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Research

Children with Dyslexia - Special Language Impairment and Kinetic Skills

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Abstract

The present research aims to investigate the kinetic profile of Greek school children (6-12 years old) with Dyslexia & Specific Language Impairment (SLI) using the Movement Assessment Battery for Children, MABC-2, and tool as compared with children in formal education and assess any differences in kinetic profile among subgroups of such children. Participants were two groups of children of which 36 comprised the first group and were diagnosed, either by a Center for Differential Diagnosis, Diagnosis and Support (KE.D.D.Y.) or Psychodiagnostic Centers for Special Educational Needs, as children with Dyslexia & Specific Language Impairment (SLI) (average age: 112.05 months). The second group comprised 51 children of the same sex and age without any developmental disorder (average age: 114.55 months). The research was conducted individually at the Center for Differential Diagnosis, Diagnosis and Support (KE.D.D.Y.) Thessaloniki II, as well as in Primary and Secondary Schools in the Prefecture of Serres. Statistical analysis was performed by means of two-way analysis of variance (ANOVA) and the results established statistically significant differences in the general motor score of Movement Assessment Battery for Children (MABC-2) between the group of children with Dyslexia & Specific Language Impairment (SLI) and the group of children in formal education. In addition, ANOVA established significant differences in hand dexterity, ball skills and balance between the two groups of children with dyslexia & Specific Language Impairment (SLI) and the group of children in formal education. Further analysis established that no significant differences in the general motor score of the test were exhibited among children with Dyslexia & Specific Language Impairment (SLI). Specifically, the group of children with Dyslexia & SLI in our research exhibits Developmental coordination disorder (DCD) at a rate (44%) as opposed to children of typical development who exhibit a much lower percentage (12%). Even within the group of Dyslexia & SLI exhibits a DCD, a percentage of children exhibit a DCD risk (22%) while the remainder (33%) does not exhibit any difficulties. On the contrary, children of atypical development exhibit much lower rates, i.e. there is a DCD risk percentage (12%) and another (78%) exhibiting no DCD at all. Within this research framework, the view supported by the contemporary international literature that movement disorders often coexist with Specific Learning Difficulties is established.

Keywords: Kinetic coordination, developmental disorders, specific learning difficulties

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INTRODUCTION

Movement provides people freedom, the right of choice and participation in simple and complex daily life activities. When movement suffers, then the involvement of children in activities both inside and outside of the school environment is seriously disturbed, with negative side effects on both physical and mental health [1].

Developmental Coordination Disorder Kinetic (DCD) is a disorder of which the percentage is growing constantly and is one of the most frequent to teachers of all levels within the school environment [2]. «Developmental coordination disorder is a situation where, given the age, children with normal mental and physical development and no apparent neurological disease have difficulties in carrying out culturally typical motor skills, including activities of daily life and school [3, 4]».» Fora specific description of the problem, there are difficulties because there is a clearly defined pattern of behavior. Children with DCD face lots of operational difficulties associated with movement skills, skills of playing, leisure activities and recreation. [5] The last 100 years, children who have difficulties in movement, is generally accepted those face growth problems as well [2]. Moving activity and coordination of movements are necessary functions for the total development and SLI of the individual. This is about features which are developinggradually, following the pace of gradual maturation of the nervous system and the conquest of sensory processing capacity (visual and tactile) stimuli [6].

The principle for the acquisition of movement skills is physical education [7]. The term movement skills refer to the development of moving control, the accuracy and correctness of execution of the basic and specialized movements. The gradual SLI of movement skills is crucial while insufficient development often leads children to frustration and failure during adolescence and adulthood [7]. The psychosocial and psycho moving development of the child occurs through the participation in physical activities in the form of free play and active participation in organized sports activities. A fairly significant percentage of children experiencing moving disorders without any neurological, mental or musculoskeletal problems are characterized as children with physical awkwardness [8]. The moving clumsiness today which is defined by the term Developmental Coordination Disorder Kinetic (DCD) is presented as a heterogeneous, having some of the children with difficulty only in fine moving skills, others having only rough moving skills, or others in both cases (9). The diagnosis is based primarily on moving skills tests (9). In order to diagnose if a child displays DCD, the numbers of the results must be outside the normal range, as set by the above procedure.

