1.5
	X	2.45	0.67	3	1

Figure 4.2

Medians of the total scores obtained in the cognitive domain by TD participants across grades
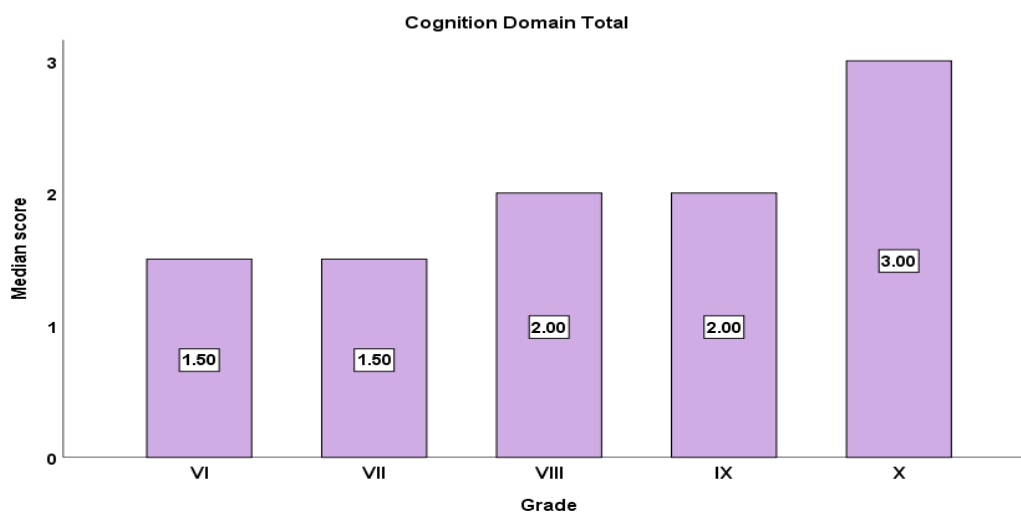
The effect of grade on the total score obtained by TD adolescents in the cognitive domain was analyzed using Kruskal Wallis test and the results revealed a significant effect ($\chi 2$ (4) = 23.645, p= 0.000). This was followed by pairwise comparisons of grades using adjusted Bonferroni corrections and the results are presented in Table 4.5. The results revealed significant differences between grades VI and X, grades VII and IX, between grades VII and X.

Table 4.5

Results of pairwise comparisons using adjusted Bonferroni test for total score of cognition domain in TD adolescents

Grades	|Z|	p value
VI-VII	0.808	1.000
VI-VIII	0.777	1.000
VI-IX	2.107	0.352
VI-X	3.520	0.004*
VII-VIII	1.585	1.000
VII-IX	2.914	0.036*
VII-X	4.328	0.000*
VIII-IX	1.330	1.000
VIII-X	2.743	0.061
IX-X	1.414	1.000

*Note: * - significant difference*

4.2.3 Academic domain

Table 4.6 includes the means, medians, standard deviations, and interquartile ranges of the scores obtained by TD adolescents across grades for each task in the academic domain. From Table 4.6, it can be observed that the mean and median scores for individual

tasks in this domain as well as the total score for the domain increased with increase in grade. The medians of the total scores obtained in the academic domain by TD participants across grades is depicted in Figure 4.3.

Table 4.6

Means, Medians, Standard Deviations (SD) and Interquartile ranges (IQR) of the scores obtained by TD adolescents across grades for tasks in the academic domain

Task	Grades	Mean	SD	Median	IQR
One-Minute Reading (Max. score = 20)	VI	14.18	5.67	15.50	9.00
	VII	16.03	4.90	18.00	4.50
	VIII	17.23	4.90	19.00	1.50
	IX	18.45	2.70	19.50	1.50
	X	19.75	0.57	20.00	0.50
Two-Minute Spelling (Max. score = 20)	VI	11.90	4.62	13.25	5.88
	VII	12.75	5.10	14.50	5.88
	VIII	15.15	4.30	16.00	1.50
	IX	16.83	4.30	19.00	3.88
	X	18.45	2.10	19.25	2.25
Two-Minute Writing (Max. score =15)	VI	12.40	1.43	13.00	1.75
	VII	12.40	2.44	12.50	3.75
	VIII	12.80	2.01	14.00	2.00
	IX	12.95	1.95	13.00	2.75
	X	14.15	1.08	14.50	1.50
Total score (Max. score = 58)	VI	40.58	10.75	44.25	13.50
	VII	43.38	11.86	46.75	11.38
	VIII	47.78	10.68	51.25	5.50
	IX	50.70	8.14	53.75	9.25
	X	54.90	3.08	55.75	3.75

Figure 4.3

Medians of the total scores obtained in the academic domain by TD participants across
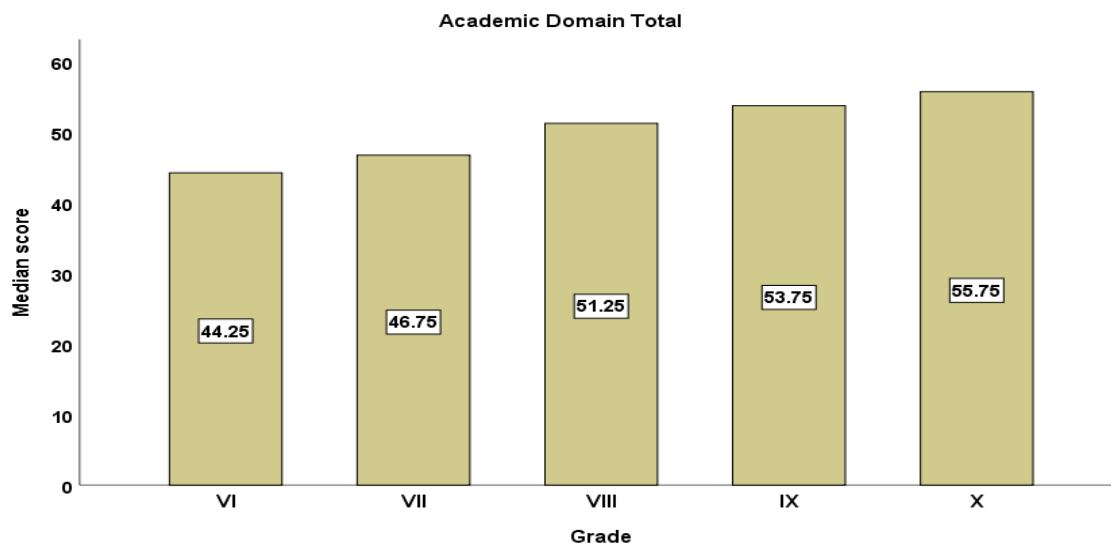
grades

The effect of grade on the total score obtained by TD adolescents in the academic

domain and also each of the tasks in the domain was tested using Kruskal Wallis test. The

results of Kruskal Wallis test revealed a significant effect of grade on the total scores of

the academic domain ($\chi2$ (4) = 37.340, p= 0.000) and also for the tasks of one-minute

reading ($\chi2$ (4) = 29.265, p= 0.000), two-minute spelling ($\chi2$ (4) = 39.237, p= 0.000) and

two-minute writing ($\chi2$ (4) = 14.978, p= 0.005).

Follow up comparisons was carried out using adjusted Bonferroni correction. The

results of pairwise comparisons between grades for the total score of academic domain and

the scores of individual tasks are presented in the Table 4.7. The results indicated

significant differences between few grades in each of the tasks, however, no particular

trend was observed. In general, the scores of grade X was found to be significantly different from that of grades VI, VII and VIII for all the tasks in the academic domain while no differences were observed between successive grades.

Table 4.7

Results of pairwise comparisons using adjusted Bonferroni test for the academic domain in TD adolescents

Grades	Academic domain total		One-minute reading		Two-minute spelling		Two-minute writing	
	|Z|	p	|Z|	p	|Z|	P	|Z|	P
VI-VII	1.012	1.000	0.517	1.000	0.587	1.000	0.746	1.000
VI-VIII	2.296	0.217	1.648	0.994	2.090	0.366	1.265	1.000
VI-IX	3.653	0.003*	2.803	0.051	4.016	0.001*	1.340	1.000
VI-X	5.472	0.000*	4.771	0.000*	5.205	0.000*	3.654	0.003*
VII-VIII	1.284	1.000	1.131	1.000	1.503	1.000	0.519	1.000
VII-IX	2.642	0.082	2.287	0.222	3.429	0.006*	0.594	1.000
VII-X	4.461	0.000*	4.254	0.000*	4.617	0.000*	2.908	0.036*
VIII-IX	1.358	1.000	1.156	1.000	1.926	0.541	0.075	1.000
VIII-X	3.176	0.015*	3.123	0.018*	3.115	0.018*	2.389	0.169
IX-X	1.819	0.690	1.967	0.492	1.188	1.000	2.314	0.207

*Note: * - significant difference*

4.2.4 Auditory ability domain

The means, medians, standard deviations, and interquartile ranges of the scores obtained by TD adolescents across grades for each task in the auditory domain are given in Table 4.8. From Table 4.8, it can be observed that the mean scores for individual tasks in this domain as well as the total score for the domain was similar in all grades with the

exception of grade X where higher scores were obtained. However, the median scores were the same across grades. The medians of the total scores obtained in the auditory domain by TD participants across grades is depicted in Figure 4.4.

Table 4.8

Means, Medians, Standard Deviations (SD) and Interquartile ranges (IQR) of the scores obtained by TD adolescents across grades for tasks in the auditory domain

Task	Grades	Mean	SD	Median	IQR
Auditory Discrimination (Max. score = 3)	VI	3.00	0.00	3.00	0.00
	VII	2.95	0.22	3.00	0.00
	VIII	3.00	0.00	3.00	0.00
	IX	3.00	0.00	3.00	0.00
	X	3.00	0.00	3.00	0.00
Phoneme Grapheme Correspondence (Max. score = 8)	VI	7.40	0.88	8.00	1.00
	VII	7.60	0.68	8.00	1.00
	VIII	7.45	1.47	8.00	0.00
	IX	7.45	0.94	8.00	1.00
	X	8.00	0.00	8.00	0.00
Total score (Max. score = 12)	VI	10.53	0.10	11.00	1.38
	VII	10.93	0.90	11.00	0.88
	VIII	10.85	1.69	11.00	1.00
	IX	10.70	1.04	11.00	1.50
	X	11.25	0.41	11.00	0.50

Figure 4.4

Medians of the total scores obtained in the auditory domain by TD participants across

grades

The effect of grade on the total score obtained by TD adolescents in the auditory domain and also each of the tasks in the domain was tested using Kruskal Wallis test. The results did not reveal an effect of grade on the total scores of the auditory domain ($\chi2$ (4) = 6.289, p= 0.179) and also for the tasks of auditory discrimination ($\chi2$ (4) = 4.000, p= 0.406) and phoneme grapheme correspondence ($\chi2$ (4) = 9.434, p= 0.051). Thus, the scores obtained by TD adolescents on tasks in the auditory domain did not differ across grades VI to X.

