

CHAPTER II

REVIEW OF LITERATURE

Various researches related to the study of Effectiveness of Thoppukaranam and Yoga, and its effects among Normal Girl Students and Learning Disabled Students were collected as well as reviews about Learning Disability and different cognitive abilities are presented with various aspects

- Learning Disability
- Types of Learning Disability
- Effects of Thoppukaranam

Learning Disability

Learning disability is common, affecting 1 to 2.5% of the general population in the western world and encompasses many different conditions. It usually leads to major functional impairment and life long need for support and interventions, not the least important of which are medical and health care services. Rapid progress is being made in the understanding of the cause and pathogenesis of many learning disability syndromes and these advances are likely to improve targeted interventions in the next decade. Many countries have abolished a learning disability speciality for medical professionals, but there is a great need to revive this niche of medical knowledge. We know little about quality of life and effects on families of people with learning disability and research is needed to address these issues.

Mizen and Cooper (2012) reviewed about thousands of causes of learning disabilities and often the cause was unknown despite comprehensive assessment. People with learning disabilities have very high rates of physical and mental ill health and comorbidity was typical. Some associated conditions were related to the causes of a person's learning disability e.g. 'behavioural phenotypes' and benefit from treatment interventions. Autism, Attention Deficit Hyperactivity Disorder (ADHD), Schizophrenia, 45 Mania, Pica and Problem Behaviours were all more common than in the general population, as were Gastro Esophageal Reflux Disorder, Epilepsy, Constipation, Sensory Impairments, Injuries and Fall. Choking and aspiration were

frequent and can cause death. Problem behaviours were multifactorial and can also be a symptom of other mental or physical disorders or distress. Assessments take longer and must involve paid careers and relatives as well as the person with learning disabilities. There were other considerations in addition to the standard assessment and standard treatment plans. A Biopsychosocial developmental approach to both was a useful framework to adopt. Care needs to be taken to avoid 'diagnostic overshadowing', where symptoms of medical conditions were attributed inadvertently to the person's learning disabilities and left untreated. People with learning disabilities face many barriers in accessing the health care they need and more proactive approaches by health professionals were required.

Mogasale, Patil, Patil and Mogasale (2012) reviewed about the prevalence of specific learning disabilities among primary school children in a South Indian city. Specific learning disability can be characterized such as dyslexia, dysgraphia and dyscalculia. Children aged 8-11 years from third and fourth standard were selected. A six level screening approach that commenced with identification of scholastic backwardness followed by stepwise exclusion of impaired vision and hearing, chronic medical conditions and subnormal intelligence was carried out among these children. In the final step, the remaining children were subjected to specific tests for reading, comprehension, writing and mathematical calculation. It suggested that the prevalence of Specific learning disabilities is at the higher side of previous estimations in India. Based on the authors' experience, they express the need for more prevalence studies, remedial education and policy interventions to manage specific learning disabilities at main stream educational system to improve the school performance in Indian children.

Russell, Bryant and House (2017) studied about people with Learning Disabilities who had poor physical and mental health when compared with the general population. They are also likely to find it more difficult than others to describe their symptoms adequately. It is therefore harder for health care workers to identify the health needs of those with learning disabilities, with the danger of some problems being left unrecognized. The research was conducted to support people to identify people with mild to moderate learning disability who were currently not registered as learning disability. Read code searches were created to identify individuals with a learning

disability. The read code search supported practices to populate their registers and was quick to run and review, making it a viable choice to support register and revalidation.

Lyon (1996) reviewed about Learning Disabilities and stressed that approximately 5% of all public school students are identified as having a learning disability. It is not a single disorder, but includes disabilities in any of seven areas related to reading, language and mathematics. These separate types of learning disabilities frequently cooccur with one another and with social skill deficits and emotional or behavioural disorders. Most of the available information concerning learning disabilities relates to reading disabilities and the majority of children with learning disabilities have their primary deficits in basic reading skills. An important part of the definition of Learning Disability is its exclusions: learning disabilities can not be attributed primarily to mental retardation, emotional disturbance, cultural difference or disadvantage. Thus, the concept of Learning Disability focuses on the notion of a discrepancy between a child's academic achievement and his or her apparent capacity to learn. Recent research indicated that disability in basic reading skills was primarily caused by deficits in phonological awareness which was independent of any achievement capacity discrepancy. Deficits in phonological awareness can be identified in late kindergarten and first grade using inexpensive, straightforward testing protocol. Interventions have varying effectiveness, depending largely on the severity of the individual child's disability. The prevalence of learning disability identification increased dramatically in the past 20 years. The "real" prevalence of Learning Disability is subject to much dispute because of the lack of an agreed upon definition of Learning Disability with objective identification criteria.

