

# INFLUENCE OF AGE DIFFERENCE IN RESPONSE TO MOTOR SKILL TRAINING ON THE PERFORMANCE OF ACTIVITIES OF DAILY LIVING BY PUPILS WITH CEREBRAL PALSY IN KISUMU KENYA

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## ABSTRACT

*The study explored age difference in response to motor skills training on the performance of activities of daily living by learners with cerebral palsy in a special school in Kisumu. An experiment was carried out with the use of a Kruskal-Wallis test. The sample size was 14 learners with cerebral palsy in a special school in Kisumu, 8 parents of learners with cerebral palsy, 3 teachers of learners with cerebral palsy, and 2 physiotherapists. Data collection was done through an experiment with the use of an observational checklist and interviews with teachers and parents of learners with cerebral palsy. Quantitative data was analyzed with the use of descriptive statistics and thematic analysis was used for qualitative data. The study findings indicated that the difference in performance between younger pupils with cerebral palsy and older pupils with cerebral palsy favoured the latter; their performance only increased with age in hand grip, strength and endurance. Where as older pupils who were severely affected experienced a lot of difficulties in the performance of certain activities of daily living, younger learners who had mild cerebral palsy were significantly better. However the less severely affected one is the easier to learn the skills regardless of age.*

**Keywords:** Age difference, Motor skills training, Activities of daily living, Cerebral palsy.

## INTRODUCTION:

Cerebral Palsy (CP) is a condition that restricts an individual's ability from independent living. Individuals with cerebral palsy are unable to perform precise movements of both fine and gross motor muscles required for self care activities such as dressing, toileting, feeding, cleaning among others. For individuals with cerebral palsy, self care abilities can be improved through training. This study evaluated the influence of age on response to motor skills training on the performance of activities of daily living by learners with cerebral palsy.

According to (Olaf, et al., 2009), younger children with cerebral palsy respond faster to exercise on the performance of activities of daily living than adults.

(Sekuler, Bennet, & Mamelak, 2005) observed that practice improved performance for both younger and older subjects. However, (Livingston, Stewart, Rosenbaum, & Russel, 2011) revealed that in South Africa, youths with severe physical disabilities have more difficulty performing cognitive skills than self-care skills when compared with younger ones. The study further revealed that most youths with severe physical challenges mastered the skills of activities of daily living even though with a lot of difficulties as compared to younger children with physical challenges. Younger children, more so those with disabilities enjoy self care activities being done for them. The difference between children with physical disabilities and those with Cerebral Palsy is that those with CP have unhealthy brain which may also deteriorate with age, it might therefore not be the age but the state of health of the brain when it comes to the abilities of learning the skills of daily living. In some cases older pupil can learn faster than younger learners and at times it can be vice –versa.

## LITERATURE REVIEW:

(Fisher, 2010) studied cardio respiratory responses to exercise in children and adults in America. The study findings noted that maximum heart rate is a function of age, and children have very high maximal heart rates. Blood flow to working muscles is higher during exercise in children, this may partially compensate for the lower cardiac output. In contrast, during exercise, skeletal muscle oxygen extraction and muscle oxidative capacity are similar in the children and adults. Children require higher minute ventilation at any given oxygen consumption. The reason is the higher respiratory rate and shallower breathing in children. The study further found that respiratory muscles of children must work harder during exercise than those of adults. These differences in the cardio-vascular and respiratory system responses to exercise limit oxygen delivery to working muscles, resulting in a lower endurance exercise capacity in children. This does not mean that children cannot perform endurance exercises or improve endurance exercise capacity; rather it means that children cannot be expected to perform endurance exercises, or train for endurance events at the same level as adults. The study recommends exercise prescription for children which should approximately follow the general recommendations for enhancing motor skill functioning in children with physical disabilities. The reviewed study was done with children and adults with respiratory problems and not with children with cerebral palsy as it is in the present study.

(Olaf, et al., 2009) conducted a study on the Gross Motor Function Classification System (GMFCS) among children with cerebral palsy in Europe. The study revealed that younger children with cerebral palsy responded faster to exercise on the performance of activities of daily living than adults.