4.2.5 Behavior domain

Table 4.9 includes the means, medians, standard deviations, and interquartile ranges of the scores obtained by TD adolescents across grades for each subscale in the

behavior domain. From Table 4.9, it can be observed that the mean scores for individual subscales in this domain and the total score for the domain did not differ much across grades. The medians of the total scores were the same for all grades of TD participants in each of the subscales, as depicted in the figure 4.5.
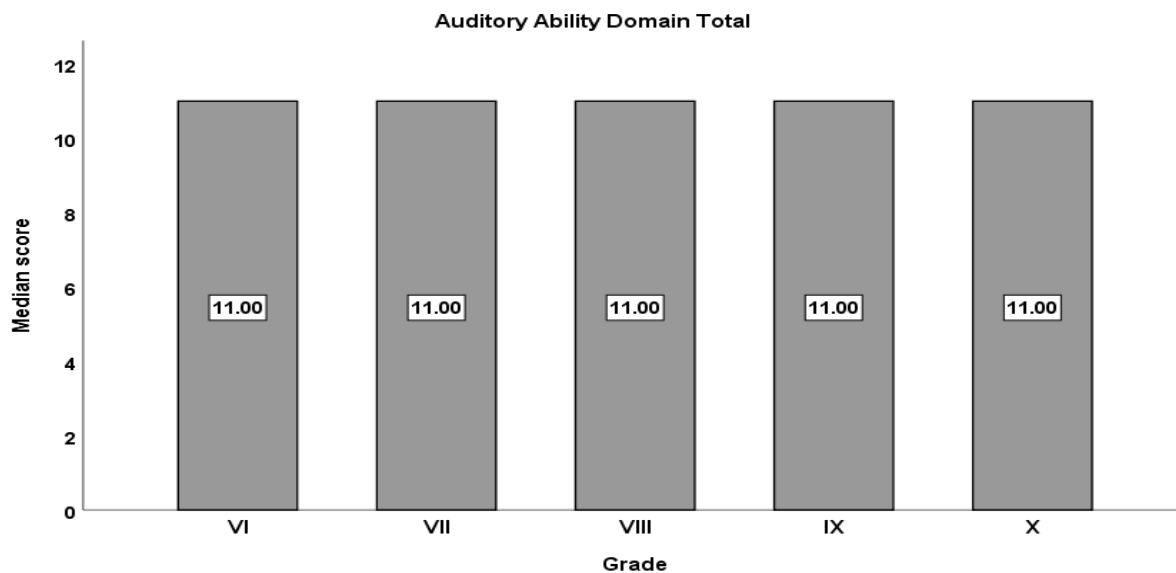
Table 4.9

Means, Medians, Standard Deviations (SD) and Interquartile ranges (IQR) of the scores obtained by TD adolescents across grades for subscales used in the behavior domain

Subscale	Grades	Mean	SD	Median	IQR
Learning Motivation Subscale (Max. score = 9)	VI	8.78	1.00	9.00	0.00
	VII	8.75	0.91	9.00	0.00
	VIII	9.00	0.00	9.00	0.00
	IX	8.88	0.56	9.00	0.00
	X	9.00	0.00	9.00	0.00
Internalizing Behavior Subscale (Max. score = 4)	VI	4.00	0.00	4.00	0.00
	VII	3.70	0.66	4.00	0.00
	VIII	4.00	0.00	4.00	0.00
	IX	3.90	0.45	4.00	0.00
	X	3.85	0.67	4.00	0.00
Externalizing Behavior Subscale (Max. score = 5)	VI	5.00	0.00	5.00	0.00
	VII	5.00	0.00	5.00	0.00
	VIII	5.00	0.00	5.00	0.00
	IX	5.00	0.00	5.00	0.00
	X	5.00	0.00	5.00	0.00
Total score (Max. score = 18)	VI	17.78	1.00	18.00	0.00
	VII	17.45	1.43	18.00	0.00
	VIII	18.00	0.00	18.00	0.00
	IX	17.78	1.00	18.00	0.00
	X	17.85	0.67	18.00	0.00

Figure 4.5

Medians of the total scores obtained in the behavior domain by TD participants across grades

Behavior Domain Total
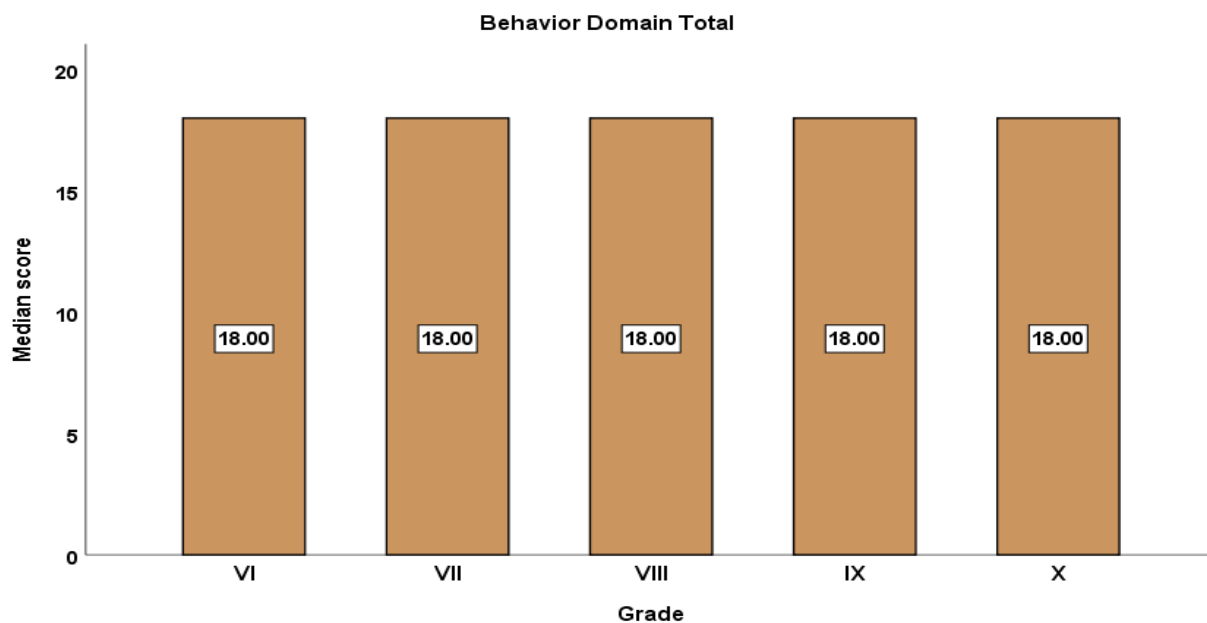
Kruskal Wallis test was administered to test the effect of grade on the total score obtained by TD adolescents in the behavior domain and also each of the subscales in the domain. The results did not reveal an effect of grade on the total scores of the behavior domain ($\chi2$ (4) = 6.715, p= 0.152). Further, grade effect was not significant for the three scales in this domain namely, Learning Motivation subscale ($\chi2$ (4) = 3.558, p= 0.469); Internalizing Behavior subscale ($\chi2$ (4) = 9.158, p= 0.057); and Externalizing Behavior 0ubscale ($\chi2$ (4) = 0.000, p= 1.000). Therefore, the behavioral traits observed in TD adolescents was similar across grades VI to X.

4.2.6 Overall Scores on the Screening Tool

Table 4.10 includes the means, medians, standard deviations, and interquartile ranges of the overall scores obtained by TD adolescents across grades on the screening tool. From Table 4.10, it can be observed that the mean overall scores increased from grade VI to grade X. Figure 4.6 depicts the medians of the total scores obtained on the screening tool by TD participants across grades.

Table 4.10

Means, Medians, Standard Deviations (SD) and Interquartile ranges (IQR) of the overall scores obtained on the screening tool by TD adolescents across grades

	Grades	**Mean**	**SD**	**Median**	**IQR**
Overall total score (Max = 132)	VI	87.30	12.71	90.25	15.63
	VII	89.85	13.39	94.25	11.25
	VIII	95.33	11.87	99.50	8.25
	IX	98.60	9.76	101.50	11.13
	X	103.88	4.16	104.00	4.88

Figure 4.6

Medians of the overall scores obtained on the screening tool by TD participants across grades
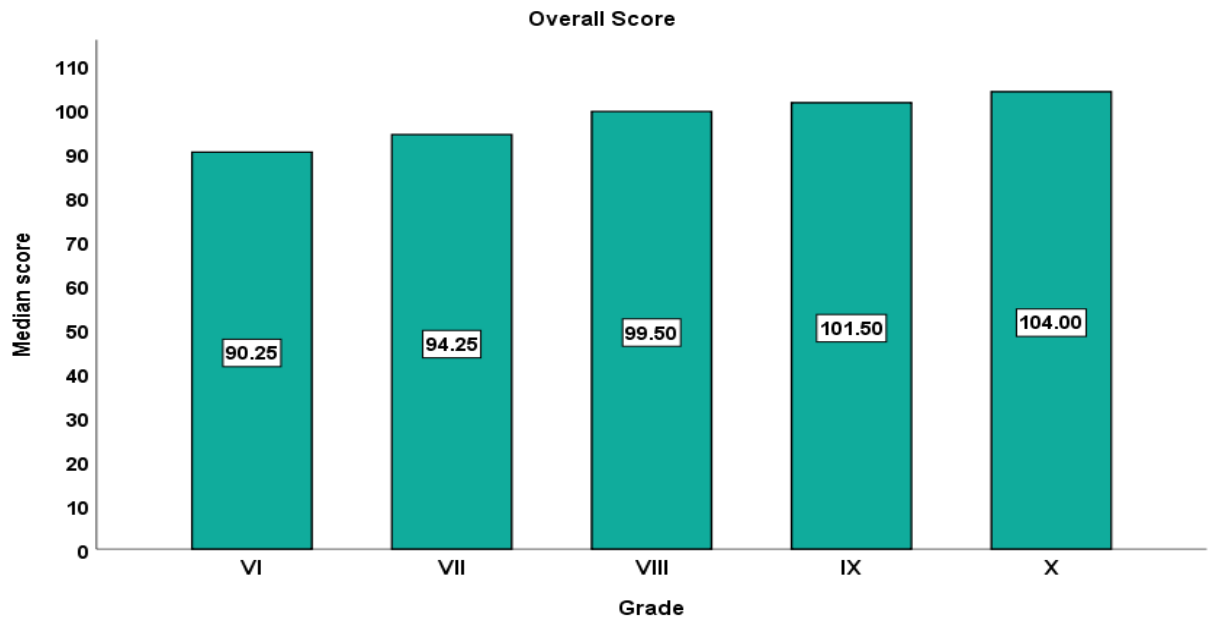
The effect of grade on the overall total score obtained by TD adolescents on the screening tool was analyzed using Kruskal Wallis test and the results revealed a significant grade effect $\chi2(4) = 37.779$, $p = 0.000$). This was followed by pairwise comparisons of grades using adjusted Bonferroni corrections and the results are presented in Table 4.11. Significant differences ($p<0.05$) were observed between grades VI and IX, VI and X, VII and X and VIII and X but not the others.

