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The Transition from Dependency to Autonomy of Children with Down Syndrome through Development of Motor Skills in Gymnastic Exercises

Bianca CHERA-FERRARIO^{1*}, Camelia VOICU²

Abstract

Motor abilities development in persons with Down syndrome is challenging but essential issue to their autonomous activity. Of motor skills, coordinating capabilities are key elements, necessary and mandatory for daily activities. Coordinating capacity is a complex a plurality of psychomotor skills inevitably present in the actions of everyday life. The paper describe the results obtained in developing autonomous abilities, targeting most the coordinating capacity, through activities held in Targoviste in the frame of the project "Development of motor skills in people with Down syndrome - essential step to an independent life". The project was coordinated by Special Olympics Romania Foundation. The research objectives were to investigate the contribution of gymnastics programs to the development of coordinating capacity and autonomy of children with Down syndrome, and to assess the parent`s satisfaction with the children`s progress in obtaining more independency in daily routine. The research hypothesis was: if children with Down syndrome participate in periodic and regular gym activities, they will have a greater degree of autonomy in their daily activities. The results of gym programs confirmed the hypothesis. The regular and continuously gymnastics program had strengthening the Down syndrome children skills and their execution. Children were not only having better coordinating skills, but also they were using motor skills with precision, courage and, most important, independently in their daily activities. Also, the parents daily reports on children`s autonomy skills and activities showed improvements of children`s independent life and of their own.

Keywords: Down Syndrome, gymnastics program, autonomy skills, coordinating capacity.

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1. Introduction

Developing motor skills in people with Down syndrome is a major goal, essential for their independent life. Co-ordinating capacities are factors that are necessary and mandatory for obtaining autonomy in everyday life. Lack of laxity, amyotonia, overweight, weak muscle power, excess flexibility are causing person`s dependence on others, difficulties of social integration and a poor adaptation to the environment. As Popescu G. argued [1], relying on human needs, as an elemental issue of the individual, gymnastic training is essential to the development of co-ordinating abilities and implicitly for more independence.

This paper describe the results obtained in developing autonomous abilities, targeting most the coordinating capacity, through activities held in Targoviste in the frame of the project "Development of motor skills in people with Down syndrome - essential step to an independent life" [2]. The project was coordinated by Special Olympics Romania Foundation and involved fifteen partners, one of them being the Department of Physical Education and Sport, Valahia University of Targoviste. The main project objective was to facilitate developing children`s skills of autonomy and independence in various daily actions, using gym exercises very similar to the actions of everyday life. Another objectives aimed by the project were the social integration of children with Down Syndrome, through interaction with different children and adults within competitions and program`s sports activities [2].

2. Problem Statement

The main motor skills are related to the coordinating capacities that represent a complex of psycho-motor qualities that imply the ability to learn quickly new movements, adapting quickly and efficiently to the various conditions of different activities. Schnabel (1974) quoted by Cordun M. [3], considers that there are three core coordination capacities: 1. driving skills based on the ability to receive, process and store information ; 2. the ability to drive movements that involve command over segments and movement; 3. motor adaptive capacity, which involves to correlate the reaction to the environment. Motor coordination involves the harmonious functioning of both neural and musculoskeletal systems, to obtain "a rapid, accurate, and balanced motor response", [4, p2]. That emphasize the necessity to design and run exercises that proper stimulate and consolidate the bonds of these systems. Also, motor development of a child with Down syndrome is

delayed rather than different. This is why their self-serving abilities are behind that of a peer, and usually are lacking in strength and balance. Children and adolescents, and even adults with Down syndrome need “more practice than typically developing individuals to improve their performance.” [5, p1].

The development of motor coordination is one major goal of physical education and sport, not only for children with typical development, but especially for children with disabilities, no matter what developmental area is affected – motor, sensory or intellectual. Recent studies related to motor coordination revealed a good correlation between these skills and executive functions, both for children and for adults. Also, research on psycho-motor education and intervention based on sports exercise programs revealed the development of appropriate and necessary skills and abilities required for social integration. Exercise programs and methods show an encouraging development and a better social integration of the subject [6].

Traditionally, physical activities know favourable effects on physical and motor development of the individual [7].