Some researchers have argued that the currently recognized 5% prevalence rate is inflated; others argue that it is still under identified. In fact, it appears that there are both sound and unsound reasons for the increase in identification rates. Sound reasons for the increase include better research, a broader definition of disability in reading, focusing on phonological awareness and greater identification of girls with learning disabilities. Unsound reasons for the increase include broad and vague definitions of learning 47 disability, financial incentives to identify students for special education and inadequate preparation of teachers by colleges of education, leading to over referral

of students with any type of special need. There is no clear demarcation between students with normal reading abilities and those with mild reading disability. The majority of children with reading disabilities have relatively mild reading disabilities with a smaller number having extreme reading disabilities. The longer children with disability in basic reading skills, at any level of severity, go without identification and intervention, the more difficult the task of remediation and the lower the rate of success. Children with extreme deficits in basic reading skills are much more difficult to remediate than children with mild or moderate deficits. It is unclear whether children in the most severe range can achieve age and grade approximate reading skills, even with normal intelligence and with intense, informed intervention provided over a protracted period of time. Children with severe learning disabilities are likely to manifest an increased number of and increased severity of social and behavioural deficits. Children with disability in reading also manifest attention deficit disorder, their reading deficit are typically exacerbated, more severe and more resistant to intervention. While severe reading disorders are clearly a major concern, even mild deficits in reading skills are likely to portend significant difficulties in academic learning. These deficits, too, are worthy of early identification and intervention. Even children with relatively subtle linguistic and reading deficits require the expertise of a teacher who is well trained and informed about the relationships between language development and reading development.

Chiara (2014) conducted a study on Emotional false memories in children with learning disabilities. Research has shown that children with learning disabilities are less prone to evince associative illusions of memory as a result of impairments in their ability to engage in semantic processing. However, it is unclear whether this observation is true for scripted life events, especially if they include emotional content, or across a broad spectrum of learning disabilities. The present study addressed these issues by assessing recognition memory for script like information in children with Nonverbal Learning Disability (NLD), children with dyslexia and typically developing children (N = 51). Participants viewed photographs of about 8 common events (e.g., family dinner), and 48 embedded in each episode was either a negative or a neutral consequence of an unseen action. Children's memory was then tested on a yes/no recognition task that included old and new photographs. Results showed that the three

groups performed similarly in recognizing target photographs, but exhibited differences in memory errors. Compared to other groups, children with NLD were more likely to falsely recognize photographs that depicted an unseen cause of an emotional seen event and associated more “Remember” responses to these errors. Children with dyslexia were equally likely to falsely recognize both unseen causes of seen photographs and photographs generally consistent with the script, whereas the other participant groups were more likely to falsely recognize unseen causes rather than script consistent distractors. Results were interpreted in terms of mechanisms underlying false memories formation in different clinical populations of children with Learning Disability.

Giofre, Stoppa, Ferioli, Pezzuti and Cornoldi (2016) investigated the structure of intelligence in children with specific learning disabilities was different as compared to typically developed children. Children with specific learning disabilities were characterized by a poor academic achievement despite an average intelligence. They were typically assessed not only with achievement tests but also with intelligence test such as Wechsler Intelligence Scale for Children. The assumption of a discrepancy between IQ and achievement in children with specific learning disabilities has been questioned, however, and the implications of using different measures in batteries of intellectual sub tests have not been thoroughly investigated. The present study examined these issues, taking advantage of a large database of scores obtained in the ten core sub tests of the Wechsler Intelligence Scale for Children - IV by a group of 910 Italian children with a clinical diagnosis of specific learning disabilities compared with the children considered for National standardization purposes. The results supported the doubts raised concerning the IQ achievement discrepancy model showing that relevant discrepancies can emerge even within the Wechsler Intelligence Scale for Children profile. The four Wechsler Intelligence Scale for Children - IV indexes were found differently related to intelligence (measured by means of the g factor) and the g content of many sub tests differed in children with specific learning disabilities with reference to typically developing children. These results have important implications both theoretical, indicating that the g₄₉ factor is weakly identified in children with specific learning disabilities children, and practical, indicating that the IQ obtained with the Wechsler Intelligence Scale for Children -IV

may not be a good measure of intellectual functioning for children with specific learning disabilities.

Chaharsooghi and Mehran (2011) explored the effect of miniature on concentration of Iranian children with Nonverbal Learning Disability. Twenty children in the age range of 8-10 years were randomly assigned to experimental and control groups. The experimental group took part in twelve sessions of miniature with 45 to 60 minutes, while the control group was put on a wait list. Both groups received the Toulouse-Pieron test three times (pre test, mid test and post test). The results of ANCOVA based on repeated measures indicated that Persian miniature had a significant effect on concentration. Results were discussed in terms of miniature as a possible therapeutic method in rising concentration for learning disability children.

Kamala (2014) studied about the specific learning disabilities in India: Rights, Issues and Challenges. It is a disorder or a retardation of development affecting specific academic area, such as reading, spelling, arithmetic and writing as well as delays in language in general. Specific Learning Disability is not visible as other disabilities such as visually impaired, hearing impaired and mentally challenged. In India, it is estimated that approximately Specific Learning Disability affects almost 5 to 15% of school going children but there is a lack of awareness about specific learning disability among the teachers, parents' community and general public. Due to these reasons, they label the specific learning disabled students as lazy, not attentive in class, dull. So the teachers, parents' community should be properly educated about the rights of the learning disability students.