Table 4.11

Results of pairwise comparisons using adjusted Bonferroni test for overall scores on the

screening tool in TD adolescents

Grades	|Z|	p value
VI-VII	0.723	1.000
VI-VIII	2.209	0.272
VI-IX	3.485	0.005*
VI-X	5.418	0.000*
VII-VIII	1.486	1.000
VII-IX	2.762	0.057
VII-X	4.695	0.000*
VIII-IX	1.276	1.000
VIII-X	3.209	0.013*
IX-X	1.933	0.532

Note: *- significant difference

4.2.7 Comparison across different grades of TD adolescents for categorical variables

Categorical analysis was carried out for stimuli in the screening tool with yes/no types of responses and present/absent responses using chi-square test. The results of chi-square analysis indicate revealed statistically significant differences ($p<0.05$) in some of the tasks. The results are presented under two sections – i) general information and ii) tasks under each domain. Cross tabulation showing percentages of participants in each grade with respect to scores obtained for categorical tasks in the tool are given in Table 4.12.

i) General information: Results of chi-square test indicated no statistically significant association between responses of TD adolescents and grade for question on attending

tuitions ($\chi2(4) = 4.924$, p > 0.05). Chi-square tests could not be performed for other questions in this section as the scores were almost similar across grades.

ii) Tasks under domains: Results of chi-square tests revealed significant association of responses with grade for tasks of phoneme fluency ($\chi2(8) = 16.060$, p=0.042), non-verbal reasoning ($\chi2(8) = 33.708$, p=0.000), and backward digit span ($\chi2(8) = 22.380$, p=0.004). Chi-square test could not be administered for other categorical tasks in the screening tool (Language - Following instruction, Cognition - Overlapping test, Academics - Reading fluency and reading comprehension, and Auditory - Auditory memory and sequencing) due to similarity in scores across grades.

Table 4.12

Cross tabulation showing percentages of participants in each grade with respect to scores obtained for tasks of phoneme fluency, non-verbal reasoning and backward digit span

Tasks	Score	Grades				
		VI	VII	VIII	IX	X
Phoneme fluency	0	5	0	0	0	5
	0.5	50	85	50	35	35
	1	40	15	50	65	60
Non-verbal reasoning	0	70	40	60	50	0
	0.5	10	25	5	5	5
	1	20	35	35	45	95
Backward digit span	0	60	85	45	35	45
	0.5	0	5	20	5	0
	1	40	10	35	60	55

4.3 Comparison of scores on different domains of the screening tool between TD adolescents and adolescents with LD

The developed screening tool was administered on ten adolescents with LD (2 each in grades VI to X) to check for clinical utility. Owing to the small sample of adolescents with LD, the data was combined for grades. Descriptive statistics were carried out to calculate the means, medians, standard deviations, and interquartile ranges for overall scores and the domain total scores obtained by participants in both the groups. The results of the same are given in the Table 4.13. From the table, it is evident that adolescents with LD obtained lower overall scores as well as lower scores on all domains of the screening tool compared to the TD adolescents.

Table 4.13

Means, Medians, Standard Deviations (SD) and Interquartile ranges (IQR) of the scores obtained on the screening checklist by TD adolescents and adolescents with LD

Domain	Group	Mean	SD	Median	IQR
Language	TD	17.05	0.94	17.00	1.00
	LD	14.85	0.97	14.50	1.25
Cognition	TD	1.86	0.75	2.00	1.38
	LD	0.80	0.35	0.75	0.50
Academics	TD	47.47	10.58	51.00	9.88
	LD	20.00	10.58	20.25	12.63
Auditory abilities	TD	10.85	1.09	11.00	0.50
	LD	9.30	0.63	9.25	1.00
Behavior	TD	17.77	0.95	18.00	0.00
	LD	7.65	2.33	7.50	1.75
Overall	TD	94.99	12.24	99.25	11.25
	LD	52.60	9.85	54.75	12.50

Mann-Whitney U test was carried out to compare the overall scores and domain total scores between the two groups of participants. Results of Mann-Whitney U test, as presented in Table 4.14, revealed significant differences in the overall scores as well as total scores of domains between TD adolescents and adolescents with LD.

Table 4.14

Results of Mann-Whitney U test comparing overall scores and domain total scores between TD adolescents and adolescents with LD

Domain	|Z|	p value
Language	4.598	0.000*
Cognition	4.185	0.000*
Academics	4.670	0.000*
Auditory ability	4.339	0.000*
Behavior	8.248	0.000*
Overall Scores	5.108	0.000*

*Note: * - significant difference*

4.3.1 Comparison between scores of adolescents with LD and TD adolescents across grades

Considering the small sample of adolescents with LD across grades (2 in each grade), no statistical measures could be carried out for comparing the scores of the two groups across grades. Nevertheless, the scores of individuals with LD in each grade were compared graphically with reference to the range of scores obtained by TD adolescents in the respective grade. Figures 4.7 to 4.12 depict the scores of adolescents with LD in

comparison to that of grade matched TD adolescents for the overall scores obtained on the screening checklist as well as total scores obtained on each domain.

As seen in the figure 4.7, adolescents with LD scored lower than the range specified by that of TD adolescents for overall scores across all grades except for one participant in grade VI whose scores were within the range of TD adolescents. It can be observed that the distance between the scores of adolescents with LD and their TD peers increased with increase in grade. Similar trends are observed in the individual domains (language, cognition, academics, auditory abilities and behavior) of the screening tool (Figures 4.8 to 4.12). In general, scores of adolescents with LD were lower than the minimum scores obtained in the group of TD adolescents of the respective grade. There were, however, few exceptions to this where the scores of adolescents with LD was observed to be within the range of scores obtained by grade matched TD adolescents. Nevertheless, the scores of such individuals were closer to the lower end of the range of scores of typical adolescents.

Figure 4.7

Overall scores of adolescents with LD in comparison to the range of scores of typically developing adolescents (TDA) on the screening tool across grades

Figure 4.8

Total scores of language domain obtained by adolescents with LD in comparison to the

range of scores of typically developing adolescents (TDA) across grades

Figure 4.9

Total scores of cognitive domain obtained by adolescents with LD in comparison to the

range of scores of typically developing adolescents (TDA) across grades
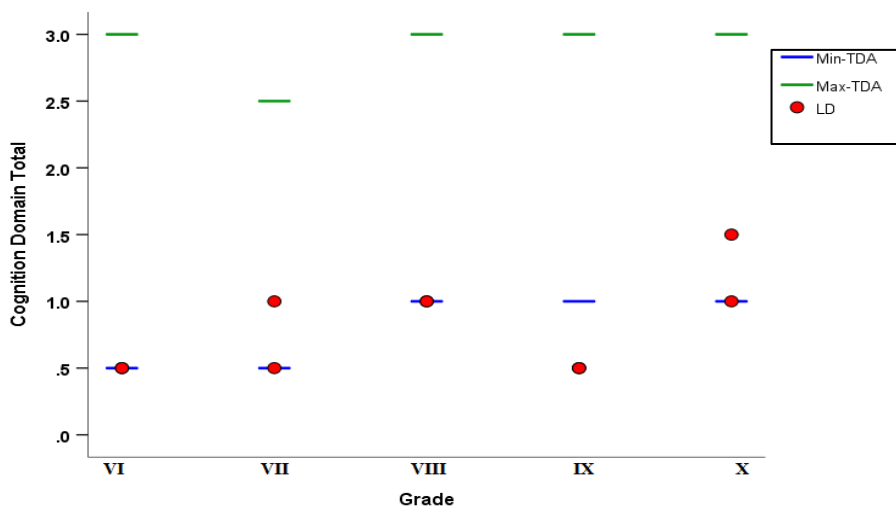
Figure 4.10

Total scores of academic domain obtained by adolescents with LD in comparison to the

range of scores of typically developing adolescents (TDA) across grades
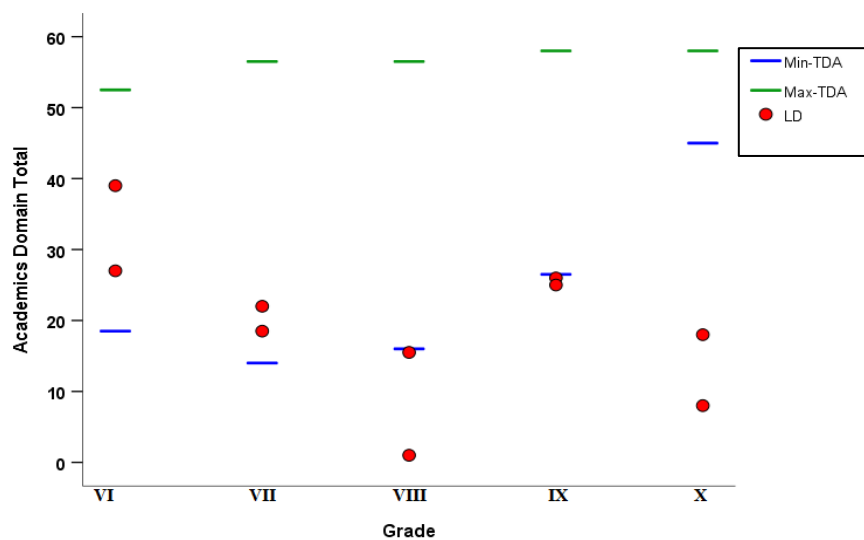
Figure 4.11

Total scores of auditory domain obtained by adolescents with LD in comparison to the