Children classified as ‹clumsy› fall into two broad categories [10]. Experts dealing with these children, rank in the first category those for which there is no apparent reason for their difficulties. These children do not have anatomical malformations; biochemical and sensory functions are normal, no neurological disorder marked and has a good mental level. Nevertheless, they face considerable difficulties in obtaining appropriate to their age, moving skills[10]. This category of children has attracted the interest of scientists in recent years both in the field of good assessment and on effective intervention. For the second category of children with disabilities, the moving clumsiness is a symptom of a medical disease or a psychological condition in which primary importance have the facts which are related to the organ that is diseased and as a result has the appearance of moving dysfunctions. In addition, in this category, there are children with hyperactivity, dyslexia, or specific speech problems. Another closer examination may reveal the moving coordination disorder as a minor problem (10). This kinetic disorder affects their daily life in a significant way and not due to a neurological disorder or delay of cognitive development (8). The recognition of this disorder is crucial. For someone who does not have the proper training, these difficulties are often interpreted as a result of immature behavior, laziness and lack of willingness to cooperate, as reported [11, 12].Although in the past, researchers believed that children with DCD sometime would overcome these kinetic disorders, research has demonstrated that these problems remain both in adolescence and in adulthood[13]. Children with DCD fail to meet the environmental requirements while parents believe that the problem will be overcome as the child grows [14]highlighted that many difficulties at the age of six years remain even at 16. If DCD›s difficulties accompanied by

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socio-affective disorders, then it is more likely that the situation will remain after the end of the school life and studies have shown that the appearance of DCD at younger ages, it is very likely to lead to other learning difficulties [15, 16].As time goes by, the reflections in science become more and more intense about the diagnosis and treat developmental disorders seen in childhood[17].Researchers have shown that DCD coexist with learning difficulties as well as difficulties in the articulation, the delay in language development and also with attention difficulties and social interaction[18].

Some children of formal development, on their entry into primary education, meet great difficulty DCD and writing. These children are characterized by children with Specific Learning Difficulties (SLI) [18]. Some others systematically fail to perform simple every day moving skills at school or at home, that is a distinct developmental disorder in the assembly of their movement. Although often one of these characteristics prevails in relation to the other, the problem is rarely isolated. Most of the times children with Specific Learning Difficulties have difficulty in assembly their movement to a greater or lesser extent. The kinetic disorder significantly affects their daily life and it›s not due to a neurological disorder or delay of cognitive development [8]. The recognition of this disorder is crucial. For someone who does not have the proper training, these difficulties are often interpreted as a result of immature behavior, laziness and lack of willingness to cooperate, as reported [19][12].

Research has shown that the frequency at which coincide Specific Learning Difficulties (SLI) and disturbances in moving coordination (DCD) is approximately 50%[20,21,and 22]. In Greece, according to the results of a few studies have confirmed that the phenomenon of impaired locomotors coordination occurs at a rate of 5-10% [23].Also, very few studies in Greek bibliography have dealt so far with the coexistence of disorder of moving coordination and the Specific Learning Disorders, and as result, there aren›t sufficient data for the Greek educational space [24].

The Specific Learning Difficulties are a heterogeneous group of disorders (National Joint Committee of Learning Difficulties / NJCLD, 1988). Both the way they occur and possible etiology appear particularly differentiated to an SLI that is difficult to identify some common features for all children. «The Specific Learning Difficulties» (SLI) is a generalized term that describes a large group of diverse difficulties, which are manifested in a wide range of linguistic processes and refers to the operation and learning of speaking, DCD, writing, understanding DCD and writing and mathematics. Along with SLI problems of self-regulation of behavior, social perception and social interaction may coexist, which, however, do not identify a learning disability. Also SLI can occur simultaneously with other problems (eg functional impairment of consciousness, mental retardation, serious emotional disturbance) or with extrinsic influences (e.g. cultural differences, language deprived environment, insufficient or inadequate education), but it is not a result of these conditions or influences (National Joint Committee of Learning Difficulties / NJCLD, 1988). The above definition is the one the Joint National Committee on Learning Disabilities has formulated (National Joint Committee of Learning Difficulties / NJCLD) of the USA in 1988. It is considered vague and simultaneously the most concise definition relied on the wording of, all the contradiction about who can be regarded atom SLI and who is not. The intrinsic nature of SLI must be emphasized which comes through the term «minimal brain dysfunction»[25] and is based on the assumption that there is a neurological dysfunction, thus excluding all those external factors that cannot be considered a cause for SLI such as family, economic, cultural, social problems. Note, of course, that is possible the aforementioned factors to coexist and exert influence, but are not responsible for the appearance of SLI[26]. These problems are inherent to the person, deemed to exist because of the dysfunction of the central nervous system and may occur throughout [27].

