ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

CO-RELATIONSHIP BETWEEN IMPAIRED COORDINATION AND FINGER DEXTERITY WITH UPPER LIMB ACTIVITY IN CHRONIC STROKE PATIENTS

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Manuscript Info

Manuscript History:

Received: 15 July 2014
Final Accepted: 29 August 2014
Published Online: September 2014

Key words:
Stroke, coordination and finger dexterity.

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Abstract

To study co-relationship between impaired coordination and finger dexterity with upper limb activity in chronic stroke patients.

Materials and Methods Upper limb activities was measured or evaluated with the help of chedoke arm hand activity inventory (CAHAI) and motor activity log (MAL) and impairment was measured with purdue peg board.

Results

Results of our study show that capacity of paretic upper limb in the completion of ADL's and participant performance in ADL's had strong correlationship. The impaired coordination and finger dexterity had weak correlationship with the capacity of the paretic upper limb in completion of ADL's. These results show that participants has weak significant correlationship between impaired coordination and finger dexterity with subject's capacity of the paretic upper limb in the completion of activities of daily living. The results of the study found no correlation between the quality of movement and the amount of use with impaired coordination and finger dexterity.

Conclusion

In our study we obtained clinical significant correlationship and weak statistical significance between impaired coordination and finger dexterity with upper limb activity in chronic stroke patients.

Introduction

Stroke is an acute onset of neurological dysfunctions due to abnormalities in cerebral circulation with resultant signs and symptoms that correspond to involvement of focal areas of brain. According to World Health Organization 'stroke is defined as rapidly developed clinical sign of a focal disturbance of cerebral functional of presumed vascular origin and of more than 24 hrs duration'.[1]

Stroke is one of the leading causes of disability in the older population and can significantly affects aspects of a person's physical, emotional and social life. Incidence of stroke increases dramatically with age doubling every decade after 55 years of age. [2,3] Incidence of stroke is about 19% higher for males than females. The best estimate derived was 102,000 deaths which represented 1.2% of total deaths in the country. [4] As the stroke mortality rates decline individuals are more likely to have residual impairments that could affect daily living. More than 80% individuals with stroke experience hemi paresis[5,6] and of those people who initially have upper extremity paresis, it is estimated that 70% have residual impairment.[7] Many of them do not regain functional use of the Paretic arm,

which can lead to difficulties in activities of daily living (ADLs) and engagement in community life. The return of upper limb function has been identified as an important rehabilitation goal. The upper limb impairment following stroke can include weakness, pain, sensory loss, impaired dexterity and impaired co-ordination.[7, 8]

Variables like co-ordination and finger dexterity assist clinician in effective treatment planning during rehabilitation[9] .The choice of these two impairment variables was based on their importance in upper limb function after stroke. The upper limb makes a significant contribution to most activities of daily living and impairment can compromise participation in man of this essential and meaningful tasks.[10, 11, 12, 13]

Purdue peg board measures two types of dexterity involving gross movement of hands, finger and arm, finger tip dexterity. Krunal Deasi, Virti Kene and et al.[14]done study on Normative data of Purdue peg board on Indian population to study dexterity. Results of this study indicated that as age increases dexterity decreases. Desrosiers J, Herbert R and Colleagues[15] and Jennifer Gallus, Virgil Mathiowetz[16] done study to verify the test-retest reliability (ICC=0.66-0.99) the results shows that the test-retest reliability of purdue peg board is good. Upper limb activities can be measured or evaluated with the help of chedoke arm hand activity inventory (CAHAI) and motor activity log (MAL). The CAHAI was used to evaluate the capacity of paretic upper limb in the completion of ADL. High internal consistency (cronbach alpha=.98) and excellent inter-rater reliability (ICC-.98) and face and content validity has been reported[17].

J.H. Vander Lee and colleagues[18]done study on clinimetric properties of the motor activity log for the assessment of arm use in hemiparetic patients. They conclude that the MAL is internally consistent and relatively stable in chronic stroke patients not undergoing any intervention. Wennis A. Nowak and colleagues[19] concluded that the Stroke subjects exhibited significant deficit in timing and coordination of tapping of movements at both the contralesional and ipsilesional hands. Results suggest that strong correlations were found between clinical scales of hand function and loss of sensibility with the deficit in timing coordination and efficiency of movement of the contralesional and ipsilesional hand. These data provide evidence that dexterity is impaired at both hands after sub cortical middle cerebral artery stroke.

