Effect of Strengthening Program on Increasing Self-Concept of Children with Cerebral Palsy

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ABSTRACT

Purpose: *This study was undergone to examine the effect of strengthening program on increasing self-concept in children with cerebral palsy (CP).* ***Methods:*** *Thirty cerebral palsy children of spastic hemiparetic or diplegic type, ranged in age from 10 to 14 years, participated in this study. They were divided randomly into two equal groups; study group and control group. Participants in the study group joined a strength training program for 12 weeks using different equipments to strength the major support muscles of the lower limb. Participants in the control group undertook their normal physical therapy program without any strengthening exercises. Self-concept was measured by the Self-Perception Profile for Children (SPPC) three times through the whole study; before the start of the strength program, after the 12th week and after 16 weeks from the start of the study to examine the long effect of the strength exercises.* ***Results:*** *The results showed a statistically significant increase of the all measured six domains of self-concept for the children in the study group, while there was no significant difference in any of the six domains for the children in the control group ($P<0.05$).* ***Conclusion:*** *These results demonstrate that there is apparent effect of strengthening program on self-concept in cerebral palsy children. Key words: cerebral palsy, muscle weakness, self-concept, physical therapy methods, strength.*

INTRODUCTION

Cerebral palsy (CP) is a term used to describe a group of non-progressive neurological disorders caused by damage to the developing brain, resulting in disorders of movement and posture[1]. The impairments commonly associated with CP (muscle weakness, spasticity, and incoordination) may cause difficulties in everyday functional activities, such as walking, climbing steps or stairs, dressing and other tasks of personal care. These difficulties may reduce a child's ability to interact with others and their environment which could impact on their self-concept[22].

Self-concept is a fundamental part of a child's psychological function. This multidimensional construct comprises a child's perceived competence in different domains such as how they feel about or view their ability to participate in sports (Athletic Competence), how they get a long with their peers (Social Acceptance), how well they perform at school (Scholastic Competence), and how they behave (Behavioral Conduct)[20,22]. Because self-concept is a fundamental aspect of psychological health, if specific domains of self-concept are impaired in children with CP, then it may affect their health and functioning[19].

The psychological status of the individual needs to be considered because many adolescents and adults with CP report prolonged periods of depression, which were in part related to decreased mobility[17]. Willner and Dunning 1993[24] involving 65 people with CP aged 23 to 82 years reported that they had experienced a decrease in walking ability at middle age. This resulted in decreased

mobility and social activity and subsequent depression. Individuals with lifelong motor disabilities show an increased prevalence of depressive disorders that can affect everyday life[15] and cause psychosomatic symptoms. King and colleagues 1993[14] found that adolescents female with physical disabilities had poorer self-perception in the areas of social acceptance, athletic competence and romantic appeal when compared to the norm. Adolescent males with disabilities perceived themselves to be low in scholastic competence, athletic competence, and romantic appeal. This information challenges the health care provider to find approaches to prevent psychological disorders in this population[17].

Clinicians and parents often assure that children with physical disabilities, such as cerebral palsy, have low self-concept. The societal view of disability as a personal tragedy assumes that individuals with a disability could not be happy or feel good about themselves[19]. Knowledge about how young people with CP feel about themselves would assist health care professionals to provide optimal management. If self-concept is indeed impaired in this group then greater awareness about how they feel about themselves may contribute to and enhance the development of a supportive and understanding child-clinician relationship[4]. An increasing body of evidence confirms that they many benefit from programs designed to increase strength and possibly to improve everyday functional activities[5,7]. In addition to physical benefits, there is some evidence that strength training might lead to psychological benefits for children with CP[6].

Self-Perception Profile for Children is a scale designed to assess children's perceptions of themselves across the domains of scholastic competence, physical appearance and behavioral conduct as well as a global perception of their worth or esteem as a person. The scale is suitable for children from third grade to approximately ninth grade, from about eight to 16 years old[12]. The scale has demonstrated good to high retest reliability ranging from r= 0.66 to 0.86[10,25] and evidence of construct validity in populations of children with physical disabilities[6]. If self-concept is unimpaired in children with CP then clinicians can concentrate on treating the presenting physical problems rather than placing emphasis on the effect of disability on self-concept. It was concluded that physical activity level clearly has a large impact on self-perception measures, and improved self-perception can be added to a long list of the benefits of being physically active[21]. An altered self-concept in children with CP, therefore, can have clinical consequences but clinicians' and parents' views may be based on an assumptions of impaired self-concept rather than on actual evidence[19]. The aim of this study is to test the prediction that participation in a strength training program would increase the self-concept of children with CP.

