

The Impact of Cognitive Impairment in Children with Intellectual Disabilities

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Abstract

The focus of the present study is to identify the most compromised aspects of cognitive impairment and how children with intellectual disabilities cope with them. A sample of 53 school aged children with intellectual disabilities (N = 24) female and (N = 29) male from 5 to 11 years old. Montreal Cognitive Assessment scale (MoCA) and Raven's Standard Progressive Matrices (IQ) to children with intellectual disabilities were used for conducting research. Generally, children with intellectual disabilities experience high and moderate levels of cognitive impairments and a low IQ. There is a significant positive relationship between age and IQ among girls and boys. In addition to cognitive impairment, a positive relation between impaired cognitive function, a high level of global disability in children with intellectual disabilities and a poor executive and memory functions were associated with difficulties in daily life activities. IQ is also a significant index of cognitive impairment and how children interact with others. Cognitive impairment is a major cause of low adoption with the environment and a significant factor that affects rehabilitation outcomes. Yet, there have been a limited number of studies that have evaluated the psychometric MoCA in children with severe intellectual disabilities, but it is necessary to identify possible difficulties in children with ID related to cognitive functions in young patients with mild to moderate impairment.

Keywords: Intellectual disability, children, cognitive impairments, general intelligence.

1. Introduction

Impairment of cognitive functions in children diagnosed with intellectual disabilities is usually assessed through IQ [Sullivan, Diepstra, Heng, Ally & Bradley et al., 2018; Thygesen, Wolfe, McQuillin, Viñas-Jornet & Baena et al., 2018].

A score of IQ 70 or less is a key indicator in the diagnosis of intellectual disability [Dunn, Rydzewska, Fleming & Cooper, 2020]. However, in this process, other aspects of neurodevelopment are also evaluated such as the assessments of cognitive and executive functions [Thygesen, Wolfe, McQuillin, Viñas-Jornet & Baena et al., 2018; Orsini, Carolina, Ferreira, de Assis & Magalhães al., 2018]. Cognitive functions are among the most compromised areas in intellectual disability, however it seems that at mild and partially moderate levels certain areas of cognitive function can be identified. They may represent a function closer to normal where other functions may appear more compromised than predicted based on age, level of development and level of intellectual disability [Kurki, Saarentaus, Pietiläinen, Gormley & Lal et al., 2019; Baines, Emerson, Robertson & Hatton, 2018; Salvador-Carulla, Reed, Vaez-Azizi, Cooper & Martinez-Leal et al., 2011; Vervoort-Schel, Mercera, Wissink, Mink & van der Helm et al., 2018; Demily, Rigard, Peyroux, Chesnoy-Servanin & Morel et al., 2016; Ali, Hall, Blickwedel & Hassiotis, 2015].

Impairments in cognitive functions are usually associated with difficulties in almost all areas of functioning of the child with intellectual disabilities, as in the process of learning in the academic context, in social interaction and practical tasks related to the daily life of the child with intellectual disabilities [Spangenberg, Corten, van Rensburg, Kilian & McKenz, 2016; Kover, 2018; Beighton & Wills, 2019; Emerson, Hatton, Robertson & Baines, 2014]. In terms of the learning objectives of the primary education curriculum, it will be a real challenge for the child, their teachers and their parents [Vervoort-Schel, Mercera, Wissink, Mink & van der Helm et al., 2018; Jahoda Hastings, Hatton, Cooper & Dagnan et al., 2017; Floyd & Olsen, 2017].

As impairments in cognitive functions are quite dominant, children with intellectual disabilities while completing academic tasks will have to make more efforts both in reading, writing and counting numbers [Adeniyi & Omigbodun, 2016]. For the development of these habits it is needed a constant engagement and repeating along with parental monitoring [Beighton & Wills, 2017; Masulani-Mwale, Kauye, Gladstone & Mathanga, 2019]. A general functioning also requires that the child with intellectual disabilities be maximally engaged in order to meet his or her needs for personal autonomy, to be able to direct himself or herself in daily activities and to be able to take care for their personal hygiene and other related needs [Deutsch, Dube & McIlvane, 2008]. In order for these habits to be learned by children with intellectual disabilities, supportive external resources are needed, sufficient for the needs of each child, which guarantee suitable and long-term monitoring of developmental intervention [De Toma, Manubens-Gil, Ossowski & Dierssen, 2016; Brown, Brown, Lewis & Lamb, 2018]. The level

of difficulties that the child with intellectual disabilities will face will vary depending on the levels of impairment of cognitive functions, IQ, and other aspects related to the environment in which the child lives as well as other neurodevelopmental conditions [Bello, Goharpey, Crewther & Crewther, 2008]. An area that seems to be particularly problematic in severe and profound intellectual disabilities and in part in moderate intellectual disabilities is that of the motor learning [Bruns, Ehl & Grosche, 2019]. And finally a series of issues in adaptive behaviors will complicate the lives of these persons causing problems in meeting the demands of everyday life that have to be accomplished by children of the same age, issues in the recognition of acceptable behaviors for the socio-cultural context of the person and in the ability to socialize using tools of communication with other members of the community where they live [Van Remmerden, Hoogland, Mous, Dierckx & Coesmans et al., 2020].

