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EXPLORING THE AWARENESS LEVEL OF DYSCALCULIA AMONG THE GREEK PRIMARY TEACHERS

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Abstract:
This quantitative study aimed to collect and analyse information from special primary education teachers regarding their knowledge of dyscalculia. One hundred thirty-one specialist primary school teachers were asked to answer a questionnaire with five main factors of study (concept and content, causes, characteristics of primary school pupils, effect on students, and intervention). Five different scores and one total score were created for the five factors, whose mean value and standard deviation show the trend of the degree of knowledge. In all the questions, the participants expressed moderate knowledge of dyscalculia. Particularly, the participants expressed moderate knowledge of the factors of concept and content and characteristics of primary school students and interventions, barely knowledge of the causes, and no knowledge of the effect on students. Summarizing, the participants expressed moderate knowledge of dyscalculia and demonstrated the need to be educated and trained on the specific learning difficulty.

Keywords: dyscalculia; opinions; knowledge; special primary education teachers; Greek teachers

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1. Introduction

Numerical skills are an integral part of our everyday life. However, a large percentage of students and also adults fail to use them. Failure in mathematics can be caused by various factors such as gender, the student's anxiety, their attitude towards mathematics, etc. A separate factor is dyscalculia, a learning difficulty that leads to low performance in mathematics.

2. Literature Review

2.1 Dyscalculia, a Learning Disability

Dyscalculia is the learning difficulty associated with problems understanding mathematical concepts. Students with dyscalculia have problems with all basic number concepts, such as fractions positive and negative numbers. They also face difficulties in the pronunciation of a mathematical problem, and they usually have difficulty with monetary transactions in their daily life (Johnson & Myklebust, 1967). The American Psychiatric Association (2013) defines Developmental Dyscalculia as a specific learning disorder characterized by impairments in learning basic number facts, processing numerical magnitude, and performing accurate and fluid calculations.

By studying people with dyscalculia, researchers have come up with a set of characteristics that a student can display. In 1967, Johnson & Myklebust were able to distinguish the characteristics either in the set of general abilities and deficiencies or in the set of skills that the student with dyscalculia has. Regarding the set of general abilities and deficits, they observed that a student shows a lack of visual-spatial perception and organization and faces difficulty in coordinating visually and metrically. In addition, a student lacks social empathy and is often observed to have a disturbed body image. In the positive characteristics they found that a student shows both a good listening ability and also shows early speech (Agaliotis, 2004). He has a high reading level and finally shows a higher performance in the verbal part of a test than in the non-verbal part (Price & Ansari, 2013).

The diagnosis of dyscalculia is one of the factors that should receive attention. Due to the fact that it affects students with many different characteristics, it makes the whole process quite complex and difficult. In addition, the diagnosis that will be made should be as clearly detailed as possible since all the teaching interventions that will be used for each student should be suitable for their individual profile.

2.2 The Teacher's Role

The teacher is the one who plays a very basic role towards the teaching of students with dyscalculia. Initially, he is the one who will first detect the problem by observing a set of behaviors of the student, dyscalculia, He is the responsible person for guiding not only the family but also the student in order to show him or her the actions they must take in a next stage (Price & Ansari, 2013). He is the one who chooses and shapes the various

support programs for the student, while finally, he is the one who supports the student both pedagogically and psychologically (Glynis, 2013).

The teacher should realize that his basic obligation is to organize his teaching methods in such a way that he will help the students with dyscalculia to understand and master mathematical knowledge. If the teacher accepts this and keeps the necessary distance from the role of the person who just gives simple orders, then he will be able to acquire the role of the researcher of the specific teaching object and also of the student (Soulis, 2009). Having virtues such as a good attitude and personal motivation in combination with basic studies and training the teacher will be able to approach the student and also to play the difficult role that corresponds to him in the educational process (Glynis, 2013).

As Bouck Kulkarni (2009) found, the lack and limited research in the field of special learning difficulties in mathematics is considered a significant deficiency in the field of education, since mathematics and mathematical way of thinking accompany the student from his first school steps. The purpose of this work is to collect and analyze information from special education teachers regarding the views and perceptions they have towards dyscalculia, the learning difficulty faced by students in mathematics.