The coexistence of SLI and particularly dyslexia and specific language impairment and DCD has been studied worldwide [21, 27,28, 29,30,31,and 32]. More specifically, [33]on the results of the survey, highlight that children with DCD have problems in writing at 87%, in DCD at 70%, compared to typical development children (15% and 14% respectively).Concluded that if SLI accompanies DCD the difficulty encountered by these children in performing perceptual-moving skills is greater [34]. Accord-

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ing to the researchers, the performance of children with DCD and SLI in moving skills, it was clearly lower than in groups who had only SLIor only DCD and moreover children SLI attributed significantly lower moving skills compared to their peers without SLI[35, 36]. Due to the reduced moving coordination, these children experience frustration at school, as well as in sports and recreational activities. Kinetic difficulties that children face, based on the theories of motivation, as the researchers claim, create kinetic syndrome clumsiness [37].

The coexistence SLI and DCD is a reality, so it would be important in our country to provide training to those involved in education and diagnosis of children and informing their families, aimed to early diagnosis and support of children. Early diagnosis could be strengthened with the appropriate supportive and therapeutic framework which would result in great improvement of the motor skills of children and change of the development of the disorder.

METHODOLOGY

Participants

The survey involved 36 schoolchildren aged 6-12 years from schools of Western Thessaloniki who have passed the diagnostic procedure of B' KEDDY of Thessaloniki and have been diagnosed with dyslexia or SLIOut of the 36 children, 11 were diagnosed with dyslexia and 25 were diagnosed with SLIOut of the 11 children with Dyslexia (Specific Disorder of Learning) the vast majority, 72.8% (8 children) belonged to the age group of 7-11 years. 27% (3 children) belonged to the age group of 3-6 years old, while there is not a representative sample for the age group of 12-16 years. Out of all the children with dyslexia and SLI, the vast majority, 60% (15 children) belonged to the age group of 7-11 year, 28% (7 children) belonged to the age group of 12-16 years, while 12 % (3 children) belonged to the age group of 3-6 years old.

The group of children with formal education consisted of 50 children with the same school age, from the typical population of Serres without developmental disorder in learning or motor coordination. Out of all the children with formal development (50 children), 23 are boys (48%) and 27 are girls (52%). As far as the age groups concerns, children are allocated to the following percentages: the majority, 82% (32 children) belongs to ages of 7-11, 12% (8 children) at ages of 3-6, and the rest 6% (6 children) belongs to the age group of 12-16 years.

Data Collection Tool

As data collection tool to evaluate the motor performance of children was used the kinetic evaluation package «Movement Assessment Battery for Children» (MABC-2), [37] which has been created to detect disabilities and is the upgraded form of the Movement Assessment Battery for Children (MABC). This tool has been designed to identify and describe disorders in motor performance of children and adolescents of ages from 3 to 16 years. The MABC-2 consists of 3 parts: a) the kinetic assay which is applied individually and requires from each child to perform certain skills, b) a checklist which is completed by parents, teachers, psychologists and experts therapists, c) a Manual with instructions and interventions for children with disabilities. The kinetic assay MABC-2 [37] is an evaluation instrument based on norms. The norms of the upgraded version cover the ages between 3 to 16 years. The final score shows the level at which each child is, depending on its age. It consists of 32 exercises organized in four sets (eight exercises per set). Each set is addressed in one of the three age categories: Category 1 (ages 3-6), Category 2 (ages 7-11) and category 3 (ages 11-16). The characteristics of the exercises are the same for each category. We used exercises of all categories to evaluate the students. Depending on the performance of each exercise the child receives a corresponding motor score. The scores of exercises that constitute on the field of hand dexterity are summed up and give the final score for this sector. The same procedure is followed both for the ball and balance exercises. In the end, the scores of all three sectors are an SLIrelated and it gives the total motor score which may range from 0 (for a child with no difficulty) to 40 (for a child with severe difficulties in movement). The kinetic assay takes 20 to 30 minutes and depends on the age of the child, the SLI of the movement difficulties but also

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the conditions under which the measurement is made.