2. Method

Participants selected for this study are students in regular schools starting from preparatory classes to 6th grade of primary education. They were 53 children with intellectual disabilities aged 5-11 years old, where 54.7% of all children are male, while the participation of female children in the study were 45.3%. The integration of children with special needs into normal classes has started to be applied to the beginning of the implementation of the law of inclusion.

The period between October 2016 - December 2019 was the time of administration of assessment tools for this sample of children and also the completion of data from parents.

In support and with the approval of ethics in this research by the entity of the Ethics Commission of the Regional Directorate of Drenas Municipality, data collection began in 53 children. Then, there were administered the testing tools as the epidemiological questionnaire and psychometric tests Vineland Adaptive Behavior Test (The adaptive behavior assessment), Montreal Cognitive Assessment Test (MoCA) and Raven Color Matrix Progressive Test.

For meeting research aims and to answer the hypotheses of this study, in addition to descriptive statistics such as arithmetic means, standard deviation, frequencies and percentages, other inferential statistics such as the Mann-Whitney test, bivariate correlations and partial correlations were also performed.

3. Results

Children who participated in the study were 53, of whom 54.7% were male and 45.3% female. 56.6% of the children lived in rural areas, while 43.4% lived in urban areas. All children attended compulsory education in Kosovo. In the preparatory class were 8

children or 15.1% of all children participating in the study. In the first grade there were 6 children or 11.3% of all children. In the second grade there were 7 children or 13.2% of all children. In the third grade there were 6 children or 11.3%. In the fourth grade there were 9 children or 17%. In the fifth grade there were 8 children or 15.1%. In the sixth grade there were 9 children or 17%. The minimum age of children participating in the current study was 5 years old (5.03 years), while the maximum was about 12 years old (11.85 years). The average age of children was 8.7 years old with $SD = 2.1$. Of the 24 women who participated in the study, half of them (50%) lived in urban areas and the other half (50%) in rural areas.

Of the 29 male who participated in the study, 62.1% of them (or 18) lived in rural areas, while 37.9% (or 11) lived in urban areas. In the present research in the preparatory class there were 2 girls and 5 boys. In the first grade 3 girls and 3 boys. In the second grade 3 girls and 4 boys. In the third grade, 3 girls and 3 boys. In the fourth grade 4 girls and 5 boys. In the fifth grade, 4 girls and 4 boys. In sixth grade, 4 girls and 5 boys. Given that these children are pre-diagnosed with Intellectual Disabilities (ID), it is assumed that their IQ scores are also expected to be generally below the average.

Table 1: General results on the Intelligence Coefficient (IQ)

	Frequency	Percentage	Valid Percentage
Mild MR IQ 55-70	45	84.9	84.9
Moderate MR IQ 40-55	7	13.2	13.2
Severe MR IQ 25-40	1	1.9	1.9
Total	53	100.0	100.0

This study shows that the majority of children (45 children) or 84.9% have mild mental retardation, which corresponds to the range of IQ values from 55 to 70. Another part of children (7 children) or 13.2% show a moderate level of mental retardation, which corresponds to the range of IQ scores from 40 to 55. Only 1 child or the 1.9% of children results from the Raven test with severe mental retardation, which corresponds to the range of IQ scores from 25 to 40. Most of the girls participating in the study (22 girls) or 91.7% of them showed a mild mental retardation and most of the boys (23 boys) or 79.3% of them showed a mild mental retardation. It seems that within the sexes there is a somewhat higher representation of the female gender in the level of mild mental retardation compared to boys. There are 17.2% of boys and only 8.3% of girls who show a moderate mental retardation. It is noticed that there is a somewhat equal gender distribution among children with mild mental retardation. 49% of them are female and 51% are male. The situation looks different in children with moderate mental retardation. This category of children is dominated by boys, who make up 71.4% and the minority are women, 28.6%. The Mann-Whitney non-parametric test also confirms the same finding. There are no statistically significant differences in the level of mental retardation by

gender of children.

The results show that most children in the preparatory class (or 75% of them) have mild mental retardation. All first graders have mild mental retardation. Most second graders (or 85.7%) have mild mental retardation, while most of third graders (or 66.7%) show mild mental retardation. Most fourth graders (or 88.9%) have mild mental retardation and sixth graders show a mild mental retardation level.