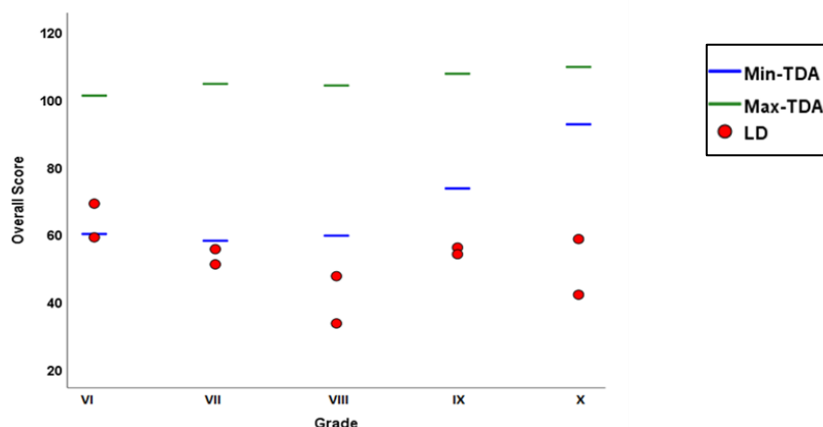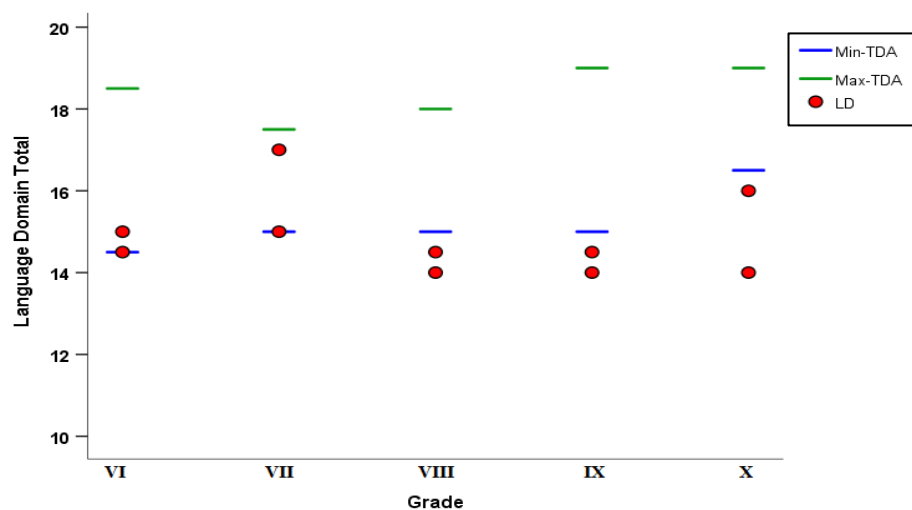*range of scores of typically developing adolescents (TDA) across grades*
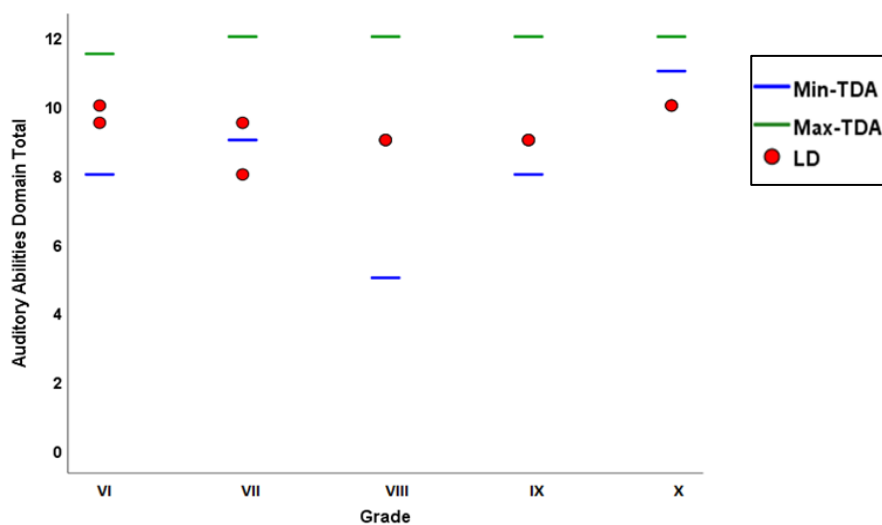
Figure 4.12

Total scores of behavior domain obtained by adolescents with LD in comparison to the range of scores of typically developing adolescents (TDA) across grades
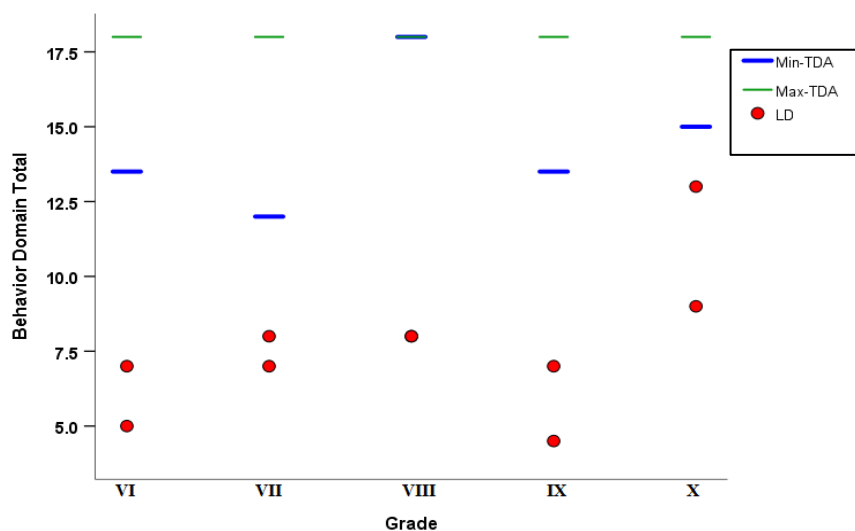
4.3.2 Qualitative analysis of the performance of adolescents with LD across the domains of the screening tool

In addition to comparison between total scores obtained by adolescents with LD and grade matched TD adolescents on each domain of the tool, an attempt was made to describe the performance of LD participants qualitatively.

Domain 1- Language

All adolescents with LD could perform the task of following instruction without any difficulty. There were some notable exceptions in the picture description task where one of the participants had trouble finding appropriate words, and few others had

difficulties in organizing the description, information content, and vocabulary usage. Phoneme deletion tasks were found to be extremely difficult for adolescents with LD – either they were unable to perform the task or required repetitions of instructions and practice trials.

Domain 2- Cognition

Tasks of non-verbal reasoning task and backward digit span proved to be difficult for adolescents with LD compared to the overlapping test, where the scores obtained were relatively better.

Domain 3- Academics

The performance of adolescents with LD was poor on this section. Most participants in the group scored lower on the reading fluency task. Few of them failed to comprehend or misinterpreted the information despite having a high reading fluency score. One-minute reading and two-minute spelling tasks were difficult for all participants across grades. In the two-minute writing task, LD adolescents displayed characteristics such as lack of motivation, writing incomplete sentences, using inappropriate vocabulary, regularizing the irregular words, absence or inappropriate usage of punctuations, presence of mirror writing, clumsy writing, poor letter formations and using inappropriate capitalization.

Domain 4- Auditory Abilities

Adolescents with LD performed well on tasks of auditory discrimination and phoneme-grapheme correspondence with an exception of few participants for the latter

task. However, all the individuals with LD scored lower on auditory memory and sequencing task. They could recall about 4 to 5 digits, however, the sequence was not correct.

Domain 5- Behavior

In the behavioral domain, adolescents with LD exhibited lack of attention, self-confidence, motivation and interest in class related activities. They were also found to require a greater number of repetitions in learning new things. They reported of tendencies to get anxious and depressed despite having put great efforts in learning, consequent to which they often missed classes or behaved rudely.

4.4 Test-retest reliability

The test- retest reliability was analyzed by re-administering the tool on 10% of the participants in the TD group (2 subjects in each age grade) randomly selected from the original sample after a period of one week from the initial testing. The results of the retest were compared with the results obtained in the first test. The Cronbach's alpha coefficients for the test-retest reliability of the tool are represented in Table 4.15. The Cronbach's alpha coefficients for each of the domains is greater than 0.7, indicating a good test-retest reliability.

Table 4.15

Cronbach's alpha coefficient for the test-retest reliability of the screening tool

Domains	Cronbach's alpha
Language	0.910
Cognition	0.943
Academics	0.774
Auditory abilities	0.992
Behavior	1
Overall scores	0.996

In summary, comparison of scores between TD adolescent boys and girls did not reveal differences between the two genders on any domain of the screening tool. A significant effect of grade was observed on the scores obtained by TD adolescents on the overall scores of the tool as well as in the domains of cognition and academics. The scores in the other domains did not vary greatly across grades. Further, no differences were observed in the scores obtained by participants in successive grades for any of the task. Scores of adolescents with LD was significantly lower than that of TD adolescents on all the domains as well as the total scores obtained on the screening tool.

CHAPTER 5

DISCUSSION

The aim of the present study was to develop and validate a screening tool for adolescents with LD and compare the performance of typically developing (TD) adolescents and adolescents with LD in the grade range of VI-X. The results of the present study are discussed as follows:

5.1 Effect of gender on the performance of TD adolescents on the screening tool

5.2 Performance of TD adolescents on the screening tool across domains and across grades

5.3 Performance of adolescents with LD in comparison to TD peers on different domains of the screening tool

5.1 Effect of gender on the performance of TD adolescents on the screening tool

The results of the present study revealed that there were no significant differences in the performance of TD adolescent boys and girls on all the domains of the tool. There is no consensus in the literature with regard to gender effect on different tasks included in the study. The findings of the present study about the scores of adolescent boys and girls for tasks in the language domain being similar are in contradiction to the existing literature reporting gender differences. It is reported that as the peer-based social order begins to take shape during the adolescence period, systematic gender variations start to show up (Eckert, 2014). In addition, adolescent females are reported to use more words related to cognitive processing and self-reflection than adolescent males. Higher levels of well-being were evidenced in the internal state language in personal narratives of teenage males, but no

correlation was found between internal state language in personal narratives and well-being in adolescent females (Bohanek & Fivush, 2010).

Research evidences indicate that the cognitive capacities are specifically shaped by biological sex (such as birth-assigned sex, sex hormones), sociocultural gender (gender identity, gender roles), and sexual orientation, thus suggesting a gender difference (Kheloui et al., 2023). Neurobiological changes are believed to contribute, in part, to the range in cognitive and affective behavior seen during adolescence. The differences in these changes between males and females are expected to result in gender differences in cognitive development (Yurgelun-Todd, 2007). However, no such differences were observed in the current study with reference to tasks in the cognitive domain.

With reference to academic tasks, no gender differences were evidenced in the present study which is supported by similar reports in the earlier literature (Tracey et al., 2005). Social and emotional self-efficacy across academic ability did not differ between genders (Armum & Chellappan, 2016). However, boys are reported to have greater interest in mathematics than girls (Frenzel et al., 2010).

