

ADDITIONAL TREATMENTS IN DAYCARE CENTER FOR CHILDREN WITH DOWN SYNDROME IN NORTH MACEDONIA

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Abstract

It is well established that additional treatments of children and youngsters with Down syndrome improves their motoric skills, however they are often neglected from these treatments in Republic of North Macedonia, and the only support that they receive are in the main institutions. A comparative study of gross motoric skills, fine motoric skills and general praxis was carried out on a sample (N = 16) children with Down Syndrome, both sexes, school age (4-14 years old) from special school in Tetovo, eight of them who visit also a daycare center. The main criterion variable are the motor skills of the children evaluated with a screening motoric test, whilst the predictor variables are visiting the daycare center, gender and age. Analysis of the Mann Whitney test for independent samples have shown a difference in favor of subjects that do not visit the daycare center only for the general praxis, especially for melocintetic skills, which indicates that the occupational treatment that they receive from the daycare do not make any difference in their alternative and mimic skills, however there is no statistical difference in gross motoric and fine motoric skills. The second variable, age have shown a difference in some segment of gross motor skills, motor coordination at rest in favor of younger group, aged 4-10, which can be as a consequence of early intervention. The gender performed a significant difference in the field of gross motor skills in favor of females, especially for tasks regarding stability where females outperformed males. Even though results showed that an additional treatment for these children with Down syndrome didn't made a difference in their motoric skills performance, the significant difference in motoric skill performance among younger and elder group in favor of younger, clarifies the need of additional treatments as early as possible, with a specific attention to developing motoric skills in males.

Keywords: daycare centers, gross motor skills, Down syndrome.

Introduction

Down syndrome (DS), with a 1.3 incidence per 1000 live births in North America, is a common cause of developmental disability (Harris & Shea, 1991). The appearance of three instead of two chromosomes is known as trisomy. Extra chromosome 21 leads to such symptoms as: metabolic disorders, tissue dimorphism, internal organs disorders, characteristic phenotype in physical appearance, muscle hypotony and mental retardation (Pangalos, et al., 1994). Chromosomal abnormalities affect many areas of physical, mental, and physiological development in children with Down Syndrome. The moment the baby is born, the doctor ascertains the trisomy without any hesitation. Some physical features are obvious. However, like any normal child, children with Down Syndrome have their own physical characteristics: the skull is small and round, the occiput (back of the head) is slightly bunched, the upper part of the face is drawn in relation to the lower part. In profile, the chin protrudes forward, the ears are small and set below normal, the nose is often short, pressed and its holes are wide, the eyes are drawn with a thin layer of leather on the inner corners., eyelashes are sparse and short, the mouth is relatively small, the palate is often oval, the lips are thick and the tongue is normal in size but lacks muscular elasticity, tooth formation is very special, there is a delay in their coming, coming out of six for a year, the exit queue is messy. Many babies and young children with Down syndrome are late to reach the early motor milestones such as grasping, rolling, sitting, standing and walking. There is wide

variability in progress, with some reaching these milestones as early as typically developing infants and some being particularly slow in achieving them (Sacks & Buckley, 2003) Delay in motor development among children with Down syndrome (DS) lead to slow rate acquisition of fundamental movement skills among them compare to typically developing peers (Gallahue, Ozmun, & Goodway, 2006), and there is theory that the determination of motor coordination with the kinematics analysis shall improvise the lower limb muscular strength proficiency and therefore the poor postural control and uncoordinated movement among children with down syndrome (Zakaria, Hassan, & Md Radzi, 2020).

In order to provide detailed information for intervention, adequate assessment methods seem to be necessary to address the child's unique motor profile. (Schott, Holfelder, & Mousoli, 2014). Different researchers have used different tools and techniques of assessment, for example Schott and colleagues (2014) examined the relationship between standardized performance-based, and teacher-report measures of children's motor performance, and came to conclusion that boys with down syndrome performed better on the run, gallop, leap and catch. The study of Malak and colleagues (Malak, Kotwicka, Krawczyk-Wasielewska, Mojs, & Samborski, 2013) on the other hand assessed the global motor functions and body balance of children with down syndrome in relation to age and mental development, by using Gross Motor Function Measure, and their results show that motor development is associated with cognitive development of the children. Other studies have include assessing not only gross motor skills, but also fine motor skills, since they are very important for children's overall functioning like everyday activities such as dressing, feeding, holding objects etc. (Memisevic & Macak, 2014).