From this study it resulted that most of the children tested with MoCa test (24 children) or 61.6% of children show mild impairments of cognitive abilities. Another part of children (13 children) or 24.5% show moderate cognitive impairments. Only 2 children (or 3.8% of children) result in severe cognitive impairment in comorbidity with other disorders. None of the children tested showed cognitive skills at the norm with age development. Once the general picture of adaptive behaviors of these children diagnosed with intellectual disabilities has been clarified, the possible differences of this variable according to the gender, place of residence, class and age of the children will be analyzed. About 66.7% of girls and 57.1% of boys show mild impairments of cognitive skills. 27.8% of girls and 38.1% of boys show moderate impairments of cognitive skills. Only a girl and only a boy resulted with severe cognitive impairment associated with other disorders. It is noted that, there is an equal gender distribution among children with mild cognitive impairments. 50% of them are girls and 50% are boys. The situation looks slightly different in children with moderate cognitive impairments. Most of them (about 61.5%) are boys and the rest (about 38.5%) are girls. Most second graders (85.7%) have mild cognitive impairment. Third graders (66.7%) and fourth graders (66.7%) have mild impairments of cognitive skills. Nearly half of fifth- and sixth-grade students have mild cognitive impairment.

The results showed that children with mild cognitive impairments were distributed in all classes in the study, from the second to the sixth grade. As for children with moderate cognitive impairments, it seems that the percentage of these children increase with the growing number of classrooms. The analysis goes further through the implementation of a non-parametric test to determine whether there is a statistically significant relationship between levels of cognitive impairment and classes. For the analysis, the cognitive skills variable is considered an ordinary variable and the student class is considered a continuous variable.

Since the cognitive skills variable has an abnormal distribution of data, to analyze the relationship between this variable and the other classroom variable, the Spearman coefficient was calculated. It was revealed that there is a statistically significant relationship between student's class and cognitive impairment and the relationship is moderate and positive ($p = 0.05$, $r = 0.308$). This means that higher grade students tend to have more severe cognitive impairments.

Table 2: The relationship between the level of mental retardation, cognitive skills and social maturity after controlling for the effect of gender, place of residence, age and class

Control Variables			IQ Col Progr Matrix Test J C Raven	Cognitive skills for all development areas assessed by MoCA Test	Level of social maturity according to Vineland scale
Gender, Age, Years & Residence & Class of Children	IQ Col Progr Matrix Test J C Raven	Correlation	1.000	.724	.797
		Significance (2-tailed)	.	.000	.000
		df	0	33	33
	Cognitive skills for all development areas assessed by MoCA Test	Correlation	.724	1.000	.788
		Significance (2-tailed)	.000	.	.000
		df	33	0	33
	Level of social maturity according to Vineland scale	Correlation	.797	.788	1.000
		Significance (2-tailed)	.000	.000	.
		df	33	33	0

If we separately analyze only the cases of children with moderate cognitive impairments, it turns out that with the increase of classes the number of students with moderate cognitive impairments increases. So, there are more higher-grade students with moderate cognitive impairments than lower graders students. Specifically, with moderate impairments of cognitive skills, there is only one second grade student, 2 third grade students, three fourth grade students and three fifth grade students, as well as 4 sixth grade students. Also, severe cognitive impairments associated with other disorders show two children of the highest grades, one of the fifth grade and one of the sixth grade. As for children with mild cognitive impairments, they are distributed almost equitably in all classes in the study. There are 6 children with mild cognitive impairments in the second and fourth grade and there are 4 children with these impairments in the third and fifth grade. It is noted that there is a tendency to have a higher percentage of children in rural areas to exhibit both mild and moderate cognitive impairments. 62.5% of children with mild cognitive impairments live in rural areas, compared to 37.5% living in urban areas. 61.5% of children with moderate cognitive impairment live in rural areas, compared to 38.5% who live in urban areas. Both children that in the current study showed severe cognitive impairment associated with other disorders, live in rural areas.

After controlling the effects of gender, place of residence, age and class, it was revealed that there is a statistically significant relationship between the level of mental retardation and the level of cognitive impairment ($p = 0.000 < 0.05$, $r = 0.724$). The

relationship between the level of mental retardation and the level of cognitive impairment is positive and strong. This means that the more severe the level of mental retardation the more impaired the child's cognitive abilities are and vice versa. After controlling the effects of gender, place of residence, age and class, it was revealed that there is a statistically significant relationship between the level of mental retardation and the level of delay in social maturity ($p = 0.000 < 0.05$, $r = 0.797$).