Relatively few studies have explored the relationship between specific upper-limb impairments such as altered tone and muscle weakness and upper limb function during ADL. In previous research weakness was correlated with poor performance in hand to mouth action (r=0.83) and ADL performance as measured with upper extremity performance test for the elderly (r=0.83-0.88)[20] whereas tone did not correlate with functional movement. Only one study[21] assessed the contribution of several impairment predictors (motor recovery, tone and sensation) to establish the most important factor of arm function. Therefore our objective was to determine the relationship between impaired co-ordination and finger dexterity with upper limb activity in chronic stroke patients.

METHODOLOGY

Sample of convenience were taken based on inclusion and exclusion criteria. Subjects included single stroke more than six months of duration, had ability to provide informed consent, were able to perform the test and should have score of more than 23 on mini mental status examination. People with significant musculoskeletal problems (arthritis, previous Fracture of arm that caused the deformity, muscle atrophy), neurological condition other than stroke e.g. Parkinson's disease, multiple sclerosis and receptive aphasia were excluded from the study. All subjects were made aware of the purpose and procedure of the study.

PROCEDURE

MEASURES OF IMPAIRMENT: PURDUE PEG BOARD

In Purdue pegboard test 4 subtests are used i.e. right hand subtest, left hand subtest, both hand subtest and assembly.

RIGHT HAND SUBTEST

Ask subject to pick up one pin at a time with right hand from right hand cup. Starting was with top hole, patient has to place each pin in right hand row. During testing if subject drop pin during activity he or she was asked to carry on with next pin without picking the dropped one .This is to be done for 30 seconds. All subjects performed 3 practices of trials. At the end of exactly 30 seconds the subjects was asked to stop. The numbers of pins inserted were counted which were taken as right hand score. Instructions were given to the subject similar to that given for right hand subtest to perform the left hand and both hand subtest.

ASSEMBLY

Sequence consists of assembling pins, collars and washers. The required test was demonstrated as follows: Pick up one pin from right hand cup with your right hand. And while Subjects were asked to place it in top hole in right hand row, pick up a washer with left hand. As soon as pin has been placed, drop the washer over the pin while the washer

is been placed over the pin by left hand. Pick up a collar with right hand while collar is been dropped over then pick up other washer with left hand and drop it over the collar. This completes first assembly. While final washer for first assembly was being placed with left hand start 2nd assembly by picking up another pin with right hand, place it in next hole, drop washer over it with left hand and so on completing another assembly till one minute. At end of exactly one minute the subject will be asked to stop. The numbers of parts assembled were recorded giving the score for assembly.[14]

SCORING

1. For right and left hand each properly inserted pin is equal to one point.
2. For both hands each pair of pin properly inserted is equal to one point.
3. Each assembly is four points. If in one minute subject completes 13 complete assembly and pin & first washer of 14th assembly are properly placed. The score is 13 multiply by 4 = 52.

MEASURES OF ACTIVITY:

Chedoke arm hand activity inventory (CAHAI) was used to evaluate the capacity of upper limb in the completion of ADL. Subjects were used both hand to complete the task. The totals of 13 tasks were included in the CAHAI e.g. pouring, buttoning, zipping. Scoring was done on a 7-point ordinal scale (1=total assistance and 7=complete independence). Scoring was based on the percentage of contribution to each task by the paretic upper limb. For example an individual would score 7 on the jar opening task if he or she was able to hold the jar in the non-paretic hand and open it with paretic hand. A score of 3 means that the individual was able to use the paretic hand to stabilize and manipulate the jar but requires hand over hand guidance (50%-74% contribution of the paretic upper limb).[17]

The motor activity log was used to measure each participant's performance in ADL. The MAL was a semi structured interview that consists of 14 ADL items. Scoring was completed using two scales (1) Amount of use scale (0-5) and (2) quality of movement (0-5).[18]

Data analysis

Statistics were performed using the SPSS software. Descriptive statistics were used to show participates demographics and study measure. Correlation analysis was used for determining the strength of relationship between variables of upper limb impairment i.e. coordination and finger dexterity and variables of upper limb activity on two scales motor activity log and chedoke arm and hand activity inventory. A value of $P \leq 0.5$ was considered significant in all calculations.

RESULTS

A total of 90 subjects included in the study. Out of these 60 subjects were male and 30 were female subjects. Out of all 90 subjects 52 subjects were left side hemiplegic patients and 38 subjects were suffering from right side hemiplegia. All the subjects were chronic patients who had stroke before 6 months. Many were independently working before stroke. After stroke they had to leave their work because of impairments after stroke.

