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RESEARCH ARTICLE

INTELLECTUAL DEVELOPMENT IN EGYPTIAN CHILDREN WITH DYSLEXIA.

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Abstract

Background: Dyslexia is characterized by trouble with reading. Problems may include difficulties in spelling words, reading quickly, writing words, "sounding out" words in the head, pronouncing words when reading aloud and understanding what one reads. Often these difficulties are first noticed at school. Different children ar e affected to varying degrees. The difficulties are involuntary and people with this disorder have a normal desire to learn. Dyslexia is believed to be caused by both genetic and environmental factors. Some cases run in families. It often occurs in people with attention deficit hyperactivity disorder (ADHD)and is associated with similar numbers. The underlying mechanisms of dyslexia are problems within the brain's language processing. Dyslexia is diagnosed through a series of tests of memory, spelling, vision, and reading skills. Dyslexia is a language disability, so it affects the ability to learn to read, write, and spell by conventional methods, it affects the ability to communicate in more subtle ways. Dyslexics have processing, perceptual, and Attention /concentration problems.

Aim of the work: The aim of this work is to assess the effect of dyslexia on different I.Q parameters as memory, attention, language, concentration, visual, and auditory etc. among representative sample of school-aged children and adolescents.

Patients and methods: This study was conducted on 90 Egyptian children (60 of them suffering from dyslexia in addition to 30 apparently health children of matched age, sex, and nutritional status as control group) , from the outpatient clinic, Al-azhar University Hospital and sidigalal health insurance clinic at Assiut city Egypt . Study started from January 2015 to September 2015.

All groups will be subjected to: complete history taking, complete physical examination, and assessmentof reading disability: By using the Arabic validated translated version ofschonell test (Schonell; 1950) and Dyslexia scale for children and adolescents (DSCA), Socioeconomic scale (Abdel-Tawab; 2010) and finally The Stanford Binet Intelligence Scale, fourth edition (SB4)

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Results: there was statistically high significant difference in frequency of low and moderate SES classes among dyslexics and controls, also There was Statistically high significant difference among patients with dyslexia and control as about 93.4% of dyslexics were poor readers with higher frequency among males than females . However, it was found that no sex difference among patients with good reading skills Also there was a statistically high significant difference for IQ parameters and total IQ, while it showed a statistically significant difference for verbal relations test and Bead Memory test and statistically no significance for the remaining IQ parameters.
Conclusion: There a strong interrelationship between cognition, dyslexia and school performance and presence of also low average IQ levels in control despite good school achievement.

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Introduction:-

Dyslexia is the most common and most important neurobehavioral kind of reading disability, characterized by difficulty in word decoding, low ability in phonological processing skills and different problems in various forms of written language. (Miles E; 1995).

Problems may include sounding out words, spelling words, reading quickly, writing words, pronouncing words when reading aloud, and understanding what was read. Often these difficulties are first noticed at school. The difficulties are not voluntary and people with this disorder have a normal desire to learn (Peterson et al; 2012).

The British Dyslexia Association definition describes dyslexia as "a learning difficulty that primarily affects the skills involved in accurate and fluent word reading and spelling. Characterized by "difficulties in phonological awareness, verbal memory and verbal processing speed"
(Sylvia Phillips et al; 2013)

Acquired dyslexia or alexia may be caused by brain damage due to a stroke or atrophy(Woollams ;2014).
Forms of dyslexia include pure dyslexia, surface dyslexia, semantic dyslexia, phonological dyslexia, and deep dyslexia(Michael Spivey etal; 2012).

The percentage of people with dyslexia is unknown, but it has been estimated to be as low as 5% and as high as 17% of the population. While it is diagnosed more often in males, some believe that it affects males and females equally.
(Peterson and Pennington; 2012).

The cause of dyslexia is believed to involve both genetic and environmental factors. Some cases run in families. It occurs more often in people with ADHD and is associated with problem with mathematics. When the condition begins in adults it may be the result of a traumatic brain injury, stroke, or dementia(Peterson and Pennington; 2012).

