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Azzam reacquisition skill grading scale and its use in cerebral palsied children

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Abstract:
Background: *The goal of this work was to show the efficacy of gradual hand skills progression training evaluated by Azzam hand skills progression scale in reacquisition of hand dexterity in hemiplegic C.P. children.*
Method: *Group A (object manipulation with levels progression plus regular physiotherapy program), and group B (regular physiotherapy program only). Azzam reacquisition skill grading scale for detecting the intention level of hand skill progression to be the base of treatment. Modified Ashworth scale for detecting the reduction of spasticity and handheld dynamometer for detecting hand grip strength. This measurement was taken before initial treatment and after 3 months of treatment.*
Results: *Measurement scores were available on the 30 hemiplegic C.P. children shared in the study. The mean value of the study group had an expressive improvement at (post-treatment) ($p<0.05$) The variance between pre and post-treatment results was significant in the study group in all variables. By comparison of both groups in hand dexterity at post-treatment, there was an expressive improvement ($p<.05$). By comparison of all hemiplegic C.P. children in modified Ashworth scale variable at post-treatment, there was an expressive decrease in spasticity ($p<.05$). By comparison of all hemiplegic C.P. children in hand grip strength at post-treatment, there was an expressive improvement ($p<.05$). According to the outcomes of this study, it can be terminated that the combined effect of object manipulation with levels progression via Azzam reacquisition skill grading scale plus regular physiotherapy program can be recommended in improvement hand dexterity in hemiplegic C.P. children.*
Keyword: *hand dexterity- hand skills progression- hemiplegic C.P.*

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I. Introduction

The interruption of pyramidal tract systems after brain insults in C.P leading to impairment of the reciprocal inhibition between hand agonist and antagonist leading to clumsy uncoordinated movements which lead to deprivations of hand functions skills and impaired of activities of daily living.1

Acquisition of skill is the key , most important and difficult stage in motor learning development in which improvement occurs in motor control via activation of silent synapses of impaired skill. This lead to gaining all the acquired skill parameter(frequency, intensity, muscles shared in skill, sequence of movement and efficiency of movement) this may take a several years to be obtained .This means the acquisition of new skill. The second stage is the retention which is the ability to perform the newly acquired skill from the different static position. The third stage of motor learning is the transfer stage in which the acquired skill was performed in a dynamic situation and in different dynamic position.2

Skills can be divided into closed skill in which hand skill training was performed in a quiet room and open skill which require more challenges as it occurs in the open environment.3.Hand skills acquirement require several mechanisms of motor planning and coordination to allow free hand and finger movement which is impaired in cerebral palsy 4,5

The web space is an important anatomical structure that allowing for locating of hand shaping to be suitable for different object shape, size, weight, and texture of materials in addition to coordination of thumb with other fingers to get proper hand position suitable for object characteristics.6 plus intact hand proprioceptors is an important requirement for processing sensorimotor mechanism leading to hemispheric disinhibition allowing for reorganization recruitment of spared neurons to produce a new neural circuit.7,8

II. Material and Methods

Subjects

30 hemiplegic C.P. children from both sexes were randomly selected for this study, aged 5 to9 years at the time of recruitment because the children in this age who can understand the research work principles and rules were entered in the study. Body weight, height, and side of paralysis, type of involvement, level of ambulation were recorded for each subject. The excluded criteria include children who had previous hand surgery or upper limb butollonium toxin injection.

Children were randomized to:

Group A (with levels progression): performed with object manipulation(size, shape, weight, texture of material, reaction time, speed, accuracy and number of trials) with levels progression plus treated by regular physiotherapy program involve 15 patients

Group B (without levels progression): performed without object manipulation and without levels progression. Consisted of 15 patients were treated by regular physiotherapy program only.

Outcome measurements

(1)- Azzam reacquisition skill grading scale:

It consists of 42 subtests according to 8 parameters including :

-Object characteristics (size, shape, weight, and texture of material):

Size: small-big **Shape:** rectangular-square-circular **Weight:** heavy-light

Texture of material: rough- smooth

- Plus factors affecting on performance (reaction time, speed, accuracy, and numbers of trials).

Time: elevated or diminished **Speed:** elevated or diminished

Accuracy: elevated or diminished **Numbers of trials:** elevated or diminished

Guidelines scoring of subtests: table (1)

We start evaluation by detecting the intention level of hand skill progression in all tests. The scale consists of 42 subtests of hand skill levels progression Each subtest is scored by the examiner on a scale from I to V points according to the guidelines for scoring. Rating scale grade from I (complete loss of hand skills) to II(Poorly developed skill) to Ш(Acceptable developed skill) to IV (Nearly developed skill) to V (complete re-acquisition of hand skills) A cut-off score of 21 suggests a partial loss of hand skills(grade Ш of skill). The score was calculated by detecting the level of progression could be reached.

Azzam subtests hand skill levels of progression: table (2)

Using Azzam reacquisition skill grading scale by manipulating the object characteristics according to 8 parameters and 42 subtests levels of progressions this lead to the dedication of the progression level of hand dexterity. Started with(1-Big object, rectangular shape, rough, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials) and the last and more difficult one is(42-Small object, circular, smooth, light, ↓time, ↑speed, ↓accuracy, ↑number of trials) It was performed before starting the therapy and after 12 weeks of it.