(Sekuler, Bennet, & Mamelak, 2005) carried out a study on age-related learning differences in USA. The study assessed how divided attention costs varied when initial performance levels were equated across the age groups at the start of practice. The result was that practice improved performance for both young and older subjects. When older subjects are provided with enough practice, their attention cost was equivalent to those younger subjects, with enough practice. Both younger and older subjects reached a point at which they showed no divided attention deficits. While the reviewed study was done with patients on divided attention in USA, the present study was conducted with children with cerebral palsy in a Kenyan school. Adequate services for all types of patients unlike Kenya. Moreover, the reviewed study was conducted with patients who could be having different conditions from those that of the children with cerebral palsy have.

(Olaf, et al., 2009)) carried out a study on the performance of exercises on children with disabilities in New York. The study reported that younger children with cerebral palsy respond faster to exercise-oriented therapies intended for the performance of activities of daily living than adults. Sekular, Bennet and Mamekik (2005) showed that the performance of activities of daily living among children with special needs often decline with age. (Livingston, Stewart, Rosenbaum, & Russel, 2011), on the contrary, records that most youths with severe challenges have mastered the skills of daily living activities compared to younger children with physical challenges. However, the studies have no information on the influence of age difference on the performance of activities of daily living among pupils with cerebral palsy which is the subject of the present study.

(Livingston, Stewart, Rosenbaum, & Russel, 2011) carried out a study in South Africa on elementary and middle

school students with physical disabilities. The study findings revealed that youths with severe physical disabilities have more difficulty in performing cognitive skills than the self care skills. It further revealed that most youths with severe physical challenges have mastered the skills of activities of daily living even though the performance is with a lot of difficulties as compared to younger children with physical challenges. The reviewed study focused on students with disabilities in general. The current study focused on pupils with cerebral palsy whose performance in the activities of daily living could be adversely affected than children with other forms of disabilities.

A study by (Hadders-Algra & Carlberg, 2008) in three developing and two developed countries, revealed that evidence from industrialized countries suggests that compared with older boys, older girls more often experience functional impairments and activity limitations, have longer duration of disability, and spend proportionately more years of life disabled.

(UNESCO, 2006) carried out a research in African countries on preferred ADL goals according to age among children with severe physical disabilities. Through comparative analysis, the findings showed that most preferred goals for the younger children aged between 6–11 years were leisure related, while the older children preferred goals regarding eating, personal care and computer use. The study however, had no information on the influence of age on the learning of activities of daily living.

(Haywood & Gretchell, 2009) conducted a study on life span motor development. The study was conducted with 50 children ranging from age five through twelve with a variety of special needs including cerebral palsy, fine motor difficulties, developmental coordination disorder and spinabifida in three African countries. Children with fine motor difficulties received occupational therapy twice a week for a three month period. The rate of change for children receiving occupational therapy exceeded that expected due to maturation, suggesting that intervention was the reason for the improvement. The study findings showed that 90% of the older children made progress while only 2% made progress among the younger children.

(Latish, 2008) carried out a study on the differences in performance of selected tasks of gross motor function among children aged between 4-6 years in Brooklyn, New York. The findings showed that there were significant differences between the age groups that appeared in quantitative parameters comparing 4 and 5 year old children. While the reviewed study was done with children aged between 4-6 years in Brooklyn, the present study was conducted with pupils with cerebral palsy of all ages in a school in Kenya.

Piek (2006) examined the effectiveness of aerobics in rehabilitating children and adults with motor disabilities in Australia. The study found that although aerobic power may be similar between children and adults, there is a considerable difference in the metabolic cost of activity and the economy of movement. The oxygen lost when exercising at a set pace is higher in children than in adolescents and young adults because their economy of movement is lower than that of more mature people. This disparity accounted for the differences in technique and body dimensions decreases with growth. Rehabilitation facilities in Australia could be easier to access than the rehabilitation facilities in Kenya, further more being rehabilitated means that these children and adults were once able to perform the activities they were being rehabilitated on before the onset of their disabilities. However, children with cerebral palsy may not be able to perform the daily living skills on their own from the time of birth. The present study therefore sought to find out how the age of children with cerebral palsy can influence their learning of activities of daily living.