Findings of the study in the auditory domain with regard to gender differences are in contradiction to that reported in the literature. Perceptual differences exist between genders due to maturational aspects and males often have better performance than females (Huyck & Wright, 2018). Further, auditory brainstem continues to mature till the end of adolescence which leads to differences in auditory processing. Maturation of structures

differ across gender and hence, gender differences can be expected across the auditory abilities too (Krizman et al., 2015). Nonetheless, no such differences were observed in the current study for the tasks considered.

It is well established that behaviors vary between boys and girls and adolescent period is no exception. However, the findings of the present study for behavior domain are contradictory to the existing literature. There is some evidence to support the claim that older adolescent girls make more self-controlled decisions than older adolescent guys (Miller & Byrnes, 2001). Older adolescent girls often have a higher level of decision-making ability than younger adolescent girls and younger and older adolescent boys. The behavioral measures considered in the screening tool used in the current study were few in number and they were inferred based on general conversations and performance on given tasks. These differences could be the reason for lack of gender differences. Further, the effect of gender was not observed with reference to prevalence of problem behaviors (Deković et al., 2004).

5.2 Performance of TD adolescents on the screening tool across domains and across grades

The results of the present study indicated differences between TD adolescents across grades for tasks in the domains of cognition and academics, but not for language, auditory abilities and behavior. A specific trend was not seen consistently across grades in each of the domains of the screening tool.

In the language domain, although not statistically significant, a slight difference was noticed in the scores of TD adolescents across grades. A developmental trend for language skills is thus indicated with higher grade individuals performing better compared to lower grades. Advanced language ability which includes ability to carry out new social interactions among the peers, maintaining peer-relationships, handling social roles emerge during the adolescent period (de Armas & Kelly, 1989). Research also indicated that language development continues to occur through adolescence and adulthood. The development continues in different components of language, vocabulary, expression of figurative language, abstract meanings and also in the comprehension of peer-used dialects of language (Nippold et.al., 1993).

A significant developmental trend was revealed in the cognitive domain with adolescents in higher grades performing better than those in the lower grades. Older adolescents have more mature brain structures and connections that are required to carry out cognitive tasks compared to lower grades. The prefrontal cortex responsible for higher cognitive tasks such as attention, perception, reasoning, working memory, decision making continues to mature during adolescence (Luciana et.al., 2005), thereby supporting the developmental pattern in the present study. Older adolescents tend to have better ability of higher order thinking, reasoning, problem solving, decision making and better memory when compared to younger adolescents and younger adolescents appear to have a less constructivist, metacognitive, and reflective knowledge of the mind than older adolescents and adults (Byrns, 2006).

Results also revealed that there was a significant difference in the performance of TD adolescents for academic domain across grades indicating better performance in higher grades than compared to lower grades. These findings draw support from the literature reporting that academic mastery of high school students differed substantially from that of middle school students (Bong, 2001). Younger children who are skilled in employing study methods succeed in higher grades indicating a better academic performance in higher grades compared to lower grades (Thomas, 1993).

There were no significant differences in the performance of TD adolescents across grades for tasks in the auditory domain. The mean scores of participants in each grade were closer to the maximum possible scores of the respective tasks, thereby approximating ceiling. These findings indicate that the skill set required to perform the auditory tasks included in the domain are already achieved by grade VI. There are evidences indicating that state certain auditory skills achieve maturity by 10-11 years of age (Moore et al., 2011). However, this may not be true for complex auditory tasks that require contribution from higher centres of the brain. The higher auditory system's myelination lasts for several years even if the lower auditory system is fully developed and functional at birth (Boothroyd, 1997).

The behavioral aspects of TD adolescents did not vary across grades in the present study. Literature reveals that behavioral aspects of individuals may either improve or decline during adolescence. Also, differences in behavior are reported between males and

females, which was again not observed in the study (Miller & Byrnes, 2001; Zi-quin et al., 2022).

5.3 Performance of adolescents with LD in comparison to TD peers on different domains of the screening tool

The results of the present study revealed poor performance of adolescents with LD on all domains of the screening tool in comparison with TD peers. These findings are in consonance with the earlier literature in which poor performance of adolescents with LD is well established on domains such as language (Wiig & Semel, 1974; 1975), cognition, academics, auditory and behavior.

Difficulties in processing linguistic concepts are often reported in adolescents with LD (Wiig & Semel, 1974). Language deficits in adolescents with LD include reduced phrase length, simplified grammatical form, reduced speed and accuracy, presence of word finding difficulty, poorer abstract concept (Wiig & Semel, 1975). LD adolescents have significantly poor immediate verbatim recall of syntactically and semantically varied sentences i.e., syntactically correct semantically incorrect sentences, complex syntactic sentences (Wiig & Roach, 1975).

LD adolescents exhibit deficits not only in language abilities but also in their thinking, reasoning abilities and judgmental skills. The difficulty in processing language in these individuals are also reflective of their reduced cognitive functions (Wiig & Semel, 1974). Delayed development of cognition in terms of convergent and divergent production

of semantically related words and retrieval problems are reported in LD adolescents (Wiig & Roach, 1975; Wiig & Semel, 1975). Word finding difficulty and difficulties in recalling aspects indicate memory deficits in this population (Wiig & Roach, 1975). Similar observations are noted in the current study, thereby substantiating the earlier findings in this regard.

Poor performance of adolescents with LD on tasks in the academic domain particularly with increase in grades is a hallmark of the condition. LD adolescents exhibit lower performance in academic related tasks like reading, writing and math calculations (Deshler et al., 1982). It is well known that the complexity of academic tasks increases as the grade increases. Academic precursors such as language, listening and cognitive skills greatly influence academic success, especially in the higher grades. Adolescents with LD have problems related to decoding and encoding of words and their comprehension. The lesser academic vocabulary in these individuals is positively correlated with reading fluency and reading comprehension (Abbott et al., 2017; Beach et al., 2015; Faggella-Luby & Deshler, 2008).

Comparison of scores between TD adolescents and adolescents with LD in the auditory domain revealed that LD adolescents scored lower only in grade VII and X and there were no differences in the other grades. Auditory deficits could be present in a subgroup of individuals with LD and not necessarily in every individual with LD. It is also plausible that nature of the auditory tasks included in the tool could have led to the lack of differences between the two groups of participants, particularly tasks for which numerical

analysis was carried out. However, differences were observed in the task of auditory memory and sequencing where adolescents with LD were outperformed by TD adolescents. Poor central auditory processing is reported in adolescents with LD (Ferre & Wilber, 1986). LD individuals often experience difficulties at the level of listening and listening comprehension which in turn impacts their academic skills (Faigel, 1973).

LD adolescents significantly scored lower in the behavior domain indicating that there are more negative or decreased positive behaviors associated with LD adolescents. These findings are in alignment with the earlier reports on behavioral deviations in LD during adolescence (Bender et al., 1996; Ching et al., 2012; Cohen, 1986). Adolescents with LD are less motived to perform academic tasks (Deshler et al., 1982). A study revealed that individuals with LD require psychotherapy because of the increase in behavioral problems as they enter into adolescence (Gardner & Sperry, 1964). Adolescents with LD are reported to be at greater risk for depression, stress and also suicide (Bender et al., 1996; Cohen, 1986).

In conclusion, a developmental trend in the performance of TD adolescents across grades VI to X was observed in the cognitive and academic domains of the screening tool. In contrast, the performance was similar across grades for tasks in the domains of language, auditory abilities and behavior. Adolescents with LD performed poorer than TD peers on tasks included in all domains of the tool except for auditory discrimination task. These findings emphasize the importance of certain domain specific skills and their contribution to language and literacy in adolescents. Further, the difficulties of LD adolescents in

different domains like language, cognition, academics, auditory abilities and behavior are evident. Therefore, it may be concluded that the tasks included under different domains in the screening tool cover a range of difficulties characteristic of LD, thereby supporting the clinical utility of the tool. Nonetheless, it is essential to field test the developed screening tool on a bigger sample of adolescents with LD to confirm the validity of the tool.

CHAPTER 6

SUMMARY AND CONCLUSIONS

The present study aimed to develop and validate a screening tool for adolescents with Learning Disability (LD). Additionally, comparison of the scores of typically developing (TD) adolescents and adolescents with LD was also carried out to check for the clinical utility of the tool. A cross-sectional, descriptive research design was employed to develop the normative for the screening tool; while standard group comparison was used to compare TD adolescent groups and those with LD.

The study was carried out in three phases – Phase 1 included development of the screening tool based on a thorough review of literature; and content validation of the tool was taken up in Phase 2. In Phase 3, the screening tool was administered on a total number of 100 TD adolescents between grades VI and grade X studying in schools in the urban ambient environment of Mysore city. They were divided into 5 groups based on their grades (grade VI, grade VII, grade VIII, grade IX and grade X) with 20 participants (10 males and 10 females) in each group. The tool was also administered on 10 adolescents with LD (grades VI to X) recruited from a clinical set up.

The results did not differ between TD adolescent boys and girls on any domain of the screening tool. A significant effect of grade was observed on the scores obtained by TD adolescents on the overall scores of the tool as well as in the domains of cognition and academics. These findings indicated a developmental trend in the performance of TD

adolescents in the cognitive and academic domain. The scores in the other domains did not vary greatly across grades. Further, no differences were observed in the scores obtained by participants in successive grades for any of the task. Scores of adolescents with LD were significantly lower than that of TD adolescents on all the domains as well as the total scores obtained on the screening tool, indicating poor performance of adolescents with LD. This suggests that the tasks included under different domains in the screening tool cover a wide range of difficulties characteristic of LD and can be sensitive to screen for adolescents at risk for LD. The validity of the screening tool, however, needs to be established by administering on a large number of adolescents with LD.

6.1   Clinical Implications of the study

    i.   The study provides an insight into the abilities of TD adolescents from grade VI to grade X along the domains of language, cognition, academics, auditory abilities and behavior.

    ii.   The tool developed can be used to screen for adolescents with LD from grades VI to X.

    iii.   The results can provide useful insights in the development of a literacy assessment battery for adolescents.

    iv.   The domains and stimuli in the tool can also facilitate in planning intervention.

6.2   **Limitations of the study**

   i.   A very small number of adolescents with LD was included in the study, and hence, the generalizability of the findings may be limited.

  ii.   Adolescents with LD were not categorized into different subgroups, which could have led to variations in the findings.

 iii.   Considering that the tool was meant for screening, the number of tasks included in each domain were limited. Thus, the entire range of difficulties in LD across tasks and domains could not be covered.