The underlying mechanism involves problems with the brain's processing of language.It is separate from reading difficulties due to poor teaching, or hearing or vision problems). Diagnosis is by a series of tests of a person'smemory, spelling, ability to see, and reading skills.

Assessment of reading disability can be done byusing:-
Schonell test :It is considered as rapid screening test fordetection of reading disability (Schonell; 1950).
Dyslexia scale for children and adolescents (DSCA):
This scale consists of 50 questions offers a full description of what appears on the child or adolescent suffering from the symptoms and signs of dyslexia(Peterson and Pennington; 2012).

Assessment of cognitive function can be done by using:-An intelligence quotient, or IQ, is a score derived from one several standardized tests designed to assess human intelligenceThe Stanford Binet Intelligence Scale , fourth edition (SB4),a standardized and well validated psychometric testing used to assess memory, attention, language, and concentration (Melika, 1998)

Aim of the work:-
The aim of this work is to assess the effect of dyslexia on different I.Q parameters as memory, attention, language, concentration, visual, and auditory etc. among representative sample of school-aged children and adolescents.

Patients and methods:-

This study was conducted on 90 children (60 of them sufferingfrom dyslexia in addition to 30 apparently health children of matched age, sex, and nutritional status as control group) , from the outpatient clinic, Alazhar University Hospital and sidigalal health insurance clinic at assiut city Egypt. Study started from January 2015 to September 2015.

Children and adolescents in this study were divided into two groups; Group I: included 60 children with dyslexia.

Group II: included 30 apparently healthy child as a control group

Inclusion criteria:
.children with dyslexia.
.age of children from 8 to 16 years old.
.Children who have score <70% of total school grades in the previous year or failing in their grade at least once

Exclusion criteria
.Age below 8 years or older than 16 years.
.Children received medication known to modify cognitive function of the brain
.children with organic brain diseases or conditions similar to dyslexia.
.Children who have score >70% of total school grades in the previousyear and with no failing in their grades.

Methods:
All groups will be subjected to:
(A) complete history taking: With stress on: educational history, history of learning difficulties
(B) Complete physical examination: with stress on Neurological examination
(C)- Investigations:-
-Assessment of reading disability By using
1- the Arabic validated translated version of schonelltest (Schonell; 1950). It is considered as rapid screening test for detection of reading disability. It is composed of 60 words divided into 3 groups, each group composed of 20 words arranged in 10 pairs.
- The first group contained 10 pairs of words, which are semantically similar
- The second group contained 10 pairs of words which are visually similar except in one or two phonemes.
- The third group contained 10 pairs of words which are not similar eithersemantically or visually.

The 60 target words were presented visually and the child is asked to read them correctly as rapid as he can.
As the normal child can read 100 words/minute (Saad El-din; 1998).
So he can read these 60 words in about 36-40 seconds. As the child with reading difficulty, read less than 52 words/minute. So the poor readers read less than 34 word/40 seconds.
2- Dyslexia scale for children and adolescents (DSCA):
This scale consists of 50 questions offers a full description of what appears on the child or adolescent suffering from the symptoms and signs of dyslexia. There are two choices in front of each question: (yes) and (no)accounts for (1) and (0) respectively where (yes) means thatthe questionapplies on the individual with the presenceof the symptom that'sexpressed by it, while (no) on the other side indicate the contrary meansthat the question doesn't apply on the individual with the absence of thesymptom that's expressed by it. So the degrees on this scale ranges from (0-50), the higher the degree indicates that the individual suffers fromdyslexia, and vice versa.For

dyslexia to be diagnosed the child oradolescent must applies for at least 40% of the questions of this scale i.e.20 degrees in this scale.

Table 1:- degrees of dyslexia according to DSCA.