Pesova, Sivevska and Runceva (2014) focused on Early Intervention and Prevention of Students with Specific Learning Disabilities. The main focus on particular group of students with learning difficulties and not mentally disabled, emotional disorders and educationally neglected and had normal vision, hearing and speech. The only explanation for their learning difficulties was the presence of Specific Learning Disabilities. The educational practices show lack of concern for these students. In the 50 regular schools, students with Specific Learning Disabilities were rarely correctly identified, much less receive adequate intervention. The purpose of the study was to give a definition of Specific Learning Disabilities and emphasized the importance of

early identification of students with such difficulties. Furthermore, it will give a description of effective teaching methods designed to match their specific needs which will provide successful progression in their education and in the outside world. These studies have very important practical implications (primarily educational) and they are a research challenge that deserves attention.

Types of Learning Disability

The term developmental dyslexia “specific learning disability” refers to an unexpected difficulty in reading in children and adults who otherwise possess the intelligence, motivation and schooling considered necessary for accurate and fluent reading.

Margreat (2001) reviewed about language to reading and dyslexia and supported the phonological deficit hypothesis of dyslexia. Findings from two experimental studies suggested that the phonological deficits of dyslexic children and adults can not be explained in terms of impairments in low level of auditory mechanisms, but reflect higher level language weaknesses. A study of individual differences in the pattern of reading skills in dyslexic children rejected the notion of ‘sub types’. Instead, the finding suggested that the variation seen in reading processes can be accounted for by differences in the severity of individual children’s phonological deficits, modified by compensatory factors including visual memory, perceptual speed and print exposure. Children at genetic risk who go on to be dyslexic come to the task of reading with poorly specified phonological representations in the context of a more general delay in oral language development. Their prognosis depends upon the balance of strengths and difficulties showed with better language skills being a protective factor. Taken together, these findings suggested that current challenges to the phonological deficit theory can be met.

De Avila and Capellini (2014) explored about reading comprehension performance profiles of children with dyslexia as well as Language Based Learning Disability by means of retelling tasks. One hundred and five children from 2nd to 5th grades of 51 elementary school were gathered into six groups: Dyslexia Group (n = 19), Language Based Learning Disability Group (n = 16); their respective control groups paired according to different variables, age, gender, grade and School system (Public or Private; Dyslexia Control and Language Based Learning Disability Control); and other

control groups paired according to different reading accuracy (Dyslexia Accuracy; Language Based Learning Disability Accuracy). Dyslexia group showed the same total of propositions, links and reference standards as Dyslexia Control Group, but performed better than Dyslexia Group Accuracy in macro structural (total of links) and super structural (retelling reference standard) measures. The results suggested that both decoding and linguistic difficulties affect reading comprehension. Moreover, the linguistic deficits presented by Language Based Learning Disability students do not allow these pupils to perform as competently in terms of text comprehension as the children with dyslexia do. Thus, failure in the macro and super structural information processing of the expository text was evidenced.

Crollen (2014) investigated the impact of Non Verbal Learning Disabilities on spatial and numerical processing. In order to do so, 15 Non Verbal Learning Disabilities and 15 control children were required to perform different spatial (the Line Bisection and Simon Tasks) and numerical tasks (the number bisection, number to position and numerical comparison tasks). In every task, Non Verbal Learning Disabilities children presented lower accuracy scores than the control group. While both groups manifested similar pseudo neglect and Simon effects, they however differed in the numerical comparison task: while control children presented the standard Spatial Numerical Association of Response Codes effect in the uncrossed and crossed postures, no Spatial Numerical Association of Response Codes effect was observed in the Non Verbal Learning Disabilities Group. The results suggested that Non Verbal Learning Disabilities affected the accuracy and the nature of the mental number line by decreasing its precision and the saliency of its left to right orientation.

Barkhordar, Moghtadaie and Jafari (2012) determined the efficacy of meta cognitive strategies on improvement in spelling learning ability among male students with spelling learning disabilities in Grade 3 elementary schools. Forty male students with disabilities in the spelling were selected by Multi Stage Sampling Method and 52 20 subjects were randomly allotted to Experimental and Control Groups and administered by The Spelling Learning Ability Test. The experimental group received meta cognitive strategies training and after the training, the Spelling learning ability test was administered to both groups. Analysis results showed that there were significant

differences in mean scores of spelling ability in experimental group. The results suggested that the effectiveness Meta Cognitive Strategies Training to students with learning disabilities, especially in spelling and their performance was improved.