6.3   **Future Directions**

   i.   The validity of the developed screening tool can be established by administering on a on a larger group of adolescents with LD across a wider range of grades.

  ii.   Based on the findings of the study, a comprehensive assessment tool for adolescents with LD could be developed.

REFERENCES

Abbott, R., Mickail, T., Richards, T., Renninger, A. A., Hidi, S. E., Beers, S., & Berninger, V. (2017). Understanding interest and self-efficacy in the reading and writing of students with persisting specific learning disabilities during middle childhood and early. *International Journal of Educational Methodology, 3*(1), 41–64. https://doi.org/10.12973/ijem.3.1.41

Barwasser, A., Lenz, B., Disabilities, M. G.-I. into L., & 2021, undefined. (2021a). A Multimodal Storytelling Intervention for Improving the Reading and Vocabulary Skills of Struggling German-as-a-Second-Language Adolescents With Learning disbility. *Insights into Learning Disabilities, 18*(1), 29–51. https://eric.ed.gov/?id=EJ1295241

Bateman, B. (1964). Learning Disabilities – Yesterday, Today, and Tomorrow. *ExceptionalChildren, 31*(4), 167–177. https://doi.org/10.1177/00144029640310040

Beach, K. D., Sanchez, V., Flynn, L. J., & O'Connor, R. E. (2015). Teaching Academic Vocabulary to Adolescents With Learning Disabilities. TEACHING Exceptional Children, 48(1), 36–44. https://doi.org/10.1177/0040059915594783

Beauchemin, J., (2008). Mindfulness meditation may lessen anxiety, promote social skills, and improve academic performance among adolescents with learning disabilities. *Patterson Complementary Health Practice Review,, 13*(1), 34–45. https://doi.org/10.1177/1533210107311624

Bender, W. N., Rosenkrans, C. B., & Crane, M.-K. (1999). Stress, Depression, and Suicide among Students with Learning Disabilities: Assessing the Risk. Learning Disability Quarterly, 22(2), 143–156. https://doi.org/10.2307/1511272

Bender, W. N., & Smith, J. K. (1990). Classroom Behavior of Children and Adolescents with Learning Disabilities: A Meta-Analysis. Journal of Learning Disabilities, 23(5), 298–305. https://doi.org/10.1177/002221949002300509

Bohanek, J. G., & Fivush, R. (2010). Personal narratives, well-being, and gender in adolescence. *Cognitive Development*, *25*(4), 368-379.

Bong, M. (2001). Between- and within-domain relations of academic motivation among middle and high school students: Self-efficacy, task value, and achievement goals. *Journal of Educational Psychology, 93*(1), 23–34. https://doi.org/10.1037/0022-0663.93.1.23

Branta, C., Haubenstricker, J. O. H. N., & Seefeldt, V. (1984). Age changes in motor skills during childhood and adolescence. *Exercise and sport sciences reviews*, *12*, 467-520.

Chandni, J., Ghosh, P. V., Chetak, K. B., & Aishwarya, L. (2020). Maturation of speech perception in noise abilities during adolescence. *International Journal of Pediatric Otorhinolaryngology*, *139*, 110459.

Ching, B. H. H., Ho, C. S. H., Chan, D. W., Chung, K. K. H., & Lo, L. Y. (2012). Behavioral characteristics of Chinese adolescents with dyslexia: The use of teachers' behavior checklist in Hong Kong. *Applied Psycholinguistics*, *35*(6), 1235–1257. https://doi.org/10.1017/S0142716413000179

Clemens, N. H., Hsiao, Y.-Y., Lee, K., Martinez-Lincoln, A., Moore, C., Toste, J., & Simmons, L. (2021). The Differential Importance of Component Skills on Reading Comprehension Test Performance Among Struggling Adolescent Readers. Journal of Learning Disabilities, 54(3), 155–169. https://doi.org/10.1177/0022219420932139

Dai, J., & Scherf, K. S. (2019). Puberty and functional brain development in humans: Convergence in findings?. *Developmental Cognitive Neuroscience*, *39*, 100690.

de Armas, A., & Kelly, J. A. (1989). Social relationships in adolescence: Skill development and training. In *The adolescent as decision-maker* (pp. 83-109). Academic Press.

Deshler, D. D., Schumaker, J. B., Alley, G. R., Warner, M. M., & Clark, F. L. (n.d.). *Emphasis on Adolescents and Young Adults LEARNING DISABILITIES IN ADOLESCENTS AND YOUNG ADULT POPULATIONS: RESEARCH IMPLICATIONS PART I.*

Eckert, P. (2014). Language and Gender in Adolescence. *The Handbook of Language, Gender, and Sexuality: Second Edition*, 529–545. https://doi.org/10.1002/9781118584248.CH27

Eisenmajer, N., Ross, N., & Pratt, C. (2005). Specificity and characteristics of learning disabilities. *Journal of Child Psychology and Psychiatry*, *46*(10), 1108-1115.

Faggella-Luby, M. N., & Deshler, D. D. (2008). Reading comprehension in adolescents with LD: What we know; what we need to learn. *Learning Disabilities Research & Practice*, *23*(2), 70-78.

Faigel, H. G. (1973). The adolescent with a learning problem: The need for insight. *Clinical pediatrics*, *12*(10), 577-581.

Fawcett, A. J., & Nicolson, R. I. (1995). The Dyslexia Early Screening Test. *The Irish Journal of Psychology*, *16*(3), 248–259. https://doi.org/10.1080/03033910.1995.10558060

Ferre, J. M., & Wilber, L. A. (1986). Normal and learning disabled children's central auditory processing skills: An experimental test battery. *Ear and Hearing*, *7*(5), 336-343.

Fuhrmann, D., Knoll, L. J., & Blakemore, S. J. (2015). Adolescence as a sensitive period of brain development. *Trends in cognitive sciences*, *19*(10), 558-566.

Goswami, S. P., Shanbal, J. C., Samasthitha, S., & Navitha, U. (2012). FIELD TESTING OF MANUAL FOR ADULT: NON-FLUENT APHASIA THERAPY IN KANNADA (MANAT-K). *Journal of the All India Institute of Speech & Hearing*, *31*.

Gardner, G. E., & Sperry, B. (1964). Basic word ambivalence and learning disabilities in childhood and adolescence. *American Journal of Psychotherapy*, *18*(3), 377-392.

Hall-Mills, S., Quarterly, L. M.-L. D., & 2022, undefined. (2020). Explicit text structure instruction supports expository text comprehension for adolescents with learning disabilities: A systematic review. *Learning Disability Quarterly, 45*(1), 55–68. https://doi.org/10.1177/0731948720906490

Huntington, D. D., & Bender, W. N. (n.d.). *REPORTS Adolescents with Learning Disabilities at Risk? Emotional Weil-Being, Depression, Suicide*.

Johnson, D. J., & Myklebust, H. R. (1964). Learning practices.

Khasawneh, M., Language, M. A.-I. J. of, & 2020, undefined. (2020). The Effectiveness of Phonological Awareness Training in Treating Deficiencies in Auditory Processing among Children with Learning Disabilities among Elementary. *International Journal of Language Education, 4*, 2548–8465. https://doi.org/10.26858/ijole.v4i3.14758

Kim-Cohen, J., Caspi, A., Moffitt, T. E., Harrington, H., Milne, B. J., & Poulton, R. (2003). Prior juvenile diagnoses in adults with mental disorder: developmental follow-back of a prospective-longitudinal cohort. *Archives of general psychiatry*, *60*(7), 709-717.

Klassen, R. M. (2010). Confidence to manage learning: The self-efficacy for self-regulated learning of early adolescents with learning disabilities. *Learning Disability Quarterly*, *33*(1), 19–30. https://doi.org/10.1177/073194871003300102

Kolb, B., (2011) Brain plasticity and behaviour in the developing brain. *Journal of the Canadian Academy of Child and Adolescent Psychiatry,* from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3222570/

Kühnle, S., Ludwig, A. A., Meuret, S., Küttner, C., Witte, C., Scholbach, J., ... & Rübsamen, R. (2012). Development of auditory localization accuracy and auditory spatial discrimination in children and adolescents. *Audiology and Neurotology*, *18*(1), 48-62.

Kuppuraj.S & Shanbal.J.C. (2009). Dyslexia Assessment Profile for Indian Children (DAPIC). A publication of the All India Institute of Speech and Hearing, Mysore. http://192.168.100.26:8080/xmlui/handle/123456789/956

Kuriyan, N. M., & James, J. (n.d.). *Prevalence of Learning Disability in India: A Need for Mental Health Awareness Programme Background: Learning Disability affects children and their family*. https://doi.org/10.4103/0253

Laasonen, M., Väre, J., Oksanen-Hennah, H., Leppämäki, S., Tani, P., Harno, H., Hokkanen, L., Pothos, E., & Cleeremans, A. (2014). Implicit learning in adult dyslexia and ADHD. *Annals of Dyslexia*, *64*(1), 1–33. https://doi.org/10.1007/S11881-013-0083-Y

Language, M. N.-, Speech, undefined, Schools, and H. S. in, & 1993, undefined. (1993). Developmental markers in adolescent language: Syntax, semantics, and pragmatics. *ASHA*, *24*(1), 21–28. https://doi.org/10.1044/0161-1461.2401.21

Liang, Z. Q., Dou, K., Li, J. B., Wang, Y. J., & Nie, Y. G. (2022). Linking self-control to negative risk-taking behavior among Chinese late adolescents: a moderated mediation model. *International journal of environmental research and public health*, *19*(13), 7646.

Luciana, M., Conklin, H. M., Hooper, C. J., & Yarger, R. S. (2005). The development of nonverbal working memory and executive control processes in adolescents. *Child development*, *76*(3), 697-712.