Grade of dyslexia	Degrees on the scale
Mild	22-27
Moderate	28-33
Severe	34-39
Extreme	40-50

(Aadel a.; 2009)

3- Socioeconomic scale

. It contains four main variables

-The educational level of the father and mother.

-The occupation of the father and mother.

-Total family income.

-Life style of the family.

Each main variable involves a set of levels or branches, these levels are weighted on a graded scale starting with grade one and ended by a number corresponding to the rank of this level.

Each level has a score; the sum of these scores gives the total mark of the variable.

The total (row) score of an individual can be obtained from an equation that depends upon these four variables categorization of individuals of a given sample as high, middle, or low class is done as follow;

A-Calculationofthe mean and SD for the total scores of the studiedsample.

B-Individuals having score higher than mean+ one SD are classified ashigh SES class.

C-Individuals having score lower than mean-oneSD are classified as lowSES class.

D-Individuals in between are classified as middle SES class

(Abdel-Tawab;2010)

4- The Stanford Binet Intelligence Scale , fourth edition (SB4)

Allparticipants (patients and controls) underwent assessment by the Arabicversion (Melika; 1998) of SB test (fourth edition) (Delany& Hopkins, 1986) a standardized and well validated psychometric testing used to assess memory, attention, language, and concentration. SB test is formedof vocabulary, comprehension, verbal relations test, abstract visualreasoning test, quantitative reasoning test, memory for sentences, test,bead memory test and intelligent quotient. This test is characterized by its acceptability to children, and relevance to daily livings activities in children group of population (Melika; 1998)

Table 2:- Classification of I.Q. Levels in the SB Intelligence Scale

Classification	I.Q	
Very superior	140 and above	
Superior	120-139	
High average	110-119	
Normal average	90-109	
Low average	80-89	
Borderline defective	70-79	
Mentally defective	Mild	55-69
	Moderate	40-54
	Sever	25-39
	Profound	≤24

(Delany& Hopkins, 1986

Results:-

Table (3) showed that 65% of patients with dyslexia were males, their mean age was 10.5 years old and 58.4% of them were from rural area.

Table 3:- Demographic characteristics of 60 studied patients with dyslexia and 30 control .

Demographic Characteristics	Dyslexics n=60		Control n=30	
Sex (number & percentage)				
Male	39	65%	15	50%
Female	21	35%	15	50%
Age (year) Mean ± SD				
Studied groups	11±2.33		11±2.84	
Male age	10.5±2.72		11±2.95	
Female age	10±1.94		11±2.73	
Residence (number & percentage)				
Urban	25	41.6%	12	40%
Rural	35	58.4%	18	60%

n= number % = percent

Table (4) showed that statistically high significant difference in frequency of low and moderate SES classes among dyslexics and controls (p<0.01).

Table 4:- SES class among dyslexics and control.

	Dyslexics n=60		Control n=30		P
	N	%	N	%	Value
Low class	16	26.7	2	6.7	P <0.01**
Moderate class	21	35	12	40	P <0.01**
High class	23	38.3	16	53.3	P >0.05

N.S : non-significant (P > 0.05) * significant (P < 0.05) ** Highly significant (P < 0.01)

Table (5) showed statistically high significant difference as about 93.4% of dyslexics were poor readers (read less than 34 words per40 seconds) (P<0.01) with higher frequency among males than females (66.1% and 33.9%) respectively. However, it was found that no sex difference among patients with good reading skills (read more than 34 words per 40 seconds).

Table 5:- Pattern of reading skills among patients with dyslexia and control according to schonell's test.

Schonell's Test Score	Dyslexics n=60			Control n=30		
	Males n (%) 39 (65%)	Females n (%) 21 (35%)	Total n (%) 60 (100%)	Males n (%) 15 (50%)	Females n (%) 15 (50%)	Total n (%) 30 (100%)
Poor reader <34word/40 sec n (%)	37 (66.1%)*	19 (33.9%)	56 ** (93.4%)	2 (67%)	1 (33%)	3 (10%)
Good reader >34word/40 sec n (%)	2 (50%)	2 (50%)	4(6.6%)	13 (48.2%)	14 (51.8%)	27(90%)

N.B.: percentages of males and females calculated based on total number in each category.