A child, who has a total motor score of less than 10, shows no problem. A child who has a total motor score of 10 to 13.5, shows moderate difficulties, while a child who has a total motor score over than 14, indicates severe disabilities. The test has been designed to differentiate the children on the motor performance and the modulation levels are between 15 and the 5 (as the lowest percentage level). As a result of a child whose kinetic performance drops below the 15th percent position compared to the norms which are set for his age, is in a limited state, having some mobility problems. If the motor performance falls below the lowest 5th percent position is severely disabled. The reliability and validity of MABC are satisfactory and described in detail in the instruction book of the test [37].

In a survey in Greece [39] in a sample of 82 children who were measured three different times, found that the correlation coefficient between the measurements was satisfactory (ICC = .78), the fact that indicates a high SLI of reliability. Moreover, as far as validity concerns, an investigation in Greece (40), showed that the kinetic tests Movement Assessment Battery for Children-2 has good construct validity and displays a satisfactory level of reliability and internal consistency.

Data Collection Process

The data collection process took place in two ways: Firstly verbally or over the phone interviews with the parents of children who had received a diagnosis SLI or dyslexia by their near KEDDY, in order to ensure their consensus and acceptance for the participation of children in research. In case of agreement, the parents signed a solemn declaration of acceptance. In a second time, we held an individual evaluation of children›s motor skills after an appointment with their parents on a specified time at KEDDY. Each student has been evaluated individually by the researcher in days and hours agreed with their parents. The exercises of the tests had been conducted in accordance with the manual instructions. Data collection for the standard population children occurred after personal contact, information and consultation with the Director of each school who expressed the will to take part in research, the permission of the teachers› association and the written consent of the parents who wanted their children to participate in our survey. So the fitness rooms of each school had been suitably shaped, according to the instructions of the manual and we performed the kinetic evaluation of children.

Statistical analysis

For the statistical analysis of empirical research data, we originally used the descriptive statistics for calculating the percentage incidence of the disorder of motor coordination in children with dyslexia and SLIand distribution-differentiation of children in accordance with the norms of MABC-2 fields: fine mobility, ball skills, static and dynamic balance. Then, the analysis of variance has been used to detect any differences between the experimental and the control group in the general motor score of the MABC-2 motor test.

• Among the group of children with dyslexia and SLIand the group of children TE, the three areas of motor MABC (hand dexterity, ball skills, static and dynamic balance).

• Among the group of children with dyslexia and SLIand the group of children TE, the score motor test MABC-2

• Among children with dyslexia and children with SLIthe score of the MABC-2 motor test. Differences at .05 were considered statistically significant

RESULTS

The study involved 36 children who had dyslexia and SLI from KEDDY and 51 children from formal education schools. The following results refer to the performance of both groups of children (dyslexia - SLI and children T.E.) in the MABC-2 kinetic test and the norms that provide the test.

Comparison of the two groups of children (dyslexia- SLI and T.E.children) to the subcategories of the MABC

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The mean values in the three mobile areas of MABC were then investigated. The fluctuation analysis revealed statistically significant differences with respect to the individual kinetic sectors.

Table 1: Hand Skill, Ball Skills, Overall Performance

Performance / Pupils	TypicalPerformance	Dyslexia	SLI
	Performance	Performance	Performance
Handskill	19.82 (5.27)	16.54 (4.48)	17.28 (5.38)
Ballskills	32.98 (8.65)	22.09 (9.75)	22.28 (10.27)
Total	75.21 (14.06) [a,b]	54.90 (17.60)[a]	58.40 (19.41)[b]

a= statistically significant differences between TE children and children with Dyslexia

b = statistically significant differences between TE children and children of SLI

The relationship between MABC-based ranking and learning difficulties (dyslexia-SLI).

In order to examine the relationship between the MABC ranking and the specific learning difficulty, the x2 test was applied. A total of two analyzes were made, the first one looking at the relationship between the group of children with dyslexia and the SLI in relation to the children of the typical population in the MABC-2 kinetic test score, while the second focuses on the relationship between groups of children with dyslexia with children with SLI in the MABC-2 kinetic test score.

Table 2: Comparison of Teenage Children and children with dyslexia - SLI.