METHODOLOGY

Subjects

Thirty children with cerebral palsy (CP) were recruited from the out-clinic of Faculty of Physical Therapy ranged in age from 10 and 14 years old. Children were included diagnosed with spastic diplegic or hemiparetic. According to the following criteria: mild to moderate degree of spasticity according to Modified Ashworth Scale[2], be able to walk independently with or without a gait aid, and be cognitively able to follow simple commands. Exclusive criteria were a fixed flexion deformity at the knee or hip greater than 25 degrees or fixed equines of more than

10 degrees, current participation in other management strategies such as serial casting, botulinum toxin or recent orthopedic surgery (within the previous 12 months), and participation in a strength training program within the previous three months. Children were excluded if they had another coexisting medical condition unrelated to CP (e.g. diabetes). Written informed consent was obtained from all children who participated in the study and their parents. Participants were randomly allocated to either an experimental 12-weeks strength training group or a non-intervention control group. The dependent variable was self-concept as measured by the Self-Perception Profile for Children. Self-concept was measured at the beginning (pre), at the end of the study at the 12th week (post1) and after 16 weeks from the start of the study (post2).

Instrumentations

1- For evaluation:

a- Modified Ashworth Scale[2]: it was used to assess the degree of spasticity for the children participated in the study. The selected cerebral palsy children were graded from mild to moderate degree (from grade 1 to grade 2).

b- The Self-Perception Profile for Children (Harter, 1985)[12] was used to measure six domains of self-concept:

- Scholastic Competence reflects a measure of perceptions of school-related competencies and scholastic performance.
- Athletic Competence directly addresses the child's perceptions of skills related to sports and outdoor games.
- Behavioral Conduct assesses the degree to which children like the way they behave, choose the right, act in ways that avoid getting into trouble.
- Social Acceptance examines the degree to which the child feels popular or accepted by peers.
- The physical Appearance subscale identifies the degree to which children are happy with the way they look and feel good-looking.

This measure also assesses the child's sense of global self-esteem or self-worth independently of any particular skill domain. The scale comprised 36 questions with 6 questions/domain. This scale has also demonstrated evidence of construct validity when used to assess children with CP, as predicted changes were detected in perceived competence after participation in a community fitness program[6].

2- For treatment:

a- Treadmill apparatus (En Tred).

b- Bicycle ergometer (Monrak Rehab Trainer model 88IE).

c- Mat, ball, roll, and wedge.

Procedures

Participants in this study were randomly allocated to either the study (strength training) or control group using a concealed method. Identical pieces of paper were placed in an opaque container, half with the words experimental group and half with the words control group written on them. In another opaque container, the name of each participant was written on a separate piece of paper. Allocation was achieved by drawing a piece of paper from each container. This process continued until all the children were allocated to a group.

1- Evaluation procedures: Self-concept was measured with the Self-Perception Profile for Children SPPC (Harter, 1985)[12] which is a questionnaire that uses a structured alternative format in which the child was presented with one positive and one

negative statement (table 1). The child was then asked to select which of the two statements was most like him/or her and whether the selected statement was "sort of true" or "really true". Each question on the scale received a score between one and four, with one indicating low perceived competence and four reflecting high perceived competence. The scale was explained in classical Arabic to the children and read to them. The questionnaire was completed by the therapist according to the child answers. Scores for questions in each domain were added and averaged, so that six separate domain scores for self-concept were obtained.

2- Treatment procedures: after the first evaluation of the self-concept was taken, children allocated to the study group completed a program of exercises designed to strengthen the major support muscles group of the lower limb: the ankle plantar flexors, knee extensor and hip extensor muscle groups.