Desoete and Gregoire (2006) studied about the numerical competence among children with mathematical learning disabilities. A longitudinal study was conducted on 82 children to investigate on 1. the numerical competence of young children and the predictive value of (pre) numerical tests in kindergarten 2. whether children's knowledge of the numerical system and representation of the number size was related to their computation and logical knowledge and to their counting skills. In an additional cross sectional study on 30 children with a clinical diagnosis of Mathematical Learning Disability of 8, 5 years, age and ability matched with 2×30 children the same parameters of numerical competence were assessed. The longitudinal data showed individual differences in numerosness, as well as the relationship between a delay in arithmetic in grade I and problems on numerosity in kindergarten. In the cross sectional results some evidence was found for the independence of numerical abilities in Mathematical Learning Disability children. About 13% of them had still severe pre numerical processing deficits (in number sequence production, cardinality skills and logical knowledge) in grade 3. About 67% had severe difficulties in executing calculation procedures and a lack of conceptual knowledge. A feature of 87% of the Mathematical Learning Disability children was severe translation deficits with a significantly worse knowledge of number words compared with the knowledge of Arab numerals. Finally a severe deficit in subtilizing was found to be present in 33% of the Mathematical Learning Disability children. On a group level the processing deficits were linked to understanding numerosity, since the ability matched younger children and the Mathematical Learning Disability children had the same prenumerical and numerical profile.

Moura, Pereira and Fernandes (2016) investigated the neuro cognitive functioning of children with Developmental Dyslexia and Attention Deficit Hyperactivity Disorder. 53 Four groups of children between the ages of 8 and 10 years participated in the study: Typically Developing Children (TDC; N = 34), Children with Developmental Dyslexia

(N = 32), Children with Attention Deficit Hyperactivity Disorder (N = 32), and Children with Developmental Dyslexia and Attention Deficit Hyperactivity Disorder (N = 18). Children with Developmental Dyslexia and Attention Deficit Hyperactivity Disorder exhibited significant weaknesses on almost all neuro cognitive measures compared with Typically Developing Children. Large effect sizes were observed for naming speed and phonological awareness. The comorbid group showed deficits consistent with both Developmental Dyslexia and Attention Deficit Hyperactivity Disorder without additional impairments. Results from binary logistic regression and Receiver Operating Characteristic curve analyses suggested that some neuro cognitive measures revealed an adequate sensitivity for the clinical diagnosis of both neuro development disorders. Specifically, naming speed and phonological awareness were the strongest predictors to correctly discriminate both disorders. The results lend support to the multiple cognitive deficit hypotheses showing a considerable overlap of neuro cognitive deficits between both disorders.

Tilanus, Segers and Verhoeven (2016) examined the responsiveness to a 12 weeks phonics intervention in 54 S-Grade Dutch Children with Dyslexia and compared their reading and spelling gains to a control group of 61 typical readers. The intervention aimed to train Grapheme Phoneme Correspondences and word reading and spelling by using phonics instruction. They examined the accuracy and efficiency of grapheme phoneme correspondences, decoding words and pseudo words, as well as the accuracy of spelling words before and after the intervention. Moreover, responsiveness to intervention was examined by studying to what extent scores at post test could directly or indirectly be predicted from precursor measures. Results showed that the children with dyslexia were significantly behind in all reading and spelling measures at pre test. During the intervention, the children with dyslexia made more progress on Grapheme Phoneme Correspondences, (pseudo) word decoding accuracy and efficiency and spelling accuracy than the typical reading group. Furthermore, they found out a direct effect of the precursor measures rapid automatized naming, verbal working memory and phoneme deletion on the dyslexic children's progress in Grapheme Phoneme Correspondences 54 speed and indirect effects of rapid automatized naming and phoneme deletion on word and pseudo word efficiency and word decoding accuracy via the scores at pre test.

Quaegebeur, Casalis and Vilette (2017) identified more precisely patterns of arithmetic performance in children with developmental dyslexia, defined with severe and specific criteria by means of a standardized test of achievement in mathematics (Calculation and Number Processing Assessment Battery for Children; Von-Aster & Dellatolas, 2006). They analyzed the arithmetic abilities of 47 children with dyslexia attending 3rd, 4th, and 5th grade, 40% displayed arithmetic deficits, mostly with regard to number Trans coding and mental calculation. Their individual profiles of performance 55 accounted for varying strengths and weaknesses in arithmetic abilities. The findings showed the pathway for the development of arithmetic abilities in children with dyslexia is not unique. The study contrasted with the hypotheses suggesting the mutual exclusiveness of the phonological representation deficit and the core number module deficit.

Tiadi, Gerard, Peyre, Buo-Quoc and Bucci (2016) explored further the visual fixation ability in dyslexics compared to chronological age matched and reading age matched non dyslexic children. Fifty five dyslexic children from 7 to 14 years old, 55 were age matched non dyslexic children and 55 reading age matched non dyslexic children participated in this study. Eye movements from both eyes were recorded horizontally and vertically by a video oculography system. The fixation task consisted in fixating a white filled circle appearing in the center of the screen for 30 seconds. Results showed that dyslexic children produced a significantly higher number of unwanted saccades than both groups of non dyslexic children. Moreover, the number of unwanted saccades significantly decreased with age in both groups of non dyslexic children, but not in dyslexics. Furthermore, dyslexics made more saccades during the last 15 seconds of fixation period with respect to both groups of non dyslexic children. Such poor visual fixation capability in dyslexic children could be due to impaired attention abilities, as well as to an immaturity of the cortical areas controlling the fixation system.