The literature review intrigued us to assess motor skills in children with Down syndrome in correlation to whether they visit or not daycare centers, age and gender, since in Republic of North Macedonia there is little research done in the topic. The objective of our research was to analyze whether there is a difference in performance of motor skills in children with down syndrome based on three main variables, attending additionally or not daycare centers, age and gender, from which we derived three research question:

1. Do children with down syndrome, based on whether they attend daycare center or not, differ in their motoric skills?
2. Do children with down syndrome, being in a different age differ in their motoric skills?
3. Do children with down syndrome, being in a different gender differ in their motoric skills?

Materials and methods

Based on our research objective and research questions, we carefully framed the methodology since it required a convenient sample, we chose only children with down syndrome. For that reason, we chose N=16 children with down syndrome, aged 8- 15, grouped in two groups, younger group 8-11 and elder group 12-15, all pupils of residential school for children with special needs in Tetovo, however 8 of them visiting additionally daycare centers, and 8 just the residential school. They were all assessed by using a translated and adapted form of check list assessment of motoric development which included assessing eleven areas of motor skills: including Gross motor skills like Stability of body position and balance, Motor coordination and Motor control at rest, Fine motor skills like manipulation by hand, Differentiation of finger motility and Graphomotorics, and praxis motor skills like Melokinetic praxis, Ideomotor praxis and Constructive praxis (Cordic & Svetomir, 2011). Each of the area were separately tested in a carefully way, to not cause exhaustion to the participants, and taking in consideration their wellbeing, for which we provided them pauses during the testing procedure.

Results

Our data was calculated by using different statistical analysis, starting with descriptive statistic for demographic variables, continuing with inferential statistic, respectively use of Mann-Whitney procedure with two independent samples for non-parametric test, since the distribution of score is not in a border of normal distribution curve. With this procedure, we calculated the differences of arithmetic means of one predictor variable and each criterion variables and Chi square was calculated to estimate the relation between each task at a level of significance $p < 0.01$ and $p < 0.05$. The table 1-1 displays descriptive statics based on the main variable attending day care centres, where 50% of younger group (4-10) attends additional treatments and 50 % didn't, as well as 50 % of elder group (10-14) that did with 50 % that didn't, and 75% of males attended additional treatments compared to only 25 % that didn't, and only 25 % of females attended these additional treatments whilst 75 % didn't.

Table 1-1: Descriptive statistic for main predictive variable attending daycare centers

Daycare	age		gender		total
	4-10	11-14	male	female	
yes	4	4	6	2	16
no	4	4	2	6	16
total	8	8	8	8	

Since we had nonparametric distribution of the score, we used nonparametric tests to calculate the difference of means between two groups of main criterion variable, attending day care centers or not and each field of motoric development skills test, gross motor skill, fine motor skills and praxis motor skills. In order to confirm these assumptions for the current study, we will present a Mann-Whitney analysis to see if there is a difference between attending additional treatments in day care centers and gross motoric skills performance which is presented in table number 1-2.

Table 1-2: Differences in performance among attending additionally daycare centers and subjects gross motor skills performance

	Daycare	N	Mean Rank	Z scores	Mann Whitney	Sig.
Stability	yes	8	8,75	-,217	30,000	0,828
	no	8	8,25			
Motor coordination	yes	8	6,50	-1,768	16,000	0,077
	no	8	10,50			
Motor control at rest	yes	8	7,00	-1,282	20,000	0,234
	no	8	10,00			
Gross motor skills	yes	8	6,88	-1,382	19,000	0,195
	no	8	10,13			

[*Note: Correlation is significant at $p < .01$ (**), * Correlation is significant at $p < .05$ (*)]

As can be seen in table 1-2, there is no statistical difference between each area of gross motoric skills and attending or not daycare centers, for what we can speculate that the treatments that they receive there either are not appropriate, or the subjects started the treatment at not so early age, since many surveys have shown that any additional treatments like occupational therapy.