Lustenberger, C., Mouthon, A. L., Tesler, N., Kurth, S., Ringli, M., Buchmann, A., Jenni, O. G., & Huber, R. (2017). Developmental trajectories of EEG sleep slow wave activity as a marker for motor skill development during adolescence: a pilot study. *Developmental Psychobiology*, *59*(1), 5–14. https://doi.org/10.1002/DEV.21446

Maag, J. W., & Reid, R. (2006). Depression Among Students with Learning Disabilities: Assessing the Risk. Journal of Learning Disabilities, 39(1), 3–10. https://doi.org/10.1177/00222194060390010201

Maja Altarac, Ekta Saroha; Lifetime Prevalence of Learning Disability Among US Children. *Pediatrics* February 2007; 119 (Supplement_1): S77–S83. 10.1542/peds.2006-2089L

Martínez, R. S., & Semrud-Clikeman, M. (2004). Emotional Adjustment and School Functioning of Young Adolescents with Multiple Versus Single Learning Disabilities. Journal of Learning Disabilities, 37(5), 411–420. https://doi.org/10.1177/00222194040370050401

McKinney, J. D. (1989). Longitudinal research on the behavioral characteristics of children with learning disabilities. *Journal of Learning Disabilities*, *22*(3), 141–150, 165. https://doi.org/10.1177/002221948902200302

Melekoglu, M. A. (2011). Impact of motivation to read on reading gains for struggling readers with and without learning disabilities. *Learning Disability Quarterly*, *34*(4), 248–261. https://doi.org/10.1177/0731948711421761

Miller, D., Psychology, J. B.-J. of E., & 2001, undefined. (2001). To achieve or not to achieve: A self-regulation perspective on adolescents' academic decision making. *Journal of Educational Psychology,* https://doi.org/10.1037/0022-0663.93.4.677

Nelson, C. A., & Luciana, M. (Eds.). (2008). *Handbook of developmental cognitive neuroscience*. MIT press.

Nelson, E. E., Leibenluft, E., McClure, E. B., & Pine, D. S. (2005). The social re-orientation of adolescence: a neuroscience perspective on the process and its relation to psychopathology. *Psychological medicine*, *35*(2), 163-174.

Johnson, M. H. (2001). Functional brain development in humans. *Nature Reviews Neuroscience*, *2*(7), 475-483.

Panicker, A., Bhattacharya, S., Hirisave, U., Health, N. N.-I. J. M., & 2015, undefined. (2015). Reliability and validity of the NIMHANS index of specific learning disabilities. *Indian J Ment Health,* *2*(2). https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=b508b74e283b5b74efad09877ec05498e7244ce0

Paus, T. (2005). Mapping brain maturation and cognitive development during adolescence. *Trends in cognitive sciences*, *9*(2), 60-68.

Quatman-Yates, C. C., Quatman, C. E., Meszaros, A. J., Paterno, M. V., & Hewett, T. E. (2012). A systematic review of sensorimotor function during adolescence: a developmental stage of increased motor awkwardness?. *British journal of sports medicine*, *46*(9), 649-655.

Ramus, F., Pidgeon, E., & Frith, U. (2003). The relationship between motor control and phonology in dyslexic children. *Journal of child psychology and psychiatry*, *44*(5), 712-722.

Rao, C., TA, S., Midha, R., Oberoi, G., Kar, B., Khan, M., ... & Singh, N. C. (2021). Development and standardization of the DALI-DAB (dyslexia assessment for languages of India–dyslexia assessment battery). *Annals of Dyslexia*, *71*(3), 439-457.

Roopesh, B. N. (2021). Specific Learning Disability Assessment and Interpretation: NIMHANS SLD Battery and Beyond. In *Roopesh: Specific Learning Disability Assessment 6 Indian Journal of Mental Health* (Vol. 8, Issue 1).

Rourke, B., Young, G., Leenaars, A., Rourke, B. P., Young, G. C., & Leenaars, A. A. (n.d.). *A Childhood Learning Disability that Predisposes Those Afflicted to Adolescent and Adult Depression and Suicide Risk.*

Sapir, S., & Mimran, R. C. (2005). The Working Memory Token Test (WMTT): Preliminary Findings in Young Adults With and Without Dyslexia. In *Ninth European Conference on Speech Communication and Technology*.

Sawyer, S. M., Azzopardi, P. S., Wickremarathne, D., & Patton, G. C. (2018). The age of adolescence. https://doi.org/10.1016/S2352-4642(18)30022-1

Shanbal, J., Goswami, S., Prathima, S., & Chaitra, S., (2010). *Development of Early Literacy Screening Tool (ELST)*. Project funded by the AIISH Research Fund, All India Institute of Speech and Hearing.
http://192.168.100.26:8080/xmlui/handle/123456789/4021

Shilpa, N., & Shyamala, K.(2013). *Development of a Screening Tool for Bi/multilingual Adults With Dyslexia.* Unpublished Master's dissertation submitted to the University of Mysore. http://192.168.100.26:8080/xmlui/handle/123456789/1212

Silvers, J. A. (2022). Adolescence as a pivotal period for emotion regulation development. *Current opinion in psychology*, *44*, 258-263.

Singhi, P., Kumar, M., Malhi, P., & Kumar, R. (2007). Utility of the WHO ten questions screen for disability detection in a rural community - The North Indian experience. *Journal of Tropical Pediatrics*, *53*(6), 383–387. https://doi.org/10.1093/tropej/fmm047

Tate, A. E., McCabe, R. C., Larsson, H., Lundström, S., Lichtenstein, P., & Kuja-Halkola, R. (2020). Predicting mental health problems in adolescence using machine learning techniques. *PLoS ONE*, *15*(4). https://doi.org/10.1371/JOURNAL.PONE.0230389

Thomas, A. (1993). Study Skills. *OSSC Bulletin*, *36*(5), n5.

Venkatesan, by S. (2013). *ENABLING AND EMPOWERING SIBLINGS OF CHILDREN WITH DISABILITIES*.

Wiig, E. H., & Roach, M. A. (1975). Immediate recall of semantically varied "sentences" by learning-disabled adolescents. *Perceptual and Motor Skills*, *40*(1), 119-125.

Wiig, E. H., & Semel, E. M. (1974). Logico-grammatical sentence comprehension by adolescents with learning disabilities. *Perceptual and Motor Skills*, *38*(3_suppl), 1331-1334.

Wiig, E. H., & Semel, E. M. (1975). Productive language abilities in learning disabled adolescents. *Journal of Learning Disabilities*, *8*(9), 578-586.

XIII, R. M. T. encyclopedia of sports medicine, & 2008, undefined. (n.d.). Skill acquisition in childhood and adolescence. *Wiley Online Library*. https://onlinelibrary.wiley.com/doi/pdf/10.1002/9780470696255#page=108

Yang, X., Liu, R. De, Ding, Y., Hong, W., & Jiang, S. (2023). The relations between academic procrastination and self-esteem in adolescents: A longitudinal study. *Current Psychology*, *42*(9), 7534–7548. https://doi.org/10.1007/S12144-021-02075-X

Yang, Y., Zhao, S., Zhang, M., Xiang, M., … J. (2022) Prevalence of neurodevelopmental disorders among US children and adolescents in 2019 and 2020.*Frontiers in Psychology,* https://www.frontiersin.org/articles/10.3389/fpsyg.2022.997648/full

APPENDIX- I
SCREENING TOOL FOR ADOLESCENTS WITH LEARNING DISABILITY

Name of the individual: _____   Age/gender: _____   Date: _____

Education: _____   Educational Board: _____   Date of Birth: _____

Socioeconomic status: _____

		Education	Occupation
Father's Name			
Mother's Name			

General Information:

1. Are you attending any tuition or support classes? Yes/No
2. Have you repeated any class during the schooling? Yes/No

If yes, specify the reason: _____

3. Do you think your language comprehension and expression is the same as that of your peers? Yes/No

If no, specify the situation where you feel difficult:

_____

4. Do you like to read/write/watch books other than class related books? Yes/No
5. Do you take more time to finish work related to the classroom? Yes/No
6. Do you require repetition of instructions to complete the task? Yes/No
7. Do you seem brighter in many other ways except studying? Yes/No
8. Do you feel difficulty to follow oral instructions in class? Yes/No

Scoring:
For domains 1-4,
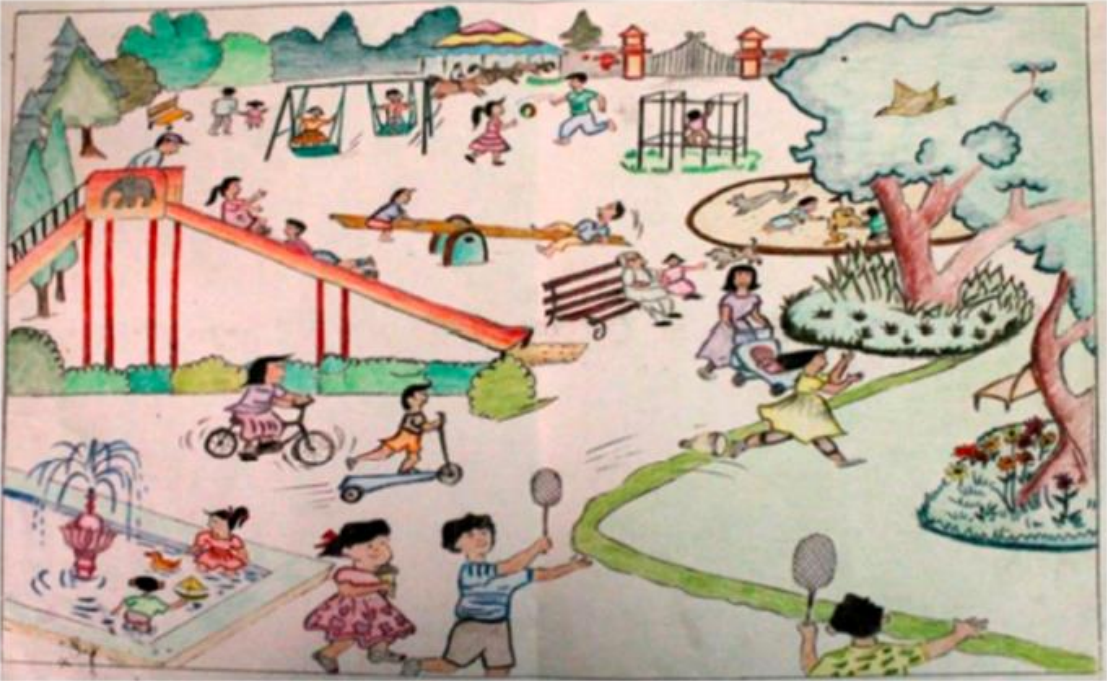
1 - correct answer/task completion/appropriate usage

0.5 - partial correct answer/partial task completion

0 - incorrect answer/not completing the task/inappropriate usage

For domain 5,

      1 -   positive behavior
    0.5 -   partially positive behavior
     0 -   negative behavior

Domain 1- Language
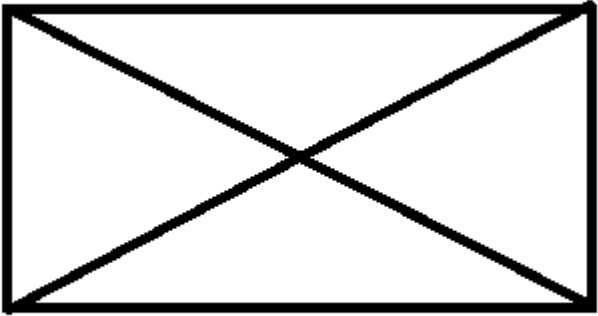
Sl. No	Task	Score		
		0	**0.5**	**1**
1.	Following instruction: Cross your right hand fingers and touch your nose and take a green pen from your left hand.			
2.	Phoneme Fluency: Quickly name as many meaningful words as possible starting from the phoneme /k/ in one minute excluding proper names, places or words in different forms. Example: Quickly name as many meaningful words as possible starting from the phoneme /t/ in one minute excluding proper names, places or words in different forms Response: Tea, take, time, task, <u>timely, Tokyo, Trisha,</u> task, table. The underlined words are not taken into account because 'timely' and 'time' are different forms of the same word; Tokyo is a place name and Trisha is a proper noun			

3.	Two-minute picture description: Describe the following picture in sentences using appropriate grammatical markers.			
3.1	Is the individual able to describe the whole picture in 2 minutes?			
3.2	Usage of plural forms For ex: **Children are** playing in the park			

3.3	Usage of tense forms
	     • Present tense can be elicited during descriptions
	For example: **Some are sitting and some are playing**
	     • Future tense can be elicited by questioning
	For example: what will the children do after playing?			