Given all the studies about positive effects of motor stimulation on motor and psychological development of disabled children, most of the recovery services recommended for them are gym classes or kinetic therapy. Although, in the last years, some children with Down syndrome included in education system from our county attended physical stimulation programs or kinetic therapy, not all of them showed an improvement of autonomous skills, nor social skills. For that we wondered if gym exercises could indeed contribute to transition from dependency to autonomy of children with Down syndrome.

3. Research Questions/Aims of the research

The research objectives of this study were to investigate the contribution of gymnastics programs to the development of coordinating capacity and autonomy of children with Down syndrome, and to assess the parent's satisfaction with the children's progress in obtaining more independency in daily routine. The research hypothesis was: if children with Down syndrome participate in periodic and regular gym activities, they will have a greater degree of autonomy in their daily activities.

The dependent variable – Down syndrome *children's autonomy in daily activities* – was operationalized in four essential skills for children over five years old: to dress themselves, to eat without help, to run on uneven surface, to climb and to get up and down on stairs. The development of these skills

was obtained through exercises that pursued specific motor skills, correlated in the development of each of the four autonomy skills:

Autonomous dressing involves the coordination of body segments in relation to a limited space, which is represented by the body. Thus, each individual has to command and drive the arm or leg segment to suit a narrow space such as coat. We consider that *crawling motor skills* are the closest to the habit of climbing, as the child has to pass, with the whole body through a narrow space, by segmental movements of both arms and legs. We believe that the independent achievement of dragging will also lead to the autonomous realization of the dress.

Getting up and down stairs involves segmental leg coordination over a fixed point and muscle contraction to overcome gravitational force to climb on a ladder with its own weight, but also muscle contraction for the getting down moment. The spatial orientation capacity is also required because the child needs to appreciate the distance to the scale, its height, and coordinate its own movements relative to other external factors. The best driving exercise for this skill is *climbing on the gym, walking and lowering on the gym*. In the gymnastic lessons, several variations were practiced with the gym: the bench in the normal position, with the bank sloping, with the bank turned with the thin side up.

Eating (as autonomous skill) is a difficult skill because it requires the coordination of the shoulder segmented with the outer object, with the move to catch a food, lift it up and lead it to the mouth. It is a segmental coordination movement, precision and finesse. As correspondence motor skill, we found that *throwing a ball with a hand* is an action similar to eating movements, targeting the segmental coordination capability of a close target. In the gymnastics lesson, we trained throwing the ball with a hand to a basket situated near, slightly away, or in a slight movement.

Running is an inherent motor act that involves general body coordination, equilibrium, speed and spatial orientation. It is a habit known to all children, but more difficult to achieve for Down syndrome children. The similar skill trained in the program was *running through the planks, independently and with help, running to an object and transporting them back, running the pursuers*.

4. Research Methods

For the first objective - the contribution of gymnastics programs to the development of coordinating capacity and autonomy of children with Down syndrome - , we compared the results of the initial evaluation with the

results of final evaluation, maintaining the same tests. We tested six motor skills: 1. *crawling through pipe*, 2. *climbing on the gym*, 3. *walking on and lowering of the gym*, 4. *throwing a ball with a hand*, 5. *grip the ball with two hands*, 6. *run through the piles*. Also we asked parents to complete, at the end of every week the child went to gym programme, a short questionnaire (self-administered) regarding the manifestation of the children`s autonomy (e.g. if they still need help and how much help was needed to dress up – to put on their lip, jacket, pants etc. - , to eat, if they are still having trouble with getting up and down the stairs, with the running on uneven ground etc.).

In the beginning, we had fifteen children with Down syndrome included in the programme, but only nine of them were included in the research, due to the frequency requirement (they had to come once per week, at least eight weeks without interruption, in every season). The gym programme had 60 minutes, and was staggered in five seasons, as follows: March - June 2015, September - December 2015, February - June 2016, September - November 2016, February - May 2017. The trainers were members of Physical Education and Sport Department, Valahia University of Targoviste.