Table (6) showed a statistically high significant difference between pattern of IQ level among studied groups (P<0.01) in normal or average, low average and borderline defective IQ levels and statistically significant difference (P<0.05) in low IQ levels.

Table 6:- Classification of IQ among dyslexics and controls according to SB fourth edition.

	Dyslexics n=60		Control n=30		Significance P value
	n	(%)	n	(%)	
Normal or average (90-<110)	3	(5%)	10	(33.3%)	P<0.01**
Low average (80-<90)	13	(21.7%)	18	(60%)	P<0.01**
Borderline defective (70-<80)	41	(68.3%)	2	(6.7%)	P<0.01**
Low IQ (mentally retard)	3	(5%)	0	(0%)	P<0.05*
55-<70	2	(3.4%)	0	(0%)	P>0.05
40-<55	1	(1.6%)	0	(0%)	P>0.05
25-<40	0	(0%)	0	(0%)	P>0.05
0-<25	0	(0%)	0	(0%)	P>0.05

Table (7) showed that a statistically high significant difference ($p<0.01$) for IQ parameters (abstract visual reasoning, memory for Sentences and short term Memory) and total IQ, while it showed a statistically significant difference ($p<0.05$) for verbal relations test and Bead Memory test and statistically no significance ($p>0.05$) for the remaining IQ parameters.

Table 7:- Intelligent quotient (IQ) by SB Intelligence Scale (SB4) , fourth edition in all patients with Dyslexia and controls.

parameters of intelligent quotient(IQ)	Controls n=30	Dyslexics n=60	Significance P value
Vocabulary	49.5±4.5	46.5±6.4	P>0.05
Comprehension	48.5±4.2	43.16±6.9	P>0.05
Verbal Relations test	97.18±12.76	89.78±10.64	P<0.05*
Abstract Visual Reasoning	99.17±13.78	90.39±12.34	P<0.01**
Quantitative Reasoning	102.91±14.81	95.55±10.69	P>0.05
Bead Memory test	51.8±5.6	45.39±7.89	P<0.05*
Memory for Sentences	52.1±4.6	45.95±7.62	P<0.01**
Short term Memory	103.53±32.03	90.09±11.84	P<0.01**
Total I Q	98.28±13.9	80.42±9.17	p<0.01**

Data represented as mean ± SD

Discussion:The reading skill is one of fundamental requirement for good school performance, children with reading disabilities may have one or more difficulties with many skills such as speaking, writing, reasoning, or mathematical abilities that interfere with academic performance.

Poor school performance, which is defined as students who failed in one or more academic subject or who got less than 70% of total marks in previous year, represent underlying large problem in children and results in not only distress to the child but also to their parents with negative feedback consequence in their adulthood.

The present study reported that Dyslexia is more in males than females and this in consistence with (Farrag et al; 1988) may be due to genetic origin or due to more interest by parents.

The present study reported that there was statistically high significant difference in frequency of low and moderate SES classes among dyslexics and controls, also There was Statistically high significant difference among patients with dyslexia and control as about 93.4% of dyslexics were poor readers with higher frequency among males than females . However, it was found that no sex difference among patients with good reading skills This is in agreement with (Vinod et al; 2013) in Mumbai who reported that 76.2% of students with low scholastic achievements had reading difficultiesConcerning SES, low SES had negative effect on dyslexia as it affects quality

of life of children and adolescents and offers overload ontheir parents who give more priority for housing, food and other basiclife requirements.

The present study reported that the majority of patients with dyslexia had low SES class which significantly affect dyslexia compared to controls, consistent with (Topor et al; 2010) in U.S.A who reported that reading skills were significantly influenced by SES state and cultureof the family.