	The answer can be 'they will go home' • Past tense can be elicited by questioning For example: where do you think they have come from? **The answer can be 'they might have come from home or school'**			

3.4	Usage of comparatives and conjunctions
	For ex:
	    • The boy is going **faster** than the girl
	    • There are few children **and** few animals			

3.5	Usage of appropriate case markers For ex: They are playing in the park			
3.6	Usage of appropriate PNG markers For ex: He is sitting They are sitting			
3.7	Word finding difficulty			
3.8	Coherence (systematic or logical connection between the spoken sentences)			
3.9	Topic management (initiation, maintenance and shift)			
3.10	Revision behaviors (the changing of something to correct or improve it)			
3.11	Fluency, style (accent and way of production) and intonation			
3.12	Organization of description			
3.13	Vocabulary usage			
3.14	Information adequacy (at word level, sentence level)/Information content			

4.	Phoneme deletion: i am going to present a word and you have to say that word by deleting the phoneme specified.
	    Example 1: "dog"
	        Say the word 'dog' again, but without first sound /d/ i.e., **og**
	
	    Example 2: benten
	        Say the word 'benten' again, but without /t/ sound i.e., **benen**			

4.1	"Sarcastic" says it again, but without first /s/			

| 4.2 | "Assessment" says it again, but without /m/ | | | |
| 4.3 | "Library" say it again, but without /j/ | | | |

Domain 2- Cognition

5.	Task: Non-verbal reasoning: Look at the following picture and find the total no. of triangles Answer:_____			

6.	Task: Backward Digit span: I am going to present an eight series of digits and you must repeat back, in a reverse order:
	Example: Task: 5 6 3 4
	          Response: 4 3 6 5
	
	     6 7 9 8 4 1 5			

7.	Overlapping Test: There are 10 hidden pictures in this pictures. Identify them.			

Domain 3- Academics

8.	Reading fluency and comprehension: Ask the individual to read the following sentence loudly and carefully and interpret two meanings: For example: "The chicken is ready to eat". There are two meanings, the first one is that the chicken is already cooked and people are going to eat that chicken, the other meaning is a chicken is going to eat. Task: "I was crossing the road and I saw a man with binoculars"			
9.	One-minute reading: Ask the individual to read the following words and non-words loudly.			

	0	0.5	1		0	0.5	1
Movement				Refraction			

Numbers				Portransnat			
Repiem				Respiration			
Angles				Conservation			
Tribals				Territory			
Gathering				Fundamentals			
Devotional				Trigonometry			
Quantities				Temkonraripo			
Sekrouser				Quadrilaterals			
Reproduce				Polynomials			

10. Two-minute spelling: Ask the individual to read the following words and non-words loudly.

	0	0.5	1		0	0.5	1
Kingdom				Substances			
Fractions				Perimeter			
Doshwas				Territory			
Lifeline				Sumenraniot			
Native				Phenomena			
Euclid				Institution			
Motion				Medacyroc			
Squotean				Electricity			
Management				Probability			
Resources				Polynomials			

11. Two-minute writing task: write a note on the topic "My Summer Vacation" for around 5-10 sentences using appropriate punctuations

		Expected responses			
11.1	Shows disinterest or lack of motivation to carry out writing task	No			
11.2	Writes complete sentences	Yes			
11.3	Uses inappropriate vocabulary	No			
11.4	Presence of regularizing the irregular words.	No			
11.5	Uses incorrect word endings or inappropriate grammar	No			
11.6	Appropriate Punctuation	Yes			
11.7	Offline writing	No			
11.8	Poor spacing	No			
11.9	Presence of mirror writing	No			

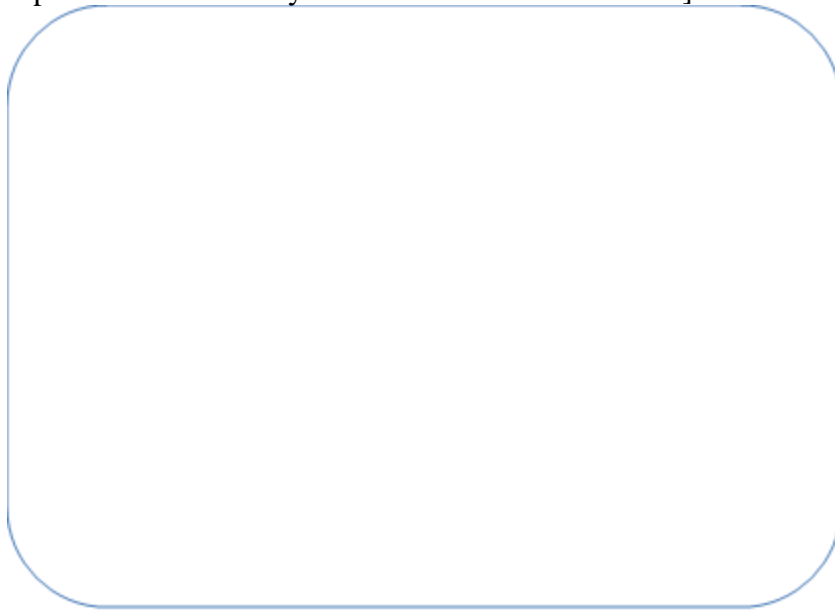| 11.10	Left to right progression	Yes			
11.11	Clumsily written letters	No			
11.12	Fragments words into letters in writing	No			
11.13	Uses appropriate capitalization	Yes			
11.14	Mixes upper- and lower-case forms	No			
11.15	Overlapped letters	No			

Domain 4 - Auditory Abilities

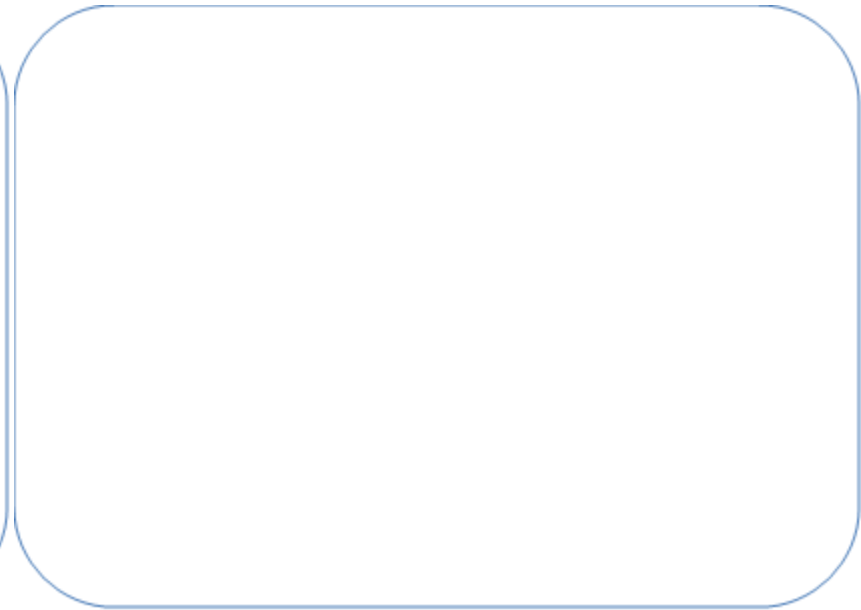| 12.	Auditory Discrimination: I will be presenting a pair of words. Tell me whether they are the same or different.			
12.1	Ben - Bed			
12.2	Sum - Dumb			
12.3	From - From			
13	Auditory memory and sequencing task: I will be saying a list of 8 words. You have to listen carefully and repeat the words in the same order. For example: bottle car monitor clock Response: bottle car monitor clock…… in the same order Task: meenu bat cake shoes selfie fan jacket floor			
14.	Phoneme-grapheme correspondence: I will say a few words now. Listen to it carefully.			
14.1	Mark '/' if you think the word starts with 'b' Brown cutlet britain bernoulli			
14.2	Mark '/' if you think the word get ends with 'n' brutten hamburger mensuration bitten			
	Write the first two letters that forms the sound at the beginning of the word I Say			
14.3	Brown			

14.4	Swarm			
14.5	Black			
14.6	Trinket			
14.7	Plaster			
14.8	Fly			

Domain 5 - Behavior

15. Task: Ask the individual to describe their school and their studies. [Ask them to describe the positive and negative (difficulties) aspects about how they feel about school and studies]

Positive aspects   Negative aspects

SCORING: The following learning motivation scale, internalizing behavior, externalizing behaviors are scored depending on the individual's response for the task no. 15, overall performance of the tool administered and general information obtained through conversation

16	*Learning motivation subscale*			
16.1	Need others' reminders to finish homework.			
16.2	Get distracted easily			
16.3	Make mistakes because of not paying attention			
16.4	Have no expectations in school performances			
16.5	Believe that s/he cannot do well even without much effort.			
16.6	Have no interest in classroom activities			
16.7	Dare not to ask questions when problems arise.			
16.8	Do not reflect on their problems in learning.			
16.9	Do not try to learn new things.			
17	*Internalizing behavior subscale*			
17.1	Get depressed easily.			
17.2	Have low self-esteem and lack confidence.			
17.3	Get anxious easily.			
17.4	Prefer to be alone, not sociable.			
18	*Externalizing behavior subscale*			
18.1	Have swinging moods.			
18.2	Skip schools without reasons.			
18.3	Likes to be the center of attraction			
18.4	Have conduct problem ex: difficulty in following rules and behaving violent			
18.5	Not obedient and rebel against teachers/seniors			