	Normal	>15%	>5%
T.E.	38	9	4
dyslexia-SLI	12	6	18

Table 3: Comparison of the performance of children with Dyslexia & Special Linguistic Impairment (SLI) and Children of Standard Performance

MABC / Groups	studentswithDyslexia& SLI		Students with Typical Education (T.E.)	
	N	%	N	%
Standard Performance	12	33	39	79
At risk	8	22	6	12
SLI	16	44	6	12

In this Table, we observe that the comparison of the two groups reveals significant differences between children with dyslexia and SLI compared to standard development children. In particular, the group of children with dyslexia and SLI shows DCD (44%) as opposed to typical development children with a much lower percentage (12%). Still, dyslexia and SLI group have a percentage of children at risk of having DCD in the(22%) and the rest (33%) has no difficulty. In contrast, children in formal development have much lower rates, ie one (12%) is at risk of having DCD and a percentage (78%) does not show DCD and one (12%) is at risk

Results of comparing motor skills classification among children with Dyslexia and SLI.

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Table 4: Comparison of children with dyslexia -SLI

	Normal	>15%	>5%
Dyslexia	9	9	18
S.L.I.	12	7	17

Table 5: Comparing Performance of Children with Dyslexia and Children with Special Language Impairment (SLI)

MABC/ groups	Students with Dyslexia		Students with SLI	
	N	%	N	%
Standard Performance	3	27	9	36
At risk	3	27	5	20
D.C.D.	5	45	11	44

As shown in the diagram above, which shows the comparison of the overall score among children with dyslexia and children with SLI we can see that the children of both teams with DCD and those in the risk zone do not differ significantly from each other. However, we can observe that children with dyslexia have a slightly higher percentage (27%) at risk of having DCD while children with SLI with a percentage (20%). Yet another percentage of children with SLI around (20%) do not seem to be at risk of having DCD in relation to children with dyslexia whose percentage reaches (27%). Children with dyslexia have (27%) the possibility of having no motoric difficulties, as opposed to children with SLI where their share reaches (36%).

DISCUSSION

This work was designed to investigate the motor profile of children with dyslexia and DCD (6-12 years old) by using the MABC-2 tool [37]in the Greek population and controlling the differences, if any, among the subgroups of these children. From the results of this research, it was realized that there is a large percentage of DCD existence children with dyslexia and DCD (44%) confirming our initial hypothesis as assessed by the Movement Assessment Battery for Children (1992).

The results of this research on the incidence of motor problems at school showed that (24%) of them after their assessment with ABC-2 appeared to have mobility difficulties. Twelve percent of children were in the red zone with severe motor problems, while 12.0% were in the danger zone for the onset of the disorder. In the international literature, there are large fluctuations in the declared prevalence rates of the disorder. According to the American Psychiatric Society (APA), rates range from 5% -6% of the school population, while 10% -15% are likely to be in the risk zone according to [38].

A high percentage of 19%, however, was found in Greece in a survey [41], while a very small percentage was found [24], with only 1.6% of children being treated with ADHD of this research was found to be consistent with the above bibliographic references. The percentage of children in the risk zone seems to be consistent with the rates of the research, (2006)[38]. Therefore, the overall percentage and for the above reasons can be compared and agreed with other surveys. Further research seems to be necessary, with greater participation of children, where it will show exact percentages in the Greek territory.

The selection of the age of the participants was based on the fact that at this age there were significant changes in the development and improvement of the basic motor skills of children [42]. In such studies the sample was children with special learning difficulties, the age of the participants ranged from 5 to 12 years, confirming the age of the participants [42]. In addition, it is considered that if there is no interference until the age of 12 in order to reduce the mobility difficulties before the child›s admission to adolescence, then any intervention may have no effect [40]. Of course, the sooner the diagnosis of the kinetic difficulties is made, the better the intervention and the treatment can be designed[21]. The sample of the group of children with dyslexia and S.L.I. was collected from an urban area while the children of the Department of SLI (T.E.) who took part in the survey came from urban semi-urban and rural areas. The socio-economic situation of the parents was not taken into account. In addition, none of the above factors affect the perfor-

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mance of children [37].

A remarkable contribution of this research to the literature lies in the fact that children with dyslexia and DCD are examined as a group in relation to motor dexterity and not as separate subgroups as is the case in most investigations.