In addition, the presented study reported that the majority of parents of students with dyslexia and low scholastic achievement have lower educational level which is statistically significant in comparison to controls with good scholastic achievement.

This is in agreement with (Nair et al; 2003) in India who reported that educational level of parents tend to predict school performance and reading ability, lower educational levels of their parents were associated with dyslexia and low scholastic achievements in their childrenCeballo and Mcloyd; 2002) in Italy reported that the education of parents has a great effect on academic achievement of their children and their reading skills and also consistent with (Haneesh et al; 2012) in India Who reported significant difference in the educational level of parents of students with scholastic backwardness and with low reading skills compared to the parents of students with good scholastic achievements and with good reading skills ties.

IQ level is one of the important prognostic variables for academic outcome in children , lower IQ level irrespective to its ethology is associated with poor school performance and failure (Kaznowski; 2004).As a person with mental retardation may have difficulties with communication, conceptual skills, social skills, self-care, home living, community use, self-direction, health and safety, functional academics, leisure, and work.In the present study, table (6) it was found that most students with dyslexia and poor scholastic achievements had IQ score below average (90-110) as; nearly 2/3 of these students (68.3%) had borderline intelligence, and (21.7%) of them had low average intelligence, in addition (5%) had mental retardation, while, only (5%) had normal IQ with negative correlation between IQ level and DSCA grade of dyslexia.

Furthermore, our interesting results among control group showed that as showed in table (6) about two thirds of those children (66.7%) had low IQ scores either had low average or borderline intelligence (60% and 6.7% of them respectively), also results of schonell's test and DSCA both show that about 10% of control group has mild degree of reading difficulties. Despite their lower IQ score and reading difficulty they could attain good reading abilities and school performance (>70% of school marks). Thus we could put the assumption that those children are potentially educable in spite of low IQ level and could succeed an attaining normal reading skills, but when low IQ score is combined with other factors for example; low SES and overcrowded classrooms, theywill fail to attain normal reading skills. The results is inconsistent with(Farrage et al; 1988) in Upper Egypt who reported that 21% of students had borderline IQ level , 21% had low average IQ level and 57% had normal IQ level.

It is important to investigate the interrelationships between cognitive functions with dyslexia. This factor should relate to dyslexia in a way that is consistent with their purpose. Several previous studies have evaluated the importance of inhibition in control and dyslexic students. In the present study, there were significant impairment in verbal reasoning, abstract visual reasoning, short term memory and IQ among dyslexic group than matched control group.

In addition, more affection in dyslexia items will associate with more impairment in cognitive functions as in Tables (7)
Keat and Ismail reported that the cognitive impairment of simultaneous processing is considered as major factor upon the difficulties of reading among the subjects. Furthermore, they reported that cognitive processes relevant to reading comprehensionspecifically, phonological processing, verbal working, memory and syntacticawareness can explain reading comprehension performance (Keat andIsmail; 2010).

Alarcon and De-Fries indicated that the correlation between the reading and cognitive factors in the pro-bands should be attenuated. Although the phonotypic correlations between reading performance andgeneral cognitive ability between reading disability and normal are both substantial (Alarcon and De-Fries; 1997).

Conclusion:-

From the previous results we can conclude the following:
The higher prevalence of low level of education of parents of children with dyslexia and Presence of reading difficulties in control despite good school achievement - Presence of also low average IQ levels in control despite good school achievement and finally There a strong interrelationship between cognition, dyslexia and schoolperformance.

Recommendations:-

- Encouragement of the prevalence surveys of reading assessment and school performance and Follow up of children is recommended regularly every 6 month until the age of 16 years to judge adequately the effect of therapy on school performance and IQ.
- Developing programs for: Identification of school students with poor scholastic achievements and Early screening of reading disabilities and provide more effort for problem solution at early school grade

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