3. Material and Methods

3.1 Design

For the implementation of the present research, primary quantitative analysis was used. The specific method was chosen because of its orientation towards the description and explanation of the problem. Furthermore, the use of the appropriate tools can make it easy to collect data and analyze them. Quantitative research also allows the use of a large number of samples thus increasing objectivity and impartiality in the research. Finally, due to the correlation that exists in the research questions, the use of quantitative correlational research and its tools was deemed necessary (Creswell, 2021).

The purpose of the research was to investigate the views of primary school special education teachers on dyscalculia. The set of individual objectives that will help to achieve the purpose of the work are:

- Recording the level of knowledge of primary special education teachers for students with dyscalculia.

Due to the purpose of this specific work and through the relevant literature, the following research questions were created:

RQ1: What are the views of primary school teachers regarding the five factors of dyscalculia?

RQ2: Is the level of knowledge related to the factors of dyscalculia?

3.2 Materials

In the research, the questionnaire as a means of data collection was considered more appropriate. The questionnaire has advantages, such as the convenience it gives to the researcher for its construction and use. What is more, the answers cannot be influenced

by the presence of the researcher, while finally it reduces the time and cost of data collection. The fact that the information is difficult to check for its reliability can be considered as a disadvantage of the specific instrument. The participants are asked to answer in a certain way, which could be another disadvantage (Creswell, 2021; Paraskevopoulos, 1993).

The questionnaire used is a combination of the one that Rajendra Kunwar and Lekhnath Sharma used in their research with an identical topic. After obtaining permission to use it, it was translated and an additional five questions were added to help answer the research questions.

It includes 24 questions targeting five factors: the concept and content of dyscalculia, causes of dyscalculia, characteristics of students with dyscalculia, effects of dyscalculia, and strategies for intervention of dyscalculia. A Likert scale was used for the answers because the answers had to be characterized by their equivalence and ranking (Creswell, 2021), and specifically, the options were:

- 1 (I do not know),
- 2 (I barely know),
- 3 (I know moderately),
- 4 (I know well), and
- 5 (I know very well).

In greater detail, questions 1, 9, 21, 16 aim at the concept and content of dyscalculia, 6, 8, 12, 13 at the causes of dyscalculia, questions 2, 3, 5, 7, 14, 15, 22 at the characteristics of students with dyscalculia, 4, 23 at the effect that dyscalculia has on students and finally, 10, 11, 17, 18, 19, 20 at intervention strategies (Table 1).

Table 1: Distribution of Questions to Factors

Factors	**Question**	**Number of Questions**
Concept and content of Dyscalculia	1, 9, 21, 16	4
Causes of Dyscalculia	6, 8, 12, 13	4
Characteristics of Students with Dyscalculia	2, 3, 5, 7, 14, 15,22	7
Effect of Dyscalculia	4, 23	2
Strategic Interventions	10, 11, 17, 18, 19, 20	6
Total		23

Regarding reliability, it should first be noted that the questionnaire was administered to a pilot group of 15 teachers. After pilot testing, some items were omitted, and other items were selected and rewritten for a final version. Regarding the reliability of the instrument's values, Cronbach's alpha coefficient was used to check the internal consistency. The control was done separately for the five factors of the questionnaire and in total. For the first scale related to the concept, the index was found $\alpha = 0.690$, for the causes $\alpha = 0.722$, for the characteristics $\alpha = 0.607$ for the effect $\alpha = 0.657$ while finally, for the interventions $\alpha = 0.866$. Regarding the content scale, $\alpha = 0.835$ was found. Therefore, the specific tool is characterized by good reliability (Table 2).

Table 2: Reliability Check

Factors	Cronbach Alpha	Number of Questions
Concept and content of Dyscalculia	0.690	4
Causes of Dyscalculia	0.722	4
Characteristics of Students with Dyscalculia	0.607	7
Effect of Dyscalculia	0.657	2
Strategic Interventions	0.866	6
Total		23

3.3 Participants and Procedure

The target population of the present research effort is the special education teachers of primary education who work in schools. The research sample consisted of 131 primary education teachers. Non-probability sampling was used to carry out the research, and in particular, convenience sampling.

It is worth noting that in this survey, at the beginning, there is information about the survey, in which it is expressly stated that the questionnaire is anonymous. The answers will be used exclusively for the purpose of the survey, and no personal data will be given to third parties. There was still no presence of the researcher when completing the questionnaires, thus ensuring anonymity (Creswell, 2021).