For the second objectives (to assess the parent`s satisfaction with the children`s progress in obtaining more independency in daily routine) we conducted individual structured interviews with nine parents (of the children included in the study), to obtain in-depth information regarding: parent's general perception of the evolution of child's autonomy, what were the expectations of the parent towards the child's progression and whether these expectations were met, to what extent did the program satisfy the parents' requirements, and what improvements parents want to bring to the gym program. The interviews were taken in the last season of the program.

5. Findings

5.1. Results of initial evaluation on children`s motor skills

As mentioned above, children were tested at the beginning of the gym program (March, 2015), on six tasks, targeting the motor skills associated with the autonomy abilities. The results of the initial evaluation are synthesized in table 1.

Table 1. Results of initial evaluation

Type of skills manifested	Throwing the ball	Catching the ball	Climbing on the bench	Walking on the bench	Crawling through the tube	Running through five milestones				
Developed skill	37,5	12,5	0	0	37,5	37,5	37,5	37,5	12,5	12,5
Undeveloped skill/ needed help	62,5	87,5	100	100	62,5	62,5	62,5	62,5	87,5	87,5

The six task were:

1. *Throwing the ball*: this process was performed with one hand, and required throwing the ball to a basket at a distance of almost one meter. Results: 37.5% of the children managed to throw the ball with one hand in the basket and 62.5% of the children failed to throw the ball with neither of the hands at the basket.

These results show that more than 50% of the subjects did NOT manage to develop segregated coordination capacity with respect to a fixed target. Also, during the test, we noticed a low level of attention and emotional instability: the children were failing to stand when throwing the ball or they were very excited by the activity our by the presence of the volunteers.

2. *Catching the ball*: this procedure required the two-handed ball to be thrown by a volunteer from a distance of one meter. The results were: 12.5% of the children managed to catch the ball and 87.5% of the children failed to catch the ball with both hands.

These results demonstrate general upper limb coordination incapacity with respect to a moving object, the children failing to appreciate the temporal moment of grip, or the gap between the hands necessary to keep the ball.

3. *Running through five milestones*: this procedure has called for a 5 rounds to run around. The results obtained: in the first 3 halves we have 37.5% of the children managed to perform the bypass and 62% failed to run the bypasses. In the last two halves, 12.5% of children managed to get around and 87.5% of children failed to complete this procedure.

As we can see, at the first milestones, a quarter of the children showed good motor skills, overall coordination, balance, spatial orientation, and the rest of the children did not at all perform this process. Also, after

the results obtained, it is noticed that at the end of the 2nd round the children show a lack of concentration and attention, decreasing the efficiency of the required driving action, so that it remains only a child who will succeed in completing the procedure requested.

4. *Climbing on the bench*: This is similar to climb the stairs procedure that must be carried out independently. The results: no child has managed to climb on the bank alone, but all children, so 100%, have climbed with the help of one or two volunteers. There were situations when children (3 of them) needed two back support points, but also the leg bending and the leg setting on the bench.

5. *Walking on the bench*: this procedure involved shifted forward to walk on the bench independently. The results were: no child was able to move independently on the gym, the children requiring two support points on both sides of the body (holding hands), this demonstrating lack of balancing of children, fear of the reduced area of leg support, mistrust in their own forces. All this showed a reduced psychomotor development, compared to children without disabilities of the same age.

6. *Crawling through the tube*: this involved demonstrating the crawling on the knee process through a narrow space. The results were: 37.5% of the children were able to demonstrate the crawling process and 62%% of the children did not.

It has been noticed that children who have crawled are children with a slightly better motor capacity, being even more active. In children who failed this process was noticed the fear for the closed space of the tube, and secondly a motor block and a leeway in the driving actions that needed crawling.

5.2. Results of the final evaluation on children's motor skills

The final assessment was conducted in April 2017, on the same sample of children, the same control tasks, in the same gym. The results of the final evaluation are synthesized in table 2.

Table 2. Results of the final evaluation

Type of skills manifested	Throwing the ball	Catching the ball	Climbing on the bench	Walking on the bench	Crawling through the tube	Running through five milestones
Developed skill	87,5	100	62,5	50	87,5	87,5 87,5 87,5 50 50

Undeveloped	12,5	0	37,5	50	12,5	12,5	12,5	12,5	50	50
skill/ needed										
help										

Results for every task:

1. *Throwing the ball*: throwing the ball with one hand to a basket, 1 meter away. The results are: 87.5% of the children have succeeded to throw the ball into the basket and only 12.5% have failed this procedure. These results show a better development of the skill at the group level, the development of hand-eye segmentation coordination, precision, emotional stability correlated with the increase of the ability to concentrate through the successful throwing of the basket.