Spark (2016) addressed the short falls by administering a self report measure of executive functions (BRIEF-A; Roth, Isquith & Gioia, 2005) and experimental tasks to IQ matched groups of adults with and without dyslexia. The laboratory based tasks tested the three factors constituting the framework of executive functions proposed by Miyake et al. (2000). In comparison to the group without dyslexia, the participants with

dyslexia self reported more frequent executive functions problems in day today life, with these difficulties centering on meta cognitive processes (working memory, planning, task monitoring and organization) rather than on the regulation of emotion and behaviour. The participants with dyslexia showed significant deficits in executive functions (inhibition, set shifting and working memory). The findings indicated that dyslexia related problems have an impact on the daily experience of adults with the condition. Further, executive functions difficulties were present in adulthood across a range of 56 laboratory based measures and given the nature of the experimental tasks presented, extend beyond difficulties related solely to phonological processing.

Kahta and Schiff (2016) investigated implicit learning processes among adults with Developmental Dyslexia using a visual linguistic Artificial Grammar Learning (AGL) task. Specifically, it was designed to explore whether the intact learning reported in previous studies would also occur under conditions including minimal training and instructions that do not reveal the grammatical nature of the strings. Twenty nine (14 Developmental Dyslexia and 15 Typical Development) adults were presented with letter sequences in the training phase and were asked to classify the test strings for grammatical and the results of the central measures in the implicit task indicated that learning had occurred for both groups, as the proportion of hits exceeded the proportion of false alarms. However, a significant difference was found between the groups in their learning measures as Typical Development readers performed significantly better than individuals with Developmental Dyslexia, supporting the assumption of a deficit in implicit sequential learning processes among individuals with Developmental Dyslexia. In order to examine whether the deficit found in the first experiment was indeed due to a deficit in implicit processes, a second experiment was designed in which explicit instructions were given during an Artificial Grammar Learning task. Results of the explicit task strengthened the assumption that the deficit was indeed specific to implicit sequential processes, as no difference between the groups was found when participants were aware of the existence of the grammar underlying the strings.

Nielsen et al. (2016) discussed about Evidence Based Reading and Writing Assessment for Dyslexia in Adolescents and Young Adults. The same working memory and reading and writing achievement phenotypes (behavioural markers of genetic variants) validated in prior research with younger children and older adults in a multigenerational family genetics study of dyslexia were used to study 81 adolescent and young adults (ages 16 to 25). Dyslexia is impaired word reading and spelling skills below the population mean and ability to use oral language to express thinking. These working memory predictor measures were given and used to predict reading and writing achievement: Coding (storing and processing) heard and spoken words (phonological coding), read and written words (orthographic coding), base words and affixes (morphological coding), 57 and accumulating words over time (syntax coding); Cross Code Integration (phonological loop for linking phonological name and orthographic letter codes and orthographic loop for linking orthographic letter codes and finger sequencing codes), and Supervisory Attention (focused and switching attention and self monitoring during written word finding). Multiple regressions showed that most predictors explained individual difference in at least one reading or writing outcome, but which predictors explained unique variance beyond shared variance depended on outcome. ANOVAs confirmed that research supported criteria for dyslexia validated for younger children and their parents could be used to diagnose the adolescents and young adults did (n=31) or did not (n=50) meet research criteria for dyslexia. Findings were discussed in reference to the heterogeneity of phenotypes (behavioural markers of genetic variables) and their application to assessment for accommodations and ongoing instruction for adolescents and young adults with dyslexia.

Vansetten et al. (2015) conducted a study on Print Tuning Lateralization and Handedness: an Event Related Potential Study in Dyslexic Higher Education Students. Despite their ample reading experience, higher education students with dyslexia showed deficits in reading and reading related skills. Lateralized print tuning, the early sensitivity to print of the left parietal cortex signalled by the N1 Event Related Potential (ERP) component, differs between beginning dyslexic readers and controls. For adults, the findings were mixed. The present study investigated whether print tuning, as indexed by the N1 component, differs between 24 students with dyslexia and 15 non

dyslexic controls. Because handedness has been linked to lateralization, first, a separate analysis was conducted including only right handed participants ($n = 12$ in both groups), like in most previous studies. ERPs were measured during a judgement task, requiring visual, phonological or semantic judgements. In both groups, the N1 was earlier and stronger in the left than in the right hemisphere. However, when only strongly right handed participants were evaluated, the N1 was less left lateralized for participants with dyslexia as compared with controls. Participants with dyslexia had longer reaction times during the ERP experiment and performed worse on many reading (related) tasks. The findings suggested that abnormal print tuning can still be found among higher education students with dyslexia and that handedness should be regarded in the study of print tuning.