The research lasted from late December 2024 to early January 2025 after permission from the University of Ioannina. The questionnaire was distributed in a variety of ways. Initially, it was given to groups such as Special Education Colleagues, Association of Special Education Staff of Special Education Attica, Substitute teachers, Educators of parallel support, etc.. In addition, through the lists of the Ministry of Education, they were sent by mail to the school units of special schools and to the principals of the general elementary schools. Finally, they were sent through the KEDASY (Centers for Diagnosis, Evaluation, Counseling and Support for People with Special Educational Needs) to corresponding agencies in Greece.

3.4 Data Analysis

The statistical analysis of the data consists of two main axes. In the first axis, a descriptive analysis of the data is made, while in the second, a correlation is made to answer the research questions.

In the first axis, the appropriate tools of descriptive statistics were used in order to achieve the objectives of the research, that is, to record the opinions of primary education teachers regarding dyscalculia. To examine the research questions, the answers to the questions were used, but beyond the questions, five different scores were created for the five different factors of the questionnaire a total of which, the higher the score, the greater the knowledge adequacy.

The analysis of scores was done with the mean value and standard deviation. Absolute and relative frequencies show how participants answered the respective questions. The mean value and the standard deviation show us the tendency of the degree of knowledge adequacy of the sample, which may differ from that answered by

the majority, assigning 1 (I do not know), 2 (I barely know), 3 (I know moderately), 4 (I know well), and 5 (I know very well).

To correlate the scores, Pearson's coefficient was used, setting as:

- Null hypothesis, H_0: There is no association
- Alternative hypothesis, H_1: There is an association.

Finally, where there was a difference, a further check was done with a pairwise comparison.

The statistical package IBM SPSS Statistics 22 was used for the analysis of the data, a program quite widespread in statistical analysis in the social sciences.

4. Results

4.1 Descriptive Data of Dyscalculia Factors

The score of the concept and content factor found a maximum value of 5 and a minimum value of 1.50, with an average M = 3.08 and a standard deviation SD = 0.68, which indicates that the participants in all the questions had moderate knowledge of the concept and content of dyscalculia The cause factor score was found to have a maximum value of 3.50 and a minimum value of 1, with a mean of M = 2.02 and a standard deviation of SD= 0.64, which indicates that the participants expressed little knowledge about the causes of dyscalculia in all the questions.

For the score of the characteristics factor, a maximum value of 4.43 and a minimum value of 1.86 were found, with an average of M = 3.13 and a standard deviation of SD = 0.54, which indicates that the participants express moderate knowledge about the characteristics displayed by a student with dyscalculia in all the questions. For the score of the impact factor, a maximum value of 5 and a minimum value of 2.50 were found, with an average M = 3.88 and a standard deviation SD = 0.74, which indicates that the participants express healthy knowledge of the impact of dyscalculia on students in all the questions.

For the score of the intervention factor, a maximum value of 4.83 and a minimum value of 1.50 were found, with an average of M = 3.31 with a standard deviation of SD= 0.80, which indicates that the participants express moderate knowledge about the interventions that should be made to students with dyscalculia in all the questions (Table 3).

Table 3: Scores of Dyscalculia Factors

Factors	M	SD	Max	Min
Score of the concept and content	3.08	0.68	5	1.50
Score of the cause	2.02	0.64	3.5	1
Score of the characteristics	3.13	0.54	4.43	1.86
Score of the impact	3.88	0.74	5	2.50
Score of the intervention	3.31	0.80	4.83	1.50

3.2 Score Correlation

The second part of the research was to investigate whether there is a correlation between the scores of the dyscalculia factors. To investigate the relationship, the Pearson parametric test was performed (Table 4).

Initially, between the concept and content and the causes, the correlation coefficient (r = 0.297**) is low positive and statistically significant at the 0.01 significance level. Correlation with characteristics showed that the correlation coefficient (r = 0.420**) is low, positive and statistically significant. Still, the correlation coefficient (r = 0.382**) with the effect is low positive and statistically significant at the 0.01 significance level. Finally, with the interventions, the correlation coefficient (r = 0.698**) is highly positive and statistically significant at a significance level of 0.05.

Between causes and characteristics, the correlation coefficient (r = 0.248**) is low positive and statistically significant at 0.01 level of significance, with the effect the correlation coefficient (r = -0.231**) is low negative and statistically significant at significance level 0.01. Finally, with the interventions, the correlation coefficient (r = 0.238**) is low positive and statistically significant at a significance level of 0.05.