The percentage of 12.5% is given by a child with a very low motor capacity, IQ of 30, slow motion in the movement that demonstrates slow or bad nervous transmission at neuronal level.

2. *Catching the ball* thrown by the volunteer, with both hands. All children, so 100%, have succeeded in doing so. This very good success rate shows a significant psychomotor development for all the children, particularly improved overall coordination, attention, ball speed perception, distance estimation, and triggering of the hand movement at the right time for hand grip.

3. *Running through five milestones*, including by-passes. The results of this process are: in the first 3 balls we again have better results than the last two. For the first 3 milestones, 87.5% of children succeeded in the self-employed, and only 12.5% of children did not do this. This demonstrates a great improvement in coordinating capabilities, spatial orientation, travel speed, stability in action by maintaining the trajectory. There is only one child who, in these actions of smoothness and speed demonstrates movement in slow motion, due to a slow command at the neural level to achieve the movement, and an inability to complete the required action.

In the last two halves we have a score of 50% - 50%, so half of the children managed to bypass two more milestones and half didn't succeed in doing this. We can see, as in 2015, a loss of children's ability to concentrate on the task's completion, which we believe can be remedied through consistent exercise.

All children experience good motorized running ability, action they perform independently in a different context.

4. *Climbing on the bench*: lift the leg and climb up the bank. 62.5% of the children managed to climb on the bench and 37.5% failed to do so. This

considerable improvement in the bench climbing process involves the increase lower segment coordination over a fixed object, increased precision, courage, concentration, and internal mobilization of children (meaning improvement of volunteer effort). However, we still have 37.5% of the children who have not improved this skill. That could be done by completing more systematic gym exercises and the maturation of neuronal structures with age-related growth.

5. *Walking on the bench*: 50% of children were able to demonstrate this process independently and 50% did not succeed independently. There is a good development in this process. This shows improved general coordination, balance, precision, self-control, courage and confidence in their own forces. The children did not agree to be helped or assisted closely, asking for independence and, by doing so, actually giving them more confidence. On the other hand, 50% of the children still need assistance, rehearsal, moral support and especially patience in the social and family group.

6. *Crawling through the tube*; demonstrating the action of crawling in closed space was 100% successful. All the children were able to demonstrate and execute crawling on the knee. Overall good coordination, courage, perseverance, self-control have been observed. Most children have run this procedure with execution speed and self-assurance, except for one subject that has a general leeway on the move, but has succeeded in demonstrating this process, although much slower.

5.3. Results of parents self-administrated questionnaires.

The parents responses indicated a gradually improvement of autonomy skills, especially in dressing and eating. This, in relation to better results obtained in catching and throwing the ball and crawling motor skills allows us to conclude that the gym program is achieving its purpose. The improvement was less evident in the first and the third season, for almost all children. This could be explained by the fact that the children`s body wasn`t sufficiently trained. Children did not participate in sports because parents were afraid of injuries and fatigue. By mobilizing children in gymnastics, the evolution and manifestation of psycho-motor capacities presented a leap in evolution, less visible from the very first session, but especially after the third session.

5.4. Results of parents interviews

Through the interviews we discovered that parents were skeptical about the child's autonomy progress in the beginning of the program, due to

the little performance on autonomy children manifested until that moment. Except for on parent who was evolved in child's recovery programs from early years and she was positive about gym program results. They thought that the psychological and motor difficulties children have are inherent to the syndrome, so children are genetically limited in their skills. For this, parents didn't have much expectations about children's progress on autonomy, and they didn't gave the child the opportunity to be independently - as much as they could have been – in daily activities. The negative perceptions on children's capacities were caused by parent's poor information on Down Syndrome implications and recovery of this children, and also by the children's low performance in daily routine, as they haven't been properly stimulated. The progressive improvements of children motor skills and, consecutive, of self-service abilities surprised most of the parents. They realized that, if appropriate stimulation is received, the child can be more autonomous and have a great degree of participation in activities. Also, during the program, parents have changed their perceptions on child's capabilities, being more confident in letting the child manage for himself. Overall parent's satisfaction of the program was very high. The only requirements they stated were regarding the opportunity for them to be trained on Down syndrome characteristic and recovery possibilities of affected children.