Cardillo, Mammarella, Garcia and Cornoldi (2017) reviewed about the Local and Global processing in block design tasks in children with dyslexia or nonverbal learning disability. Visuo constructive and perceptual abilities have been poorly investigated in children with learning disabilities. The present study focused on local or global visuo spatial processing in children with Non Verbal Learning Disability and dyslexia compared with Typically Developing controls. Participants were presented with a modified Block Design Task, in both a typical visuo constructive version that involves reconstructing figures from blocks and a perceptual version in which respondents must rapidly match unregimented figures with a corresponding fragmented target figure. The figures used in the tasks were devised by manipulating two variables: the perceptual cohesiveness and the task uncertainty, stimulating global or local processes. The results confirmed that children with Non Verbal Learning Disability had more problems with the visuo constructive version of the task, whereas those with dyslexia showed only a slight difficulty with the visuo constructive version, but were in greater difficulty with the perceptual version, especially in terms of response times. The findings were interpreted in relation to the slower visual processing speed of children with dyslexia and to the visuo constructive problems and difficulty in using flexibly experienced global Vs local processes of children with Non Verbal Learning Disability.

Alloway et al. (2017) explored whether the Specific Language Impairment and dyslexia display distinct or overlapping cognitive profiles with respect to learning outcomes. In particular, to find out two key cognitive skills associated with academic performance – working memory and IQ. They divided the children into three groups such as Specific Language Impairment, Dyslexia and Control Group and they were administered by standardized tests of working memory, IQ (vocabulary and matrix), spelling and mathematics. The pattern of results suggested that both Children with Dyslexia and Specific Language Impairment were characterized with poorer verbal working memory and IQ compared to controls but preserved non verbal cognitive skills. It appears that these two disorder groups can not be distinguished by the severity of their cognitive deficits. However, there was a differential pattern with respect to learning outcomes, where the children with dyslexia rely more on visual skills in spelling, while 59 those with Specific Language Impairment used their relative strengths in vocabulary. The results interpreted that new learning methods can be trained in classroom, which could gain importance in learning.

Developmental Dysgraphia

Dysgraphia is a specific learning disability that affects written expression; dysgraphia can appear as difficulties with spelling, poor hand writing and trouble putting thoughts on paper.

Hanley and Sotiropoulos (2018) studied about the case of an individual (N.K.) with a developmental spelling impairment (dysgraphia) who has no apparent problems in reading. His performance was therefore similar to a case of dysgraphia without dyslexia (PJT). His performance therefore provided further evidence of a classical dissociation between impaired spelling and preserved reading in individuals with developmental literacy problems. The dissociation was observed when N.K. was asked to read and spell in either his first (Greek) or his second language (English). An investigation of his spelling performance revealed that his impairment was more selective than that of P.J.T. Although his spelling of regular words and non words was normal, N.K. had a problem in spelling words with atypical sound letter associations despite having no problems in reading aloud or understanding the meaning of words of this kind. It is argued that N. K's pattern of performance can be best explained in

terms of normal development of an orthographic system that allows access to the meaning and pronunciation of written words during reading. In terms of a dual route model of spelling, his poor spelling appears to be the result of a developmental impairment that impedes access to the orthographic system from phonology and semantics. In terms of the triangle model, his poor spelling appears to be the result of a developmental impairment that affects activation of orthography from semantics.

Quantitative assessment of drawing tests in children with dyslexia and dysgraphia was assessed by Galli et al. (2018). Drawing tests in children diagnosed with dyslexia and dysgraphia was quantitatively compared. Fourteen children with dysgraphia, 19 with dyslexia and 13 normally developing were asked to copy 3 figures: a circle, a square and a cross. An optoelectronic system allowed the acquisition of the drawing track in three 60 dimensions. The participants' head position and upper limb movements were measured as well. A set of parameters including movement duration, velocity, length of the trace, Range of Motion of the upper limb was computed and compared among the 3 groups. Children with dyslexia traced the circle faster than the other groups. In the cross test, dyslexic participants showed a reduced execution time and increased velocity while drawing the horizontal line. Children with dyslexia were also faster in drawing certain sides of square with respect to the other groups.

Rosenblum (2013) found out the interrelationships between objective handwriting features and executive control among children with developmental dysgraphia. Participants included 64 children, aged 10-12 years, 32 with dysgraphia based on the Handwriting Proficiency Screening Questionnaire (HPSQ) and 32 matched controls. Children copied a paragraph in the paper affixed to a digitizer that supplied handwriting process objective measures (Computerized Penmanship Evaluation Tool). Their written product was evaluated by the Hebrew Handwriting Evaluation (HHE). Parents completed the Behaviour Rating Inventory of Executive Function (BRIEF) questionnaire about their child's executive control abilities. Results showed that there was a significant correlation between each group such as working memory and legibility as well as for other executive domains and handwriting measures. Furthermore 20% of the variability of the mean pressure applied towards the writing surface among children was explained by their 'emotional control' (BRIEF). The results

strongly suggested consideration of executive control domains to obtain better insight into handwriting impairment characteristics among children with dysgraphia to improve their identification, evaluation and the intervention process.