Table 1-3 Differences in performance among attending additionally daycare centers and subjects fine motor skills performance

	daycare	N	Mean Rank	Z scores	Mann Whitney	Sig.
Manipulation by hand	yes	8	6,75	-1.473	18,000	0,140
	no	8	10,25			
Differentiation of finger motility	yes	8	7,25	-1.070	22,000	0,285
	no	8	9,75			
Graphomotorics	yes	8	7,31	-1.021	22,000	0,307
	no	8	9,69			
Fine motor skills	yes	8	6,75	-1.483	18,000	0,138
	no	8	10,25			

[*Note: Correlation is significant at $p < .01$ (**), * Correlation is significant at $p < .05$ (*)]

The second table 1-3 again has performed with no statistical significance in performance of fine motor skills among subjects that attend and not attend day care center since Mann Whitney for Global fine motor skills is 18,000 and $p=0,138$, respectively is higher $p>0,05$, for what we can speculate that developing fine motoric skills is crucial when learning to write and read, for which the educational settings like schools pay very much attention to it, and we also can speculate like in the previous table that subjects were not included at the early age at these centers.

Table 1-4 Differences in performance among attending additionally daycare centers and subjects' praxis motor skills performance

	daycare	N	Mean Rank	Z scores	Mann Whitney	Sig.
Melocinetic praxis	yes	8	5,44	-2,626	7,5000	0,009**
	no	8	11,56			
Idemotor praxis	yes	8	6,25	-,816	25,000	0,415
	no	8	10,75			
Construcitve praxis	yes	8	5,44	-1,929	14,000	0,54
	no	8	11,56			
Global praxis	yes	8	5,81	-2,268	10,500	0,023*
	no	8	11,19			

[*Note: Correlation is significant at $p < .01$ (**), * Correlation is significant at $p < .05$ (*)]

As can be seen on table number 1-4, there is a strong statistical difference among subjects that attend daycare centers and those who don't, respectively with Mann Whitney score 10.500 and significance of difference $p=0,023$ for global praxis, based on mean ranks subjects that do not attend day care center have performed better, especially in the area of melocinetic praxis, with a Mann Whitney score of 7,500 and significance of difference $p=0,009$, which is lower than $p<0,01$. Even though developing praxis skills need additional therapy for children with Down syndrome, in our survey this wasn't the case, those that attend only school environment have performed better.

Table 1-5 Differences in performance among age and subjects gross motor skills performance

	Age	N	Mean Rank	Z scores	Mann Whitney	Sig.
Stability	4-10	8	10,94	-2,114	12,5000	0,34
	11-14	8	6,06			
Motor coordination	4-10	8	7,00	-1,325	20,000	0,185
	11-14	8	10,00			
Motor control at rest	4-10	8	10,81	-1,977	13,500	0,048*
	11-14	8	6,19			
Gross motor skills	4-10	8	10,14	-1,382	19,000	0,167
	11-14	8	6,88			

[*Note: Correlation is significant at $p < .01$ (**), * Correlation is significant at $p < .05$ (*)]

Compared to the variable attending or not daycare center, based on table 1-5 age as predictive variable have shown statistical difference among younger and elder group for gross motoric skill, especially for motor coordination at rest with a Mann Whitney score of 13, 500 and significance $p=0,048$ with is lower $p<0,05$, and based on the mean rank the younger group have outperformed the elder group, which may indicate that early inclusion in additional treatments may improve gross motor skills in children with Down syndrome.