Table (1): Guidelines scoring of subtests

Skill grade	Description	Characteristics	Initial assessment	Levels training
I	**Lost skill**	**Can not perform the first level of skill progression**	**For locating the skill level of progression Then by re-evaluation for locating the new level**	**Gaining of the specific level of progression obtained by massed practice at that level**
II	**Poorly developed skill**	**Can perform less than 10th levels of progression**		
Ш	**Acceptable developed skill**	**Can perform less than 20th levels of progression**		
IV	**Nearly developed skill**	**Can perform all levels of progression except the last one**		
V	**Well developed skill**	**Can perform all levels perfectly**		

Table (2): Azzam subtests hand skill levels of progression

1-Big object, rectangular shape, rough, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials	**22-Small object, rectangular, rough, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials**
2-Big object, rectangular shape, rough, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials	**23-Small object, square, rough, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials**
3-Big object, square shape, rough, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials	**24-Small object, square, rough, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials**
4-Big object, square shape, rough, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials	**25-Small object, circular, rough, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials**
5-Big object, rectangular, rough, light, ↑time, ↓speed, ↑accuracy, ↓numbers of trials	**26-Small object, circular, rough, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials**
6-Big object, rectangular, rough, light, ↓time, ↑speed, ↓accuracy, ↑number of trials	**27-Small object, rectangular, smooth, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials**
7-Big object, rectangular, smooth, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials	**28-Small object, rectangular, smooth, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials**
8-Big object, rectangular, smooth, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials	**29-Small object, rectangular, rough, light ↑time, ↓speed, ↑accuracy, ↓numbers of trials**
9-Big object, circular, rough, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials	**30-Small object, rectangular, rough, light, ↓time, ↑speed, ↓accuracy, ↑number of trials**
10-Big object, circular, rough, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials	**31-Small object, square, rough, light ↑time, ↓speed, ↑accuracy, ↓numbers of trials**
11-Big object, rectangular, smooth, light, ↑time, ↓speed, ↑accuracy, ↓numbers of trials	**32-Small object, square, rough, light, ↓time, ↑speed, ↓accuracy, ↑number of trials**
12-Big object, rectangular, smooth, light, ↓time, ↑speed, ↓accuracy, ↑number of trials	**33-Small object, rectangular, smooth, light, ↑time, ↓speed, ↑accuracy, ↓numbers of trials**
13-Big object, circular, smooth, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials	**34-Small object, rectangular, smooth, light, ↓time, ↑speed, ↓accuracy, ↑number of trials**
14-Big object, circular, smooth, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials	**35-Small object, square, smooth, light, ↑time, ↓speed, ↑accuracy, ↓numbers of trials**
15-Big object, circular, smooth, light, ↑time, ↓speed, ↑accuracy, ↓numbers of trials	**36-Small object, square, smooth, light, ↓time, ↑speed, ↓accuracy, ↑number of trials**
16-Big object, circular, smooth, light, ↓time, ↑speed, ↓accuracy, ↑number of trials	**37-Small object, circular, smooth, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials**
17-Big object, rectangular, rough, light ↑time, ↓speed, ↑accuracy, ↓numbers of trials	**38-Small object, circular, smooth, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials**
18-Big object, rectangular, rough, light, ↓time, ↑speed, ↓accuracy, ↑number of trials	**39-Small object, circular, rough, light, ↑time, ↓speed, ↑accuracy, ↓numbers of trials**
19-Big object, square, rough, light ↑time, ↓speed, ↑accuracy, ↓numbers of trials	**40-Small object, circular, rough, light, ↓time, ↑speed, ↓accuracy, ↑number of trials**
20-Big object, square, rough, light, ↓time, ↑speed, ↓accuracy, ↑number of trials	**41-Small object, circular, smooth, light ↑time, ↓speed, ↑accuracy, ↓numbers of trials**
21-Small object, rectangular, rough, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials	**42-Small object, circular, smooth, light, ↓time, ↑speed, ↓accuracy, ↑number of trials.**

A modified Hand manual dexterity could be evaluated by box and blocks test via Azzam reacquisition skill grading scale. It consists of a wooden box divided by a partition and contains several objects. Each level consists of 20 blocks has the identical characteristics. To achieve level 1 you should manipulate the 20 block of level 1 to the other side in 60 seconds. once the patient gets to level 1 he transfers to level 2 to achieve this level he should manipulate the 20 blocks of level 2 to another side in 60 seconds and so on till the child achieve level 42 after that he has got the reacquisition of the skill (Fig.1).

Figure 1): Modified Hand manual dexterity test .9

2)- Modified Ashworth scale: used in detecting of grade of spasticity
(3)- Handheld dynamometer: is considered an indicator of fine motor skills used in the evaluation of hand grip motor control.