Developmental Dyscalculia

Developmental dyscalculia is a specific learning disability that affects the acquisition of knowledge about numbers and arithmetic. Severe difficulty in learning and doing arithmetic that can not be attributed to general intellectual impairment or lack of educational opportunity. Kucian and Von-Aster (2015) studied about Developmental Dyscalculia. Numerical skills are essential in our everyday life, and impairments in the development of number processing and calculation have a negative impact on schooling and professional careers. Approximately 3 to 6% of children were affected from specific disorders of numerical understanding (Developmental Dyscalculia). Impaired development of number processing skills in these children is characterized by problems in various aspects of numeracy as well as alterations of brain activation and brain structure. Moreover, Developmental Dyscalculia is assumed to be a very heterogeneous disorder putting special challenges to define homogeneous diagnostic criteria. Finally, interdisciplinary perspectives from Psychology, Neuroscience and Education can contribute to the design for interventions and although results are still sparse, they are promising and have shown positive effects on behaviour as well as brain function.

Jaekel and Wolke (2014) evaluated whether the risk for dyscalculia in pre term children increase the lower the Gestational Age and whether small for gestational age birth was associated with dyscalculia. A total of 922 children ranging from 23 to 41 weeks Gestational Age were studied as part of a prospective geographically defined longitudinal investigation of neonatal at risk children in South Germany. At 8 years of age, children's cognitive and mathematic abilities were measured with the Kaufman Assessment Battery for Children and with a standardized mathematics test. Dyscalculia diagnoses were evaluated with discrepancy based residuals of a linear regression predicting children's mathematical scores by IQ and with fixed cutoff scores. They investigated each Gestational Age groups for general cognitive impairment, general mathematic impairment and dyscalculia by using binary logistic regressions. The risk

for general cognitive and mathematic impairment increased with lower Gestational Age. In contrast, preterm children were not at increased risk of dyscalculia after statistically adjusting for child sex, family, socioeconomic status and small for gestational age birth.

Price and Ansari (2013) studied about Developmental Dyscalculia as a learning disorder affecting the acquisition of school level arithmetic skills present in approximately 3-6% of the population. At the behavioural level Developmental Dyscalculia as characterized by poor retrieval of arithmetic facts from memory, the use of immature calculation procedures and counting strategies and the atypical representation and processing of numerical magnitude. At the neural level emerging evidence suggested that Developmental Dyscalculia was associated with atypical structure and function in brain 62 regions associated with the representation of numerical magnitude. The current state of knowledge points to a core deficit in numerical magnitude representation in Developmental Dyscalculia, but further work was required to elucidate causal mechanisms underlying the disorder.

Kaufmann and Von Aster (2012) reviewed about the diagnosis and management of dyscalculia. About 5% of children in primary schools were affected by Dyscalculia and does not improve without treatment. They reviewed the publications on dyscalculia from multiple disciplines (Medicine, Psychology, Neuroscience, Education/Special Education). Many children and adolescents with dyscalculia have associated cognitive dysfunction (e.g., impairment of working memory and visuo spatial skills) and 20% to 60% of those affected have comorbid disorders such as dyslexia or attention deficit disorder. The few interventional studies that have been published to date document the efficacy of pedagogic therapeutic interventions directed toward specific problem areas. The treatment is tailored to the individual patient's cognitive functional profile and severity of manifestations. Psychotherapy and/or medication are sometimes necessary as well. The early identification and treatment of dyscalculia are very important in view of its frequent association with mental disorders. Sufferers need a thorough, neuro psychologically oriented diagnostic evaluation that takes account of the complexity of dyscalculia and its multiple phenotypes and can thus provide a basis for the planning of effective treatment.

Visscher, Noel and Pesenti (2017) identified the core deficit of Developmental Dyscalculia mainly by assessing a possible deficit of the mental representation of numerical magnitude. Research in healthy adults had shown that numerosity, duration and space share a partly common system of magnitude processing and representation. However, in Developmental Dyscalculia, numerosity processing has until now received much more attention than the processing of other non numerical magnitudes. To assess whether or not the processing of non numerical magnitudes was impaired in Developmental Dyscalculia, the performance of 15 adults with Developmental Dyscalculia and 15 control participants was compared in four categorization tasks using numerosities, lengths, durations and faces (as non magnitude based control stimuli). Results showed that adults with Developmental Dyscalculia were impaired in processing numerosity and 63 duration while their performance in length and face categorization did not differ from controls' performance. The findings supported the idea of a non symbolic magnitude deficit in Developmental Dyscalculia, affecting numerosity and duration processing but not length processing.

Effects of Thoppukaranam (Super Brain Yoga)

Chandrasekeran, Rajesh and Srinivasan (2014) examined the effect of Thoppukaranam on selective attention and psychological states in a sample of young adults. A randomized self as control within subjects design was employed. Thirty undergraduate students (4 females and 26 males) from a residential Yoga University in Southern India were selected for this study. The d2 test, State Anxiety Inventory-Short Form and State Mindful Attention Awareness Scale (SMAAS) were used to measure cognitive performance and psychological states. Assessments were made in three sessions: Baseline, Control (squats), and Experimental (Thoppukaranam) on 3 separate days. Data were analyzed using one way repeated measures analysis of variance between three sessions, that is, Baseline, Squat, and Thoppukaranam. The findings indicated Thoppukaranam resulted in enhancement of cognitive functioning and psychological states. Jeremy, Kathleen and Genevise (2015) tested the ability of Super Brain Yoga to improve performance on a cognitive task called the Number Facility Test. In the first experiment, 30 adults completed a baseline version of the Number Facility Test; performed standard squats, Super Brain Yoga, and a rest trial (counterbalanced) and