Table 1-6 Differences in performance among age and subjects fine motor skills performance

	Age	N	Mean Rank	Z scores	Mann Whitney	Sig.
Manipulation by hand	4-10	8	10,63	-1,801	15,000	0,72
	11-14	8	6,28			
Differentiation of finger motility	4-10	8	7,94	-,428	27,500	0,630
	11-14	8	9,06			
Graphomotorics	4-10	8	10,88	-2,042	13,000	0,41
	11-14	8	6,13			
Fine motor skills	4-10	8	10,19	-1,424	18,500	0,154
	11-14	8	6,81			

[*Note: Correlation is significant at $p < .01$ (**), * Correlation is significant at $p < .05$ (*)]

The second table of variable age, table 1-6 didn't performed any statistical difference among younger and elder group since Mann Whitney score of 18,500 performed with significance of $p=0,154$, which indicates the fact that fine motoric skills may not improve with age, regardless if they attend or not daycare center, however these scores can be as a result of late inclusion of subjects in daycare centers.

Table 1-7 Differences in performance among age and subjects' praxis motor skills performance

	Age	N	Mean Rank	Z scores	Mann Whitney	Sig.
Melocinetic praxis	4-10	8	9,75	-1,072	22,000	0,284
	11-14	8	7,25			
Ideomotor praxis	4-10	8	9,75	-1,166	22,000	0,244
	11-14	8	7,25			
Constructive praxis	4-10	8	9,50	-,857	24,000	0,391
	11-14	8	7,50			
Global praxis	4-10	8	9,69	-1,002	22,500	0,314
	11-14	8	7,31			

[*Note: Correlation is significant at $p < .01$ (**), * Correlation is significant at $p < .05$ (*)]

The third area of motoric skills, praxis, based on table 1-7 it is obvious that with a Mann Whitney score of 22,500 and $p=0,314$, there is no statistical difference between younger and elder group while performing melocinetic, ideomotor and constructive praxis, which may indicate that these skills may not improve with age if they are treated properly, in our study the centers may not offer the proper treatments for developing praxis motor skills.

Table 1-8 Differences in performance among gender and subjects' gross motor skills performance

	Gender	N	Mean Rank	Z scores	Mann Whitney	Sig.
Stability	Male	8	6,06	-2,114	12,000	0,034*
	Female	8	10,94			
Motor coordination	Male	8	6,38	-1,877	15,000	0,060
	Female	8	10,63			
Motor control at rest	Male	8	6,75	-1,496	18,000	0,135
	Female	8	10,25			
Gross motor skills	Male	8	5,69	-2.391	9,500	0,017*
	Female	8	11,31			

[*Note: Correlation is significant at $p < .01$ (**), * Correlation is significant at $p < .05$ (*)]

Table 1-8 offers different scores compared to previous variable, respectively there is a significant statistical difference among males and females on global gross motoric skills in favor of females, since Mann Whitney score is 9,500 with $p=0,017$ which means $p > 0,05$. In addition, the statistical difference is also noticed in the tasks of stability again in favor of females, with Mann Whitney score 12,000 and $p=0,034$, which indicates that females have predisposition to improve their gross motoric skills more than males.

Table 1-9 Differences in performance among gender and subjects' fine motor skills performance

	Gender	N	Mean Rank	Z scores	Mann Whitney	Sig.
Manipulation by hand	Male	8	7,31	-1,007	22,500	0,314
	Female	8	9,69			
Differentiation of finger motility	Male	8	9,06	-,482	27.500	0,630
	Female	8	7,94			
Graphomotorics	Male	8	7,69	-,699	25,500	0,485
	Female	8	9,31			
Fine motor skills	Male	8	7,81	-,580	26,500	0,562
	Female	8	9,19			

[*Note: Correlation is significant at $p < .01$ (**), * Correlation is significant at $p < .05$ (*)]

Table 1-9 does not display any statistical difference of performance on the task of fine motoric skills among males and females, since Mann Whitney score is 26,500 with $p=0,562$, and this shows that males and females develop the same skills on manipulation by hand, differentiation of finger motility and graphomotorics.