Roseanbaum *et al* (2005) explored the differences in effectiveness on aerobic exercise capacity in children and adults. The results showed that the aerobic capacity, as measured in 10-30 all out exercise, is much lower in children compared with adults. Anaerobic capacity increases throughout childhood and adolescence, with the greatest changes occurring between the ages 9 and 15. As with aerobic capacity and strength, there are a few sex differences before age 9, with sex differences emerging between the ages 10 and 13 in girls. An aerobic capacity breaks between ages 14-16 in girls but continues to increase until at least age 20 in boys, the differences are due to increased muscle mass associated with growth and maturation in boys. The differences in anaerobic capacity between children and adults persist even when values are adjusted in body mass or muscle. The study was done with children and adults with motor disabilities. Children with motor disabilities may have different challenges from children with cerebral palsy. The present study therefore focused on how age of children with cerebral palsy may influence their response to motor skill training in the performance of activities of daily living.

(Majnemer, et al., 2009) carried out a study in Zimbabwe on the performance of activities of daily living among youths and younger children. The study findings showed that youths with different primary disability classifications differ dramatically in the frequency with which they perform the activities of daily living. The practices on the activities are more difficult for youths with orthopedic impairments, cerebral palsy, autism and those with multiple disabilities. However, this is not always the case with younger children with the same conditions; younger children with orthopedic cases learn faster than the old ones.

Dendevoort, Roebroek, Wiegenrinik, Van Der Heijden and Stam (2007) conducted a study in South Africa among children with cerebral palsy. The study findings revealed that children with hemiplegic cerebral palsy, aged 3 to 12 years performed significantly better than older children when trained in the activities of daily living for motor skill ability. While the study was done in South Africa with children with hemiplegic cerebral palsy only the present study was conducted in Kenya with children with all types of cerebral palsy. The children with hemiplegic cerebral palsy across all ages may respond differently to motor skill training from children with monoplegic, diplegic or quadriplegic, depending on the part of the body affected and how severe the effects are. The present study therefore focused on the influence of age in the performance of activities of daily living of pupils with all types of cerebral palsy before, during and after motor skills training.

(Donkervoort, Roebroek, Wiegeninks, Van der Helijden, & Stam, 2007) observed that older students with physical challenges fight against all the odds to be able to perform certain activities of daily living independently. This is in agreement with (Majnemer, et al., 2009) who report that as youths mature, it is often expected that they take on responsibilities within the home such as preparing their own meals, straightening up their room and doing their laundry. In addition (Waehrens, Amris, & Fisher, 2010) reports that youth begin to function more independently outside home especially when they are at school, where they are responsible for their own feeding, bathing, dressing and cleaning. These kinds of daily living skills can measure both youth's competence and independence. However, younger children especially those with disabilities are used to things being done for them. The case of children with cerebral palsy might be different from the cases of other children with physical challenges. Children with physical challenges other than cerebral palsy might have been able to perform certain activities of daily living before the onset of a disability which could have been as a result of an accident or a disease. Children with cerebral palsy on the other hand had never performed any activities of daily living before and therefore their training might be more difficult. That is why the present study focused on the age difference and its influence on learning of activities of daily living by pupils with cerebral palsy before, during and after motor skill training.

The reviewed literature showed that age difference was a secondary factor that influenced the effectiveness of motor skills training in the performance of dressing as an activity of daily living and not a main factor.

#### **GOAL:**

The study explored the influence of age differences in response to motor skill training for the acceleration of performance of the activities of daily living by learners with cerebral palsy.

#### **Design:**

Experimental method was used with observations for data collection, this was done with the use of Kruskal Wallis test.

#### **Sample Size:**

The sample size included fourteen (14) learners with cerebral palsy, eight (8) parents of learners with cerebral palsy, three (3) teachers incharge of the learners with cerebral palsy in the school, and two (2) physiotherapists. All the groups of participants were sampled through purposive sampling methods.