Between characteristics and impact, the correlation coefficient (r = 0.412**) is low positive and statistically significant at the 0.01 significance level, while with interventions, the correlation coefficient (r = 0.184**) is low positive and statistically significant at the significance level 0.05. Finally, between the effect and the interventions, the correlation coefficient (r = 0.321**) is low positive and statistically significant at the 0.01 significance level.

Table 4: Scores Correlation

	Concept and Content	**Cause**	**Characteristics**	**Impact**	**Intervention**
Concept and Content	1	,297**	,420**	,382**	,698**
		,001	,000	,000	,000
N	131	131	131	131	131
Cause		1	,248**	-,231**	,238**
			,004	,008	,006
N		131	131	131	131
Characteristic			1	,412**	,184*
				,000	,035
N			131	131	131
Impact				1	,321**
					,000
N				131	131
Intervention					1
N					131
**. Level of significance 0.01 level (2-tailed).					
*. Level of significance 0.05 level (2-tailed).					

5. Discussion

The purpose of the research was to investigate the views of primary school special education teachers on dyscalculia. In particular, an approach was taken to record the level of knowledge of primary education teachers in relation to factors of dyscalculia, the meaning and content, the causes, the characteristics of the students, the effect on the students and the intervention that is made. It was also investigated whether knowledge is correlated between the five factors.

Quantitative research was used on a sample of 131 teachers through convenient sampling to achieve the purpose and objectives of the research. Data was collected by completing an electronic questionnaire that was distributed to participants through various means. For the analysis, five different scores were created for the factors and one total, the higher the score, the greater the level of knowledge.

Regarding the factors concept and content, characteristics and interventions of dyscalculia, the analysis showed that the participants in all the questions expressed moderate knowledge of the specific factors. This is likely due to the sufficient general knowledge that teachers have about learning disabilities and the fact that they see the concept of dyscalculia in the light of the concept of learning disability without differentiating it. In addition, for the cause factor the participants express little knowledge on the causes of dyscalculia, and for the effect factor, the participants in all the questions express well knowledge on the effect of dyscalculia on students. So, the analysis showed that the participants express moderate knowledge about dyscalculia, but this does not mean that they are correctly informed about the subject of dyscalculia. This is likely because, during the training of teachers in learning disabilities, dyscalculia is not particularly emphasized in relation to other learning disabilities such as dyslexia, ADHD or autism. This results in teachers receiving knowledge about dyscalculia but without delving into the learning difficulty. The specific findings coincide with the research of Meltem Karasakal (2018), who found a lack of information and awareness in a sample of 113 teachers, as well as Rajendra Kunwar and Lekhnath Sharma (2020) who found that they have moderate proficiency in numeracy in a sample of 150 special education teachers.

More generally, for secondary education teachers, it is worth mentioning that in his research, Kavalaris (2017) also showed in a sample of 122 mathematicians, that the majority of the teachers have moderate contact with dyscalculia, which is characterized as superficial.

Furthermore, in a more general bibliographic report on learning difficulties, the research of Tsiala (2020) gave similar results, with most of the interviewed teachers in a sample of 70 people answering that they have moderate knowledge about dyslexia. Similarly, the research of Tzouriadou (2015) showed in a sample of 387 teachers that they have quite contradictory knowledge of dyslexia. Also, Pollali's (2018) research revealed moderate knowledge of dyslexia in a sample of 75 English language teachers.

On the other hand, the specific findings contradict the research of Michelle de Almeida Horsae Dias, Monica Medeiros de Britto Pereira, and John Van Borsel (2013),

who showed that in a survey of 63 teachers, the participants had little specific knowledge about dyscalculia.

Finally, a relatively statistically significant correlation was found between the scores of the five factors. In the majority of them the scores are related in a low positive way, i.e. greater knowledge in one factor leads to an increasing trend of knowledge in another, possibly due to the connection of these factors. It is worth noticing that between the factors' causes and effects, there is a correlation in a negative low way, i.e. greater knowledge of the causes leads to a lower knowledge of the effect, possibly due to a decrease in the feeling of empathy since the difficulty faced by the student is rationalized through the causes.

6. Conclusion

In conclusion, many of the findings are in agreement with other research both on dyscalculia and on learning difficulties in general. They are strengthened by both the Greek and foreign language literature, giving more validity to the research and its results. This study highlights that the participants express moderate knowledge of dyscalculia and demonstrate the need to be educated and trained on the specific learning difficulty.

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