Table 1-10 Differences in performance among gender and subjects' praxis motor skills performance

	Gender	N	Mean Rank	Z scores	Mann Whitney	Sig.
Melocinetic praxis	Male	8	7,44	-,911	23.500	0,382
	Female	8	9,56			
Ideomotor praxis	Male	8	8,38	-,117	31,000	0,959
	Female	8	8,63			
Constructive praxis	Male	8	6,50	-1,715	16,000	0,105
	Female	8	10,50			
Global praxis	Male	8	6,69	-1,530	17,500	0,130
	Female	8	10,31			

[*Note: Correlation is significant at $p < .01$ (**), * Correlation is significant at $p < .05$ (*)]

Table 1-10 also does not display any statistical difference of performance on the task of praxis motoric skills among males and females, since Mann Whitney score is 17,500 with $p=0,130$, and this shows that males and females develop the same skills on melocinetic praxis, ideomotor praxis and constructive praxis.

Discussions

The results of our research are very surprising regarding the first predictor variable, attending or not additional treatment in day care center, since the only difference in performance among subjects that attend additional treatment in daycare appeared in the tasks performance of praxis motoric skills in favor for those who do not attend additional treatment in daycare centers, especially strong statistical difference appeared in the tasks of melocinetic motoric skills, for what we can speculate that activities like stretching the arms sideways, placing the hands towards the body, extending the front arms, raising the arms high, opening and closing the eyes and bloating pages among others, are skills that can be developed also by school settings only, that the treatment

received in the daycare center did not made any difference, like in the research of Harris (1981) that is old dated, however there is little evidence on the benefits of daycare centers in developing motoric skills in children with Down syndrome. (Sacks & Buckley, 2003). The results regarding the two remaining area, global gross motor skills and fine motor skills, with no difference on performance between subject that attend daycare centers and subjects with only school settings, intrigued us for the future to investigate the treatment that these subjects receive in the daycare centers, since researches have shown that different occupational therapy help developing gross and fine motoric skills (Sacks & Buckley, 2003; Pelosi, Ferreira, & Nascimento, 2020; Uyanik, Bumin, & Kayihan, 2003). The second predictor variable, age (calendar age) performed with statistical difference between younger and elder group only in one area of gross motoric skills, motor coordination at rest in favor of younger group, which indicates that tasks like standing with eyes closed for 1 minute, quiet motor control with count up to 20 and motor control at rest through easy pushing is easily performed at younger age than older age in children with Down syndrome, or that younger group have been in early intervention program more actively than the elder group. However, performance of fine motoric skills and praxis motoric skills displayed no difference among age, which indicates that motoric skills are closely correlated to their mental age, not calendar, and this is also shown to many other researches (Jobling, 1999; Almeida, et al., 2000). Gender as the last predictor variable performed with statistical differences in only one area, global gross motoric skills, in favor of the girls, especially at the tasks of stability (balance), which means that tasks like balance (standing on one leg / proof "scales"), stability while walking (walking through the rope placed on the floor), harmonization of walking according to the rhythm (following the rhythm of the hands), collision of the foot while walking and jumping in place are easier for females to perform than the males which do not correspond to some research like of Schott and colleagues, where boys performed better (2014)

Conclusion

It seems the data from this research are inconclusive, for that reason there is a need to reduplicate the research in larger group of sample. According to Sacks and Buckley (2003) the findings of many research studies in the area of motor skills have to be interpreted with caution for several reasons like small number of sample (like in our survey), comparison groups and practical relevance. However, even though our survey didn't emphasize the importance of daycare centers on subjects performance, there are still surveys (Ulrich, Ulrich, Angulo-Kinzler, & Yun, 2001) that have shown that daily practice improve motoric skills in children with Down syndrome. Also the literature indicates that with appropriate therapy, developmental motor delay may be minimized, and the child's social quotient may be improved (Sanz & Menendez, 1996; Fewell & Oelwein, 1991), for that reason we suggest to encourage active movement, since the most important factor in improving movement is the control from the brain, for what is needed to teach these children by modelling, because these children learn more effectively by modelling the activity than by giving verbal instruction (Sacks & Buckley, 2003), and the attention be directed to males than females.

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