6. Discussions

The study aimed to bring some evidence for the contribution of motor skills development in gymnastic exercises for the autonomy development of children with Down syndrome. Although the research group is not statistically representative, the results of initial and final assessment of children's motor skills brings good evidence to support research hypothesis. We couldn't done a final assessment of children who were not regularly involved in gym program, but, based on trainers observation, it can be appreciated that those children were not having so much progress as the nine ones from the research group.

Also, besides weekly exercises within the program, we believe that parents' positive attitude, mostly from the second season of the program, contributed to the progress of children's autonomy. Further research is needed to understand better the way the variable "parent's attitude" can influence motor development of children affected by Down syndrome.

7. Conclusions

The final evaluation results and parents report on children progress in daily self-service support the research hypothesis, bringing evidence for the contribution of gymnastics programs to the development of coordinating capacity and autonomy of children with Down syndrome. The research highlighted the importance of exercise regularity and parent's responsibility for succeeding in obtaining progress with children affected by Down syndrome. The regular and continuously gymnastics program had strengthening the Down syndrome children skills and their execution. Children were not only having better coordinating skills, but also they were using motor skills with precision, courage and, most important, independently in their daily activities. These contribute to parent's satisfaction with the program and with future child activities, and to a positive attitude toward children capabilities development.

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The undersigned Chera-Ferrario Bianca and Voicu Camelia-Delia, teaching staff at Valahia University of Târgoviște;

We declare on our own responsibility that the participants in the research have been informed of the voluntary nature of participating in research, of understanding the information received and of understanding that the withdrawal from the research can be made at any time, without adversely affecting the participant.

The research, and the participants / guardians of the participants gave their consent to participate in the research.

References

- [1] Popescu G. Performance, Reference Systems and Strategies for Balance Training in Syndrome Down Subjects Beginning Gymnastics. PSBS [Internet], 2014 March [cited 2017, march, 10]; 117: 553-558. Available from <http://dx.doi.org/10.1016/j.sbspro.2014.02.261>
- [2] Special Olympics Romania. Dezvoltarea de abilitati motorii la persoanele cu sindrom Down [Development of motor skills in people with Down syndrome]. Bucuresti: SpecialOlympics; 2015 [cited 2017, feb.25]. Available from <http://specialolympics.ro/programe/sport/dezvoltarea-de-abilitati-motorii-la-persoanele-cu-sindrom/>
- [3] Cordun M. Bioenergetică și Ergometrie în Sport [Bioenergy and Ergometry in Sport]. Bucuresti: Editura CD PRESS; 2011. 289 p.
- [4] Fernandes VR, Ribeiro MLS, Melo T, de Tarso Maciel-Pinheiro P, Guimarães TT, Araújo NB, et al. Motor Coordination Correlates with

- Academic Achievement and Cognitive Function in Children. *Front. Psychol* [Internet]. 2016 March 15 [cited 2017, May 12]; 7: 318. Available from: doi: 10.3389/fpsyg.2016.00318,
- [5] Sacks B, Buckley SJ. Motor development for individuals with Down syndrome – An overview. *Down Syndrome Issues and Information*. 2003. Portsmouth, UK. [cited 2017, may, 12]. Available from www.down-syndrome.org/information/motor/overview
- [6] Neagu N. Improving social and professional integration of people with Down syndrome by means and kinetic techniques. *PSBS* [Internet]. 2012 January [cited 2017, march, 10]. 33: 493-497. Available from: <https://doi.org/10.1016/j.sbspro.2012.01.170>
- [7] Bădicu G, Grosz WR, Balint L. Influences of practicing leisure sports activities on mental health in adult population. *PSBS* [Internet]. 2016 May [cited 2017, may, 10]. 180: 1221-1228. Available from: <http://dx.doi.org/10.15405/epsbs.2017.05.02.193>.