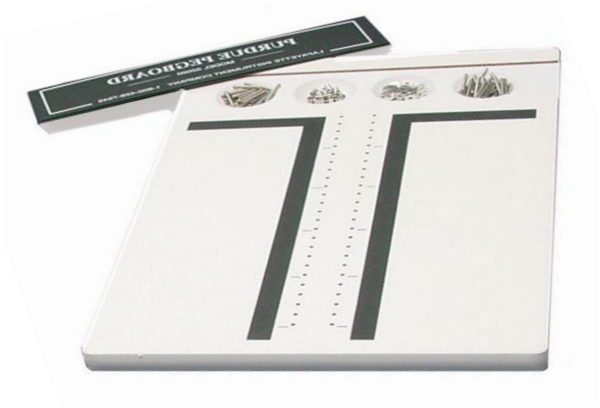

Fig. 1 Purdue Peg Board

Table 1 Mean and standard deviation value of purdue peg board (1), chedoke arm and hand activity inventory (2), motor activity log-quality of movement (3) and amount of use (4).

Variable	**Mean X**	**Standard Deviation**
Purdue peg board	31.8	10.9
Chedoke Arm and hand Activity Inventory	55.5	14.3
Motor Activity log - Quality of movement	40.0	8.4
MAL- Amount of use	32.8	8.2

Table 2 Statistically no significant correlations were found between the impaired coordination and finger dexterity with upper limb activity log. Quality of movement (QOM) of motor activity log r=.18 and amount of use (AOU) of motor activity log r=.028. Upper limb activities measured with chedoke arm and hand activity inventory and with motor activity log are strongly correlated statistically

VARIABLE	CHEDOKE ARM AND HAND ACTIVITY INVENTORY	MOTOR ACTIVITY LOG QOM	MOTOR ACTIVITY LOG AOU
PURDUE PEG BOARD	.216 (*)	.181	.028

Table 3 upper limb activity with chedoke is strongly correlated with quality of movement of upper limb r=.714, p<.01. Upper limb activity with chedoke is also strongly correlated with amount of use when measured with motor activity log r=.588, p<.01. These results show they are strongly correlated with each other.

VARIABLE	MOTOR ACTOVITY LOG QOM	MOTOR ACTIVITY AOU
CHEDOKE ARM AND HAND ACTIVITY INVENTORY	.714 (**)	.588(**)

DISCUSSION

The study examined the strength of the relationship among the specific impairments and measures of activities (ADL's). We found that the impaired coordination and finger dexterity had weak relationship with upper limb activities in chronic stroke when measured with chedoke arm and hand activity inventory (CAHAI).There was very weak correlationship found between impaired coordination and finger dexterity with upper limb activities when measured with motor activity log (MAL).

Our study results had shown strong correlationship between measures of activity i.e upper limb activity with chedoke arm and hand activity inventory (CAHAI) and motor activity log (MAL).Results of our study show that capacity of paretic upper limb in the completion of ADL's and participant performance in ADL's had strong correlationship. These results show that participants has weak significant correlationship between impaired coordination and finger dexterity with subject's capacity of the paretic upper limb in the completion of activities of daily living. The results of the study found no correlation between the quality of movement and the amount of use with impaired coordination and finger dexterity.

The results of one study suggest that remediation of impaired coordination and finger dexterity may be clinically important for the recovery of the activities of daily living. Impaired coordination and finger dexterity were only weak contributing factor to upper limb performance in activity of daily living after stroke. However few studies have found that improvement in impaired coordination and finger dexterity helps in improvement of ADL's of paretic upper limb. This highlights the need for a study to be undertaken to clarify the role of upper limb coordination and finger dexterity for making improvement in upper limb performance.

The results of our study do not show that no relationship found between impaired coordination and finger dexterity but findings of the study suggest that impaired coordination and finger dexterity had minimal influence on upper limb activities of paretic upper limb. Our study suggest that even with report of impaired coordination and finger dexterity, these do not interfere significantly with activities of daily living and quality of life. In addition individuals in the chronic stage of recovery may adapt to impaired coordination and finger dexterity and thus do not report about impaired coordination and finger dexterity as interfering with performance in activities of daily living or participation. Impaired co-ordination and finger dexterity were weakly co-related with upper limb activities. Therefore our study suggests that the other parameters of upper limb are also important to stress upon. So this knowledge can assist clinician in making specific treatment interventions for improving condition of chronic stroke patients. Future research is recommended with larger sample size and suggested with subject treated for 3-4 week exercise protocol.

CONCLUSION

In our study we obtained clinical significant correlationship and weak statistical significance between impaired coordination and finger dexterity with upper limb activity in chronic stroke patients.

ACKNOWLEDGEMENT

The authors are thankful to subjects who participated in this study to carry out this work.

SOURCE OF FUNDING

The work done in the study has not been supported by any funding agency or supported by a grant and it has not been adapted from a conference presentation.

CONFLICT OF INTEREST

There was no conflict of interest.

ETHICAL CLEARANCE

The research was approved from the ethical committee of maharishi markendeshwar institute of physiotherapy and rehabilitation, mullana.

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