The program included:

1- Treadmill training: the child was asked to walk on the treadmill with a speed of 1.5 kilometers/hour and 0 degree inclination for 5 minutes, increase gradually to reach 3 kilometers/hour and 4 degrees inclination for 20 minutes at the end of the study.
2- Bicycle ergometer: the child performed pedaling on a bicycle ergometer, 50 ramps/minute for 5 minutes increased gradually to 10 minutes at the end of treatment period.
3- Group of exercises included: bilateral heel rises off the edge of a portable step (height, 20 cm), bilateral half-squats using a large inflatable ball (55 cm in diameter) placed between the participants lower back and the wall to guide the movement and step-ups on a small portable step. The training load was adjusted by adding free weights to a backpack worn by the child to be able to complete between 8 and 10 repetitions of each exercise with good form before fatigue[9]. The children were asked to complete 3 sets of each exercise 3 times/week for 12 weeks of the program.

Children in the control group did not participate in a progressive resistance strength-training program. All participants, including those in the control group were instructed to continue their normal daily activities, including school and sports. Participants were also attending their normal physical therapy program, provided that therapy did not include a progressive resistance exercise program. Due to random allocation procedures, it was expected that the amount of physical therapy and the level of sports and physical activity that the children participated in would not be different between the two groups.

At the end of the study, all children in the control group confirmed that they had not participated in a progressive strength training program during the study.

To assess the effects of the 12-weeks strength training program on self-concept, children in the study and control groups were tested immediately after the 12th week. To determine whether the strength training program had longer effects, children in the both groups were tested again 16 weeks after starting of the study.

Table (1): Examples of questions from the Self-Perception Profile for Children (Harter, 1985)[12].

Domain	Example
Scholastic Competence	Some kids feel that they are very good at their school work BUT other kids worry about whether they can do the school work assigned to them.
Social Acceptance	Some kids find it hard to make friends BUT other kids find it's pretty easy to make friends.
Athletic Competence	Some kids do very well at all kinds of sports BUT other kids don't feel they are very good when it comes to sports.
Physical Appearance	Some kids are happy with the way they look BUT other kids are not happy with the way they look
Behavioural Conduct	Some kids often do not like the way they behave BUT other kids usually like the way they behave
Global Self-worth	Some kids don't like the way they are leading their life BUT other kids do like the way they are leading their life

Statistical Analysis

The pre treatment evaluation, post1 and post2 results were compared in the two groups using the Wilcoxon Signed Ranks Test as it is the most appropriate. The Wilcoxon Signed Ranks Test is a non-parametric equivalent o2f a group by time interaction and was used because the Self-Perception Profile for Children is an ordinal scale.

RESULTS

Demographic details of the 15 children randomly assigned to the strength-training group and the 15 children assigned to the control group can be viewed in table 2. There were no significant differences between the study and control groups for age, height, weight, or gender. All the 30 participants completed the 12-weeks of the study duration.

Table (2): Characteristics of the participants.

	Study Group	Control Group
- Demography		
Age,years,mean (SD)	12.8 (2.3)	12.2 (1.9)
Male/ Female, no.	8/7	8/7
- Anthropometry, mean (SD)		
Body height, cm	146.8 (12.1)	148.8 (4.6)
Body weight, kg	45.3 (16.1)	41.7 (8.7)
- C P , classification Diplegia/ hemiparesis	5/10	6/9

SD: standard deviation No: number

There were no baseline differences between the two groups for the six domains of self-concept. However, for the domain of scholastic competence, social acceptance and physical appearance the female participants in the study and control groups rated themselves lower than the males participants in both groups.

There were significant differences between the pre and post1 (from the beginning and after 12-weeks) and between pre and post2 (from the beginning and after 16-weeks) for the six measured domains of self-concept in the study group, (P>0.05) table 3.

Table (3): Results of the study group (pre/post1), (pre/post2).

Domain	Pre/post1	Pre/post2
Athletic competence	Z= 3.50 P=0.000	Z= 3.50 P=0.000
Scholastic competence	Z= 3.87 P=0.000	Z= 3.87 P=0.000
Social acceptance	Z= 3.87 P=0.000	Z= 3.87 P=0.000
Physical appearance	Z= 3.87 P=0.000	Z= 3.87 P=0.000
Behavioral conduct	Z= 3.87 P=0.000	Z= 3.87 P=0.000
Global self-worth	Z= 3.87 P=0.000	Z= 3.87 P=0.000

There were no significant differences between the pre and post1 (from the beginning and after 12-weeks) and between pre and post2 (from the beginning and after 16-weeks) for the six measured domains of self-concept in the control group, (P<0.05) table 4.