#### **Research Instruments:**

Observational checklist was used as the primary source of data collection. Secondary sources for supporting data was collected through interviews with teachers, parents and physiotherapists.

#### **Procedures for data collection:**

To establish whether age difference had influence in response to motor skill training on the performance of activities of daily living, fourteen pupils with cerebral palsy were divided into three age groups. The first group had 4 pupils who were aged between 9 – 12 years, the second group had 7 pupils with cerebral palsy who were aged between 13-14 years, and the third group were 3 learners with cerebral palsy aged 15 years and above. A pre test was carried out for the fourteen learners and their performance recorded before any training was given to them. Motor skill training programs was then administered to them for a period of three months. Observations were made during training sessions and their progress recorded. A post-test was then done and their performance recorded and compared to their pre-test performance.

#### **DATA ANALYSIS:**

Quantitative data was analyzed with the use of descriptive and inferential statistics with the statistical package for Social Sciences (SPSS) version 20. Kruskal Wallis test was performed. Scores were converted to ranks and the mean rank for each group was compared. Qualitative data analysis was done through thematic analysis.

**FINDINGS:**

To establish whether age difference had effect in response to motor skill training on the performance of Activities of Daily Living by pupils with cerebral palsy, Kruskal-Wallis test (sometimes referred to as the Kruskal-Wallis H Test) was performed. This is the non-parametric alternative to a one-way between-groups Analysis Of Variance (ANOVA). Scores were converted to ranks and the mean rank for each group was compared. Given that this was a ‘between-Groups’ analysis, different participants were to be in each of the three different age groups; “9-12 years”, “13 – 14 years” and “<15 years”. This is presented in table 6.1 below.

**Table 6:1 Kruskal-Wallis test Research Question Test Summary**

	Statistical significance	Test	Sig.	Decision
1	The medians of Post-Test are the same across categories of Age.	Independent-Samples Median Test	.189	No statistical significance

Asymptotic significances are displayed. The significance level is .05.

From the Kruskal-Wallis test results, shown in the SPSS output in Table 6.1, the  $p = .189$  at significance level of .05 indicate that there was no statistically significant difference in the level of response to motor skills training on the performance of Activities of Daily Living by learners with cerebral palsy across the three age groups. Hence, a conclusion that age did not affect response to motor skills training on the performance of activities of daily living was plausible.

Given the fact that statistical significance was not achieved, there was no need to go further to inspect the Mean Rank for the three groups or to compute multiple correlations (Post Hoc Tests). This finding was very interesting that growth and development acquired as one gathers years did not seem to confound on age, as an independent variable and performance as a dependent variable, of the pupils with cerebral palsy. This was confirmed in the observable natural setting when the pupils were being trained on the motor related skills. Their performance entirely depends on the severity of their disability and not their age. After training, different test items were listed for fine motor muscle test and gross motor muscle tests. Test items for fine motor muscles, included threading, picking seeds, tying shoes laces, zipping, finger manipulation and dress manipulation. Test items for gross motor muscles included raising hands, playing with a ball, crawling, raising legs, and dress manipulation. The activities listed were administered in a fixed sequence and 15 minutes endurance shuttle run was the last test item for all the 14 children. Before each test item was administered, the skill being assessed was demonstrated and instructions were provided. Adjustments were made for some test items according to individual needs and not according to age.

During the 15 minutes endurance tests the number of completed stages were displayed using pictures. The performance of 4 children aged between 9-12 years were compared with those of 2 children aged 13 years and 14 years and those above 15 years by means of ANCOVA with age and sex as concavities. The association between age difference and the level of performance was examined by means of ANCOVA analysis per task. The results are shown in 6.1 significant overall effect of age.

Whereas older pupils who were severely affected experienced a lot of difficulties in the performance of certain activities for daily living, younger pupils with mild cerebral palsy were significantly better.