Regarding the first research question, the results of the study showed that children with dyslexia and SLI have a markedly higher percentage of motoric hardship than the typical population. «Poor motor skills very often coexist with dyslexia.»[43]

This has been reported since the 1930s when children with dyslexia were first characterized as motorically clumsy [43]. Dyslexia was thought to be related to problems in motor development and coordination. Children with dyslexia are characterized by «a difficulty in rough and thin mobility that is not in keeping with age and stage of development» [43] Previous research estimates that 60% of children with learning disabilities have DCD and other problems with motor skills[44, 21].

This has led to the question of whether poor motor skills and dyslexia are only a problem of co-morbidity, or whether both developmental disorders are simply caused by a generalization problem. However, the incidence of motor symptoms in groups of children with dyslexia is variable in many studies. The research found that in 59% of cases a kinetic problem was found in a group of 22 children with dyslexia aged between 8 and 12 years old[45, 21], in their research, found that 63% of children with DCD they also had dyslexia. This variability, however, may be related to the methods for evaluating these disorders.

At the same time, it is necessary not to generalize about the mobility difficulties experienced by children with SLI and to talk about specific difficulties in terms of rough and fine mobility.

In the case of children with DCD, it has been reported by different researchers that they usually have fewer motor skills in some areas than their typically developing pee [46, 47, 48], although in some areas there is a spectacular improvement in their performance if an intervention program of their motor skills is implemented[39, 30].

Some studies done using MABC, [49] have confirmed the above theories. Thus, although the research data is not much, it seems that the subgroups of children with DCD[39] may have difficulties in visual-spatial and motor skills, a finding that may require further detailed research [46] reports that children with SLI they resembled them with DCD. This percentage is consistent with the 50%, rate of coexistence of the two disorders, which they reached using the same measurement tool (MABC) and other researchers[21, 49].

The relationship between the SLI and motor problems should be examined with detailed descriptions and comparisons of these disorders. Taking into account the rates of occurrence of the SLI at 5-7% [50] and DCD in 6% (APA, 1994), and their increased incidence in other neurodevelopmental disorders, there is an urgent need for further understanding of the difficulties encountered in these disorders. A large number of this overlaps SLI the possibility of a single underlying reasoning.

In contrast, it has been appreciated that with regard to precision in motor skills, children with DCD[48,51]. Despite the difficulties associated with the research of neurodevelopmental disorders in relation to the development of motor skills, research to understand this relationship needs to be developed. In short, it is clear that motor dexterity is characteristic of children with dyslexia and SLI.

According to the above, our research confirms the results of other previous studies from the international literature and is particularly important for the evaluation and treatment of developmental disorders.

From the results of the research on the second research question, it was realized that school-age children with dyslexia and SLI are more likely to have motor problems than children in the typical population. These two disorders have been highlighted by many studies that they burden the development of children not only at the motor and learning levels but at social, emotional and academic levels[30].

From the comparisons between the two groups of children in our research, as far as the three individual areas of the test (hand skills, ball skills, and dynamic static balance) are con-

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cerned, children with dyslexia and SLI recorded significantly lower performance. Compared with the children›s TE group, the group of children with dyslexia and DCD had serious difficulties in hand skills, and in particular the ability to perform repetitive movements that required precision. Important difficulties were presented by the group of children with dyslexia and SLI in the ball skills and minimal in the static and dynamic balance.

The results of this work are consistent with previous studies [51,52,53] that children with dyslexia and SLI encountered significant problems in hand skills and balance skills, with hand skills as the most difficult sector, but there are also differences in literature research. Other research, of course, SLI that there was no difference in ballistic skills among the experimental and control [52, 53], and there was a statistically significant difference.

The weakness in skills that mainly concerned hand skills reveal that many children with dyslexia and DCD encounter significant difficulties in grapho-kinetic co-ordination, ie in writing, which means they have limited skill in the hands. This may have a direct impact on the academic development of the child, so appropriate and specialized intervention is required to improve their visual and emotional coordination. Early diagnosis of motor coordination disorders offers more opportunities for recognition, intervention and coping with both the disorder itself and specific learning difficulties.

Researchers report that there is no golden rule for the assessment of motor skills and extensions for recognizing the disorder of motor coordination [10]. Even weighted tools do not recognize the whole range of motor problems because the assessment uses limited skills but also why the quality of the movement is difficult to evaluate [11]. Another problem is that there is no agreement on how severe the disorder should be to qualify as a child with DCD[54].