Table (4): Results of the control group (pre/post1), (pre/post2).

Domain	Pre/post1	Pre/post2
Athletic competence	Z= 0.000 P=1.000	Z=0.000 P=1.000
Scholastic competence	Z= 1.000 P=0.317	Z= 1.000 P=0.317
Social acceptance	Z= 0.000 P=1.000	Z= 0 m\0 P=1.000
Physical appearance	Z= 0.000 P=1.000	Z= 0.000 P=1.000
Behavioral conduct	Z= 0.000 P=1.000	Z= 0.000 P=1.000
Global self-worth	Z= 0.000 P=1.000	Z= 0.000 P=1.000

There were significant differences in the six domains of the self-concept (post1 and post1) between the study and control groups (P > 0.05) as shown in table 5.

Table (5): Comparison between the results of study and control groups post 1 (after 12-weeks).

Domain	Z- value	P-value
Athletic competence	3.50	0.000
Scholastic competence	2.73	0.006
Social acceptance	3.54	0.000
Physical appearance	2.87	0.004
Behavioral conduct	3.50	0.000
Global self-worth	3.50	0.000

DISCUSSION

This study was done to investigate whether strength training had an effect on the self-concept of CP children. Self-concept is a central factor in evaluating psychological function and is defined as a person's perception and evaluation of his or her own characteristics[12].

Self-concept is related to factors such as life satisfaction. Characteristics commonly included when evaluating children's self-concept are perceived adequacies such as appearance and peer relations as well as perceived competencies in areas such as athletic skill and academic achievement[8]. Self-concept is increasingly being studied as a collection of distinct elements that together make up an individual's sense of self. Using a variety of terms, such as self-esteem, self-concept, self-perception and self-image, research indicated that differentiated aspects of self-concept could be measured and evaluated in children and adolescents[3] .Relatively little

information is available about the self-concept of children with CP. It is commonly assumed by many clinicians that children with chronic, often severe, physical disabilities such as those associated with CP are likely to have lower self-concept than their unimpaired peers[23].

This coincides with the pre-treatment findings in this study which revealed lower scores in the six measured domains of self-concept. These findings contradict with Magill and Hurlbut [16] who found no overall differences between the self-concept of a group of adolescents with CP and a matched control group of adolescents without physical disabilities. However, these researchers did find that girls with CP had significantly lower self-concept. The same was observed in the results of the current study, coinciding with the results of another studies that revealed lower self-concept in the domains of social acceptance, physical appearance, athletic and scholastic competence in adolescent females with CP compared with adolescent females without disability[12].

This study suggests that females with CP had a comparatively lower self-concept in some domains and this have an impact on their global self-concept. Similar results have been reported for females with physical disabilities and chronic illness[14].

Harter 1985 demonstrated that the domains of scholastic success, athletic ability, and behavioral conduct are important to children between ages of 8 and 13 years. This explains the range of age selected in this study. Also, Harter demonstrated that the positive regard of significant others is an important predictor of self-worth with the influence of peers increasing after age of 8 as the influence of parents decreases[13].

Because the importance of appearance is accentuated during older childhood and into adolescence, this domain was also identified as a prominent indicator influencing the self-worth of a child in this age range[13].

The results of the pre-treatment evaluation for athletic competence revealed lower scores coinciding with Hansen 1994 who reported that irrespective of sex and age, children with CP had a lower self-concept in athletic competence than children without impairment suggesting that they acknowledge that their physical disability can make it more difficult to participate in games and sports. However, Sherill et al 1990 contradict this opinion as they found the self-concept scores for adolescents with CP fell within the ranges of the normative group for athletic competence. In respect to scholastic competence domain it was found to be at lower scores in the pre-treatment questionnaire. This agree with other studies which reported lower scholastic competence in some groups of CP children[11,20] explaining the reason for this as CP results from an insult to the developing brain, it is possible that certain aspects of cognition, communication, and perception may be affected, which might compromise a child's learning abilities. Some CP children may also feel a reduced sense of competence in their school work as a result of more frequent absenteeism from school due to hospitalizations or clinic visits which might make it harder for them to catch up on school work [20].