Fine motor skills that include hand coordination, finger dexterity and objects manipulations proved to be more difficult for older pupils with cerebral palsy than to younger pupils with cerebral palsy. Hand strength, muscle grading and applying of correct amount of pressure for performance of activities as well as use of hands simultaneously seemed more difficult to younger pupils with Cerebral Palsy than to older pupils with cerebral palsy. This finding concurs with Livingston et al (2011) who reported that most youths with severe physical challenges have mastered the skills of activities of daily living even though their performance is with alot of difficulties as compared to the younger children with cerebral palsy. This is in corroboration with (Olaf, et al., 2009), who reported that younger children with cerebral palsy respond faster to exercise oriented therapies intended for the performance of activities of daily living than adults.

Interviews with the physiotherapists revealed that age appropriate capabilities for growth and development are certainly important for functional activities as well as independent daily and social living for children with cerebral palsy; however balanced development of physical and cognitive functioning is rare in children with cerebral palsy. The temporal development of children with cerebral palsy is affected across all age groups by

abnormal posture, muscle and joint contractures, malformation, visual impairment, sensory impairment and other major functions. One of the physiotherapists concluded by saying:

"Even though younger children are easier to train in the performance of the physical activities of daily living than the older ones, when it comes to children with cerebral palsy, their ability to learn entirely depends on the severity of the disability and not on the age of the child".(Physiotherapy, 2)

Both old and young pupils with cerebral palsy found it difficult to twist or rotate main parts of their body which made it difficult for them to dress independently. Due to floppiness and stiffness of their fingers and arms, they were not able to manipulate small objects that required finger dexterity especially after only a short period of training. The use of gross motor muscles involved appeared to be more difficult to younger children than the older ones. Older pupils with cerebral palsy appeared physically stronger than younger pupils. Overall performance, and endurance in the training of activities of daily living increased with age and the older pupils seemed more eager to care for themselves than the younger pupils with cerebral palsy. This could be attributed to the fact that the younger children were contented with the way things were done for them out of sympathy by both their parents and friends without any embarrassment while the older ones felt embarrassed when they were not able to perform certain activities that required privacy on their own.

There are several explanations for lower performance among younger children. (Taylor, 2007) distinguished two factors that influence motor performance in children with cerebral palsy. One factor that might have played a role was lack of awareness of the existence and the relevance of the skill for personal use among younger pupils with cerebral palsy, whereas older pupils with cerebral palsy at some stages in life feel embarrassed when they are being assisted. Being aware of the existence and the relevance of the skill and being aware of their deficiency in this area, ideally by attempting to use the skill and failing. The older children then realize that by improving their skill or ability in the area, their effectiveness will improve and therefore makes a commitment to learn and practice the new skill however difficult it may be.

According to (Capture & Accado, 2008) each type of cerebral palsy has its different types of challenges and therefore the impact of cerebral palsy on an individual varies with the extent to which the individual's brain is affected and not according to age. Never the less it is assumed that younger children with tender muscles can be in a better position to learn new skills than older children with cerebral palsy whose muscles have grown older and stiffer. In addition, there was some evidence that inferior motor muscles might have negatively affected performance of younger pupils with cerebral palsy than the older ones.

Three environmental factors might have played a role in the present study. First it was likely that younger pupils with cerebral palsy received more of sympathy from care givers than older pupils with cerebral palsy. Parents and care givers of older pupils with cerebral palsy and the pupils themselves felt embarrassed being helped with the performance of certain activities that required privacy such as bathing, toileting and dressing, this made them struggle to be independent. It also emerged that in the institutions such as homes and schools, younger children with cerebral palsy were not given the opportunities to do things for themselves. The older children with cerebral palsy were sometimes left for a long time without help to encourage them to be more independent. This made them feel frustrated hence the struggle to be independent.

A striking finding in children with cerebral palsy was noticed between younger children with cerebral palsy and older children with cerebral palsy especially the paraplegics and quadriplegics, more so, in the use of legs. In monoplegic, hemiplegic and diplegic cases, the older children performed better than younger ones. An explanation for these findings being that in paraplegia both legs are severely affected and in quadriplegia all the four limbs are severely affected in these two cases, the legs cannot be used even with training. In monoplegia, only one limb is affected it could be one leg or one arm and with training a child can use any of the remaining three limbs effectively to perform certain activities of daily living. In paraplegia, both legs are affected but the hands are not affected and can be effectively used for daily activities. In hemiplegia, one side of the body is affected and with training the child can be able to use the remaining side to care for themselves. In triplegia, three limbs are affected, it could be both legs and one arm or two arms and one leg, the child can still be trained to use the remaining limb for the performance of activities of daily living.