The relationship between the level of mental retardation and the level of delay in social maturity is positive and strong. This means that the more severe the level of mental retardation the higher the delay in the social maturity of the child and vice versa. After controlling the effects of gender, place of residence, age and class, it was revealed that there is a statistically significant relationship between the level of cognitive impairment and the level of delay in adaptive behaviors ($p = 0.00 < 0.05$, $r = 0.788$). The relationship between the level of cognitive impairment and the level of retardation in social maturity is positive and strong. This means that the more impaired the cognitive skills the higher the delay in social maturity and vice versa.

4. Discussion

Presenting a level of intellectual disability at a moderate and mild level, most children have difficulty with cognitive functions and adaptive behaviors. In terms of impairments in cognitive functions the situation is serious, while in terms of adaptive behaviors, these results in levels close to normal rate for their age and level of development. Studies have shown that children with intellectual disabilities often face difficulties in managing behavior, emotions, and in establishing and maintaining interpersonal relationships [Wilson & Scior, 2015; Long, Lobato, Kao, Plante & Grullón et al., 2013]. They also present difficulties in maintaining motivation in the learning process and in focusing attention on schoolwork [Lee, Leung, Chen, Louie, Brown & Chen et al., 2017]. The study revealed a connection between IQ, impairments in cognitive functions, and adaptive behaviors. Children with significant levels of cognitive impairment and reduction of adaptive behaviors are characterized by difficulties in general cognitive functioning such as learning, developing new knowledge, reasoning and symbolic representation of the expected level related to the chronological age and development.

The study also identified an increasing difficulty for the group of children with moderate intellectual disabilities and an increased difficulty in terms of verbal comprehension, perceptual reasoning, working memory and speed of information processing compared to children at the mild level of intellectual disability. These findings are confirmed by other studies that consider these cognitive impairments to be typical in children diagnosed with this disorder [Lauterborn, Schultz, Le, Amani & Friedman et al., 2019; Greig, McGrath & McFarlane, 2019]. Children with intellectual disabilities show significant limitations in adaptive behaviors compared to other peers of the same age in

meeting the demands of everyday life in terms of social and practical areas [Kim & Ko, 2016; Sterkenburg & Wouda, 2018].

These difficulties seem to have a kind of resilience throughout the stages of individual development that make it difficult to improve the situation and overcome this limitation definitively [Hanzen, van Nispen, Vlaskamp, Korevaar & Waninge et al., 2020]. Early interventions, however, significantly improve functioning both socially and practically [Syed, Neelofur, Moran & O'Reilly, 2020; Brown, Brown & Dibasio, 2013]. Our study shows that the majority of children (about 85%) have mild mental retardation, 61.5% have mild cognitive impairment and 77.4% are at the normal rate of social maturity. Of all children with mild mental retardation, the majority (about 91%) are at the normal rate of age-adaptive behaviors and also the majority (about 73%) are with mild cognitive impairments. Most children diagnosed with intellectual disability who participated in this study (about 85%) have mild mental retardation. This level of mental retardation gives these children more chances to overcome their difficulties and to be as successful as possible in school activities [Raspa, Moultrie, Wagner, Edwards & Andrews et al., 2020; Gerstein & Crnic, 2018; di Lieto, Castro, Pecini, Inguaggiato & Cecchi et al., 2020].

It was confirmed that there are no statistically significant differences in the level of mental retardation of children related to gender, class, age or place of residence. Most children participating in the study (diagnosed with intellectual disabilities), about 62% have mild impairments of cognitive abilities. It was noted that at the level of cognitive impairments, there are no statistically significant differences related to gender, age and place of residence. It results in a moderate and positive relationship between the level of impairments of children's cognitive abilities and classrooms. The higher the grades, the more impaired the children's cognitive abilities are.

From this study it was found that there is a moderate and positive relationship between the level of mental retardation and the level of cognitive abilities. There is a strong and positive relationship between cognitive impairment and the level of delay in adaptive behaviors. Even after controlling the effects of different demographic variables such as gender, place of residence, age and class, it was revealed that the relationship between the three main variables of the study (level of mental retardation, cognitive impairment and delay in adaptive behaviors) is strong and positive.

5. Conclusion

The current study concluded that cognitive impairments in diagnosed children with intellectual disabilities will characterize the early onset of difficulties in adaptive behavior. Our conclusions are particularly important given that cognitive impairments are affected by a child's level of intellectual disability. We must also consider that the difficulties that the child with ID will face will not depend on age, gender or place of residence, but rather on the degree of mental retardation expressed with IQ below 40 and the level of cognitive

impairments and adaptive behaviors which are part of his repertoire of behaviors. These results suggest that an early intervention would be the best option to guarantee a normal progress in the process of learning the necessary skills that allow the child to function independently and autonomously.

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