Certain studies[11,16,18] assessed the social acceptance domain of self-concept and reported that CP children had a lower scores especially adolescent females[16] in this domain compared with others without disability. This agree with the present study findings which confirmed that females had a lower scores compared to males pointing out that health care professionals should be aware of the need to assist females with CP who have a vulnerable self-concept in social acceptance.

For example, therapists may assist them to actively define what makes a person socially acceptable through discussion, or develop interpersonal skills that will enhance their confidence in social settings include putting others at ease with disability and initiating interaction[16].

In the results of the pre-treatment evaluation of the physical appearance, lower scores were observed especially for females, corresponding with other study[16] which reported that adolescent CP females had significantly lower self-concept in the physical appearance domain compared with adolescent females without disability. For behavioral competence, one study[11] found no significant difference between the groups of CP contradicting with the results of the present study. Finally, the global self-worth was found to be at lower scores in the results of the pre-treatment scores evaluated by SPPC. This agree with another study[16] who reported that global self-worth scores of adolescent females with CP and younger children with CP tended to be lower than in matched children without disability. These differences in self-concept in children with CP may have implications for health care professionals who are involved in managing the physical disabilities of those children.

The present study provides preliminary information about the effect that strength exercises may have on self-concept in young people with CP. The effect of a group gymnasium-based physical activity program on the self-concept of 23 young people with CP was documented. Improvements in self-concept were found, specifically in the domain of physical appearance[6].

Other study[17] documented that aerobic exercises may help increase strength of the lower extremity muscles and improve gross motor function and self-perception for some adolescents with CP. both studies agree with the post treatment results of this one that concluded that strength training can improve self-concept in CP children. Also, the present findings agree with the study of Verschuren et al., 2007[26] who documented that exercise training improved physical fitness, participation level and quality of life in children with CP when added to standard care. While, contradicting with the study of Dodd et al., 2004 who concluded that strength training program ha san inhibitory effect on the self-concept of CP children. In my opinion, this may be due to the short time of the study (6 weeks only), the strength program was home program that might not be followed accurately. The post2 treatment results obtained in this study revealed that strength training program can affect the measured self-concept domains in the longer term. So, it is even possible to suggest that physical program implemented in this study may provide children with an opportunity to develop a more realistic self-evaluation of their own skills and abilities, which in turn may provide these children with better preparation for adult life.

Conclusion: this study was done to examine the effect of a strength-training program on the self-concept of CP children. We found a positive effect on the self-concept of those children compared with controls suggesting that strength training in those populations is beneficial not only to functional activities but also to psychological aspects.

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الملخص العربي

تأثير برنامج لتقوية العضلات على زيادة المفهوم الذاتي لدى الأطفال المصابين بالشلل المخى

أجريت هذه الدراسة لاختبار تأثير برنامج لتقوية العضلات على زيادة المفهوم الذاتي لدى الأطفال المصابين بالشلل المخى . شارك في إجراء هذه الدراسة ثلاثون طفلا تراوحت أعمارهم من ١٠ إلى ١٤ عام وتم اختيارهم وتقسيمهم عشوائيا إلى مجموعتين مجموعة الدراسة والمجموعة الحاكمة . شارك أطفال مجموعة الدراسة في برنامج لتقوية عضلات الدعم الرئيسية للأرجل باستخدام أجهزة مختلفة لمدة ١٢ أسبوع بينما لم يشارك أطفال المجموعة الحاكمة بهذا البرنامج ولكن استمروا في جلسات العلاج الطبيعي لمثل هؤلاء الأطفال . تم اختبار المفهوم الذاتي بمقياس المفهوم الذاتي للأطفال ثلاث مرات خلال الدراسة (قبل بداية برنامج التقوية وبعد ١٢ أسبوع وبعد ١٦ أسبوع من بداية الدراسة لاختبار امتداد تأثير البرنامج المستخدم بالدراسة) . أظهرت النتائج وجود فروق ذات دلالة إحصائية في المجالات الستة للمفهوم الذاتي في مجموعة الدراسة بينما لا يوجد فروق ذات دلالة إحصائية في المجموعة الحاكمة . نستنتج من نتائج هذه الدراسة أن هناك تأثير واضح لبرنامج التقوية على زيادة المفهوم الذاتي لدى الأطفال المصابين بالشلل المخى .