Findings by Livingstone *et al* (2011) showed that most youths with severe physical disabilities master the skills of activities of daily living faster as compared to younger children with physical disabilities. (Donkervoort, Roebroek, Wiegeninks, Van der Helijden, & Stam, 2007) similarly observed that older students with physical challenges fought against all the odds to be able to perform certain activities of daily living independently outside their homes, especially when they were in schools as compared to young ones with physical challenges.

Waeherenset al (2010) in corroboration reported that when youths with physical disabilities mature, they try by all means to function independently, whereas the young ones feel comfortable when they are helped with the activities of daily living. On the contrary, a study by (Majnemer, et al., 2009) in Zimbabwe recorded that younger children with Orthopedic cases learn the activities of daily living faster than the older ones.

The performance of activities of daily living proved to be a very difficult task for pupils with cerebral palsy of all ages. Lack of flexibility in both the fine and gross motor muscle might be the influence behind the impossibility to function well. In general the less severely affected a child is, the earlier, the child is able to learn how to dress, irrespective of age. The difference in performance between younger pupils with cerebral palsy and older pupils with cerebral palsy favoring the latter, increased with age in hand grip.

The findings on age difference in response to motor skill training on the performance of activities of daily living by pupils with cerebral palsy revealed that the difference in performance between younger pupils with cerebral palsy and older pupils with cerebral palsy favored the latter, their performance only increased with age in hand grip, strength and endurance. Whereas older pupils who were severely affected experienced a lot of difficulties in the performance of certain activities related to dressing, younger pupils who had mild cerebral palsy were significantly better. Fine motor skills that include hand coordination, finger dexterity and objects manipulations proved to be more difficult for older pupils with cerebral palsy than to younger pupils with cerebral palsy. Hand strength, muscle grading and applying of correct amount of pressure as well as use of hands simultaneously seemed more difficult to younger pupils than to older pupils with cerebral palsy. Older pupils with cerebral palsy seemed more eager to learn different skills than younger pupils with cerebral palsy. Age did not affect much of the response to motor skill training on the performance of the activities of daily living. Both old and young pupils with cerebral palsy found it difficult to twist or rotate the main parts of their body which made it difficult for them to care for themselves independently. Lack of flexibility in both the fine and gross motor muscles contributed to the impossibility to function well by pupils with cerebral palsy. After motor skills training on the fine and gross motor muscles, younger pupils with cerebral palsy were able to perform better in fine motor related activities than the older pupils with cerebral palsy. On the other hand, older pupils with cerebral palsy performed better in the gross motor related activities than the younger pupils with cerebral palsy. Due to floppiness and stiffness on the fingers and arms of pupils with cerebral palsy, majority of the pupils were still not able to manipulate small objects especially after a short period of training.

### CONCLUSION:

The performance of daily living activities proved to be difficult for pupils with cerebral palsy of all ages even after training. However older pupils seemed more determined to learn the skills for performing activities of daily living than younger pupils. In general the less severely affected the child is, the earlier the child is able to learn how to be independent irrespective of age. Both the old and young pupils with cerebral palsy found it difficult to twist or rotate the main parts of their body which made self care very difficult for them. The use of gross motor skills appeared more difficult to younger pupils than to the older pupils. On the other hand the performance of fine motor skills appeared more difficult to the older pupils than to the younger pupils. It emerged that younger children with cerebral palsy were not given opportunities to be independent in performing the activities of daily living while the older ones were most of the times left to do things for themselves and as they struggled to fight against all the odds they learnt to be as independent as possible.

### RECOMMENDATIONS:

Parents sensitization should be made available so that children born with cerebral palsy are trained right from early stages on the performance of activities of daily living.

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