The kinetic profile of children with dyslexia and special language in our third research question seems to be different from that of the children of the typical population. Thus, the percentage of children in the typical population who presented DCD ranged in (12%) while children with dyslexia and DCD had a percentage (44%).

In a survey conducted in Greece [55], the results regarding the incidence of motor problems at school showed that (41.3%) of the children who participated after their assessment with MABC-2 appeared to have motoric difficulties. A proportion of 28.3% of the children was in the red zone with severe motor problems, while 13.0% were in the risk zone for the onset of the disorder.

In the international literature, there are also large fluctuations in the reported prevalence rates, while according to [38] a 10% -15% is likely to be in the risk zone. A high percentage of 19%, however, was found in Greece in a survey [39], while a very small percentage was found [24], with only 1.6% of children facing DCD Perhaps a possible explanation, is the fact that the results of the assessment with Movement Assessment Battery for Children [37] for equilibrium skills as age grows, show unusually high scores, resulting in many children feeling motorically awkward because of their failure to do so[37].

This contrastsour own findings where, in the field of balance, no significant differences between the two groups of children were observed. An older survey conducted in our country in children aged 7-12 years, where the results showed that as the age of children grows, the more the difficulties in equilibrium skill in MABC [40].

The percentage of typical development children in our research who have DCD is 12%, as well as the percentage of children in the danger zone (12%). While children belonging to the typical development team are in (76%). On the contrary, the percentage of children in the risk zone seems to be in line with the rates from the [38]. From the group of children with dyslexia and DCD who participated in the present study, they exhibited kinetic behavior with severe motor problems (44%), while fewer children (22%) were found within the limits of motor coordination disorder.

The sample of the group of children with dyslexia and SLI was not homogeneous in terms of gender to see if the boys, according to some surveys, are the majority of children with ID[53].

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Further research involving a larger number of children and covering the entire territory of Greece seems to be necessary. If motor problems are identified at an early age, parent educators and other specialists should be prepared for the possibility of gradual occurrence of other developmental disorders [53)]. Therefore, the overall percentage and for the above reasons cannot be compared and agreed with other investigations.

The kinetic profile of the two groups of children, i.e. dyslexia and children with SLI in our fourth research question did not seem to differentiate between each of the three areas assessed (hand skills, ball skills, and dynamic static equilibrium). Thus, our rates show that children with dyslexia who have DCD they are (45%), they are at risk (27%), and without mobility difficulties they are (27%), and children with DCD who have SLI are (44%), at risk (20%), and without mobility difficulties (36%). These rates, of course, are much smaller than other surveys [55], where about 60% of pupils with special learning difficulties who participated in the research showed kinetic behavior with serious motor problems. On the contrary, the percentage (50%), the coexistence frequency of the two disturbances, and other researchers [56].In our research, we did not examine the gender of the children involved because, unlike what they previously believed, kinetic clumsiness was more common in boys than in girls[25]. Current research data do not confirm [21, 30, and 53]. They believe that the previous view emerged from the boys ‹predominance among the experimental group participants because the boys› supremacy in sports activities was more.

From the results of this research, it was realized that there is a large percentage of SLI coexistence among children with dyslexia and children with SLI as assessed by the Movement Assessment Battery for Children [37].Early diagnosis of motor coordination disorders offers more opportunities for recognition, intervention and coping with both the disorder itself and specific learning difficulties. The only guaranteed conclusion at present that we can export is that the difficulties of children with dyslexia and SLI not specifically related to language. Although the information that has so far is minimal and unclear, it is indicative of overlap, should not be treated as separate disorders and should, therefore, be considered as being aware of the risk and knowing that linguistic delay is associated with mobility problems [46].On the basis of the data considered, it is reasonable that while the underlying cause of these disorders is the same, the behavioral expressions of the disorders are different and are due to various factors, such as age, the severity of the disorder and brain development [43, 21].Researchers report that there is no golden rule for the assessment of motor skills and extensions for recognizing the disorder of motor [10].

We, therefore, need far more time to understand the relationship between neurodevelopment language and movement disorders. After reviewing the literature and despite the fact that this review was not exhaustive, it can be seen clearly that there is considerable co-morbidity between dyslexia and the SLI and poor motor skills, as well as those kinetic difficulties in children with dyslexia and SLI, are similar to those seen in other neurodevelopment disorders, such as DCD.

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