were readministered the Number Facility Test after each task. A non parametric Quad test showed no significant difference in outcome measures ($p = 0.99$, Kendall's $W = 0.01$). In the second experiment, 30 adults completed a baseline version of the Number Facility Test, performed standard squats and 2 alternative forms of Super Brain Yoga (counterbalanced) and were readministered the Number Facility Test after each task. A Quad test indicated no significant difference in outcome measures ($p = 0.19$, Kendall's $W = 0.09$). The results provided no support for the claims made for Super Brain Yoga. However, this research can not exclude the possibility that alternative forms of Super 64 Brain Yoga might be effective or that it might have an effect on cognitive skills not captured by the Number Facility Test.

Verma and Kumar (2016) assessed the efficacy of super brain yoga along with few yogic techniques on mental activity in adolescence. They had randomly selected 50 Sanskrit students with age ranging between 15 to 22 years of age. Practicing 51 minute /day yogic intervention particularly and only those students were considered who were willing to participate in such types of practices. The obtained data was statistically significant at 0.01 level between pre and post conditions in the level of Alpha E.E.G. This reveals that the effectiveness of super brain yoga along with yogic practices in enhancement of mental activity and the state of meditation in special reference with college going adolescence.

Siar, Tucker and Slovacek (2003) measured the effects of Super Brain Yoga with 56 students who experienced academic and behavioural problems during 2003-2004 academic year. Thirty seven children served as a study group and 19 served as the control group. The study group performed the Super Brain Yoga at least twice a week, before tests and when the students were noted to be tired, restless, emotional or needed to assimilate academic information. The results showed a significant increase in performance scores. Six out of Ten students interest toward academic performance was increased.

Pankaj (2016) conducted a study in management of mathematics anxiety through Behaviour Technology, Super Brain Yoga and Varmalogy in 9 th Standard students. Thirty five students from IX standard pursuing in Kendriya Vidyalaya were selected

for the therapy on the basis of their SUD score. Anxiety in Mathematics was developed due to various causes and the students were not dyslexic. Mathematics Anxiety was assessed by using Suri, Monroe and Koc's (2012) Short Mathematics Anxiety Rating Scale. Interventions used were Rate of Breathing Exercise, Laughter Technique, Adappakalam and Super Brain Yoga. The Anxiety level and performance in Mathematics anxiety were significantly reduced. This shows that behaviour modification techniques, Adappakalam and Super Brain Yoga were very effective in treating Mathematical Anxiety.

Saliyan, Dayananda V.R., Bharathi Dhevi (2019) studied about Effect of Thoppukaranam on attention, memory concentration-concentration, mindfulness and state exam anxiety in school going children. The results showed that while the practice of Squats improved Attention and as well as state mindfulness and decreased state anxiety, the improvement was more significant following the practice of Thoppukaranam

Sadati, Daneshjoo, Bazargad and (2020) researched about Effectiveness of Super Brain Yoga exercise on fluid intelligence, Visual Spatial perception, academic achievement and balance in slow paced children. The results of this study showed that it would be advisable to use Super Brain Yoga exercises for improving educational achievement for slow paced children along with other commonly used educational programs

Joseph Ivin Thomas, Venkatesh D (2017) reviewed about A comparative study of the effects of Super Brain Yoga and aerobic exercise on cognitive functions, The present study demonstrates that super brain yoga has a positive impact on both attentional control and working memory components of cognition. The effect was more pronounced on working memory than attentional control in the Super Brain Yoga group compared to simple squats group.

Application of Super Brain Yoga for Academic Anxiety Management in Adolescence was studied by Kumar and Pankaj (2016). Fifty students were selected through random purposive sampling for the yogic intervention and were exposed to yogic practice daily for half an hour for thirty days. Intervention continues during Sundays and Holidays. Academic anxiety is one of the major problems with the young generation especially during their examination. This yogic intervention was found to reduce the academic anxiety level of the practitioner.

Super Brain Yoga is a simple squatting technique that uses subtle energy to improve cognitive functioning of individuals. The present study aims to find the effectiveness of Super Brain yoga on short term memory and selective attention of students. Pre Test, Post Test Design was used in the study. The study was conducted on 91 students from a residential school in Mysore District with a mean age of 11.9 years. The Knox Cube Test was used to evaluate the Short Term Memory and Digit Cancellation Test was administered to assess the selective attention of students. Pre scores and Post scores were recorded and energy enhancement was measured before and after Super Brain Yoga practice. Scores were analysed using Repeated Measure ANOVA and Chi-square Test. A mean gain of 1.18 in score with significance ($F = 1.884, p < .001$) in short term memory and a mean gain of 3.31 with significance ($F = 4.426, p < .001$) in selective attention after one month of Super Brain Yoga was observed. In between pre and post session an increase of 34.27% in left hemisphere and 28.71% in right hemisphere was measured in pranic energy levels. Super Brain Yoga has been found to be effective in improving short term memory and selective attention among students.