Intervention
For both groups before and after treatment:
Both groups (A and B) received a traditional physiotherapy program, as the following:
1. Hot packs to improve circulation and decrease the degree of tightness applied to the upper limb muscles for 20 minutes.
2. Facilitation of anti-spastic muscles (extensors of upper limb and flexors of lower limbs): facilitate muscle contraction by (tapping, apply fast and short stretch ,facilitate protective reaction by produce painful stimuli of L.L to inhibit extensor spasticity, increase muscle pull via bearing the weight ,proprioceptive training , musculotendinous junction sensory stimulation, firing of motor neuron pool by junderasic maneuver and irradiation , brief time icing).
3. Prolonged stretch to inhibit released abnormal pattern and decrease the degree of spasticity (antispastic positioning, static splint, inhibition of released abnormal pattern, NDT) for 20 minutes.
4. Passive stretching to tight muscles (wrist flexors+ biceps brachii
+pronators+ iliopsoas and rectus femoris and adductors+ hamstring+ tendon-Achilles muscles) to destruct adhesions in muscles and sheath. It must be a decent gentle gradual stretch not over stretch at all, lasting 20 seconds then relaxation 20- seconds 3-5 times per session then maintain the new range by using an adjustable splint.
5. Graduated active exercise in trunk muscles.
6. walking training using aids in a closed environment using obstacles, side walking followed by pass walking to stimulate protective reaction.
7. Balance training program which includes static and dynamic training.
8. Faradic stimulation of anti-spastic muscles. To prevent cross electricity to reach spastic muscles because these higher excitable tissues are more attractive to respond to electric stimulation than the less excitable. Mother was asked to support wrist and foot in function positioning during NEMS for 15 minutes.

The experimental group (group A) received specialized progression skill training exercise program as following:

In accordance with the level of skills progression determined by evaluation. Massed practice hand skill training was performing at that level determined before till the patient can perform this level perfectly. Transfer to the following level of skill progression is directly after and massed practice was performed till this level be acquired. Then to the following level till reaching the final level of skill progression in which impaired skill was acquired.

Hand skill levels progression training according to Azzam reacquisition skill grading scale:
The easiest level is a Big object, rectangular shape, rough, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials.
The most difficult one: Small object, circular, smooth, light, ↓time, ↑speed, ↓accuracy, ↑number of trials.

III. Results

Patients' characteristics.

The table 3 displays the patient's characteristics. There were 17 boys (56,66%) and 13 girls (43.33%). and in terms of the side of affection reported in 18 patients (60%) RT hand affection, and also12 patients (40%) were left-hand affection. There was no representative difference in all children in terms of age (p=0.8990), in terms of sex (p= 0.2849) and in terms of the side of affection (p= 0.4734).

Table 3: Patients' characteristics.

Variables	Study group N=15	Control groupN=15	P-value
Age	10±1.46	9.93±1.39	0.8990
Sex N% Boys Girls	7 (46.67%) 8 (53.33%)	10 (66.67%) 5 (33.33%)	0.2849
Side of affectionN% Right Left	10 (66.67%) 5 (33.33%)	8 (53.33%) 7 (46.67%)	0.4734

Changes in hand dexterity

Mean test scores and SD for both groups are displayed in table 4. The mean record of hand dexterity variable in both groups (assessed by modified hand tool dexterity test via Azzam reacquisition skill grading scale) at baseline measurement (pre-treatment) was insignificant (p>0.05).While study group had a highly statistical progress in hand dexterity post-treatment(p<.05)while there is statistical progress in the treatment group. The average progress of hand dexterity variable tended to be highly significant in the experimental group (33.07±8.10versus35.00±8.45, p=0.0013) while significant result in the control group (33.93±8.35versus35.00±8,73, p=0.0334). The percentage of progress of hand dexterity was (5.51%) in the experimental group compared to the (3 .05%) in control group.

Table 4: The average test of hand dexterity variable in both groups.

Hand dexterity variable	Study group Mean±SD	Control group Mean±SD	P-value (within groups)
Pre-treatment	35.00±8.45	35.00±8,73	1.0000
Post-treatment	33.07±8.10	33.93±8.35	0.7751
Improvment%	5.51%	3 .05%	0.1693
P-value (within groups)	0.0013	0.0334	

Spasticity changes:

Mean test scores and SD for all hemiplegic C.P. children are displayed in table 5. The mean value of spasticity reduction variables in both groups (assessed by modified Ashworth scale) at baseline measurement (pre-treatment) was insignificant (p>0.05). The average improvement of spasticity reduction variables moves toward being highly significant in the study group (1.80±.77 versus 2.27±0.70, p=0.0035) while significant result in the control group (2.27±1.03versus2.53±1.13, p=0.0406). The percentage of improvement of spasticity reduction variable was (20.7%) in the study group compared to the (10.28%) in control group.

Table 5: The average test of spasticity reduction variable in both groups.

Spasticity reduction variable	Study group Mean±SD	Control group Mean±SD	P-value (within groups)
Pre-treatment	2.27±0.70	2.53±1.13	0.4430
Post-treatment	1.80±.77	2.27±1.03	0.1725
Improvment%	20.7%	10.28%	0.1361
P-value (within groups)	0.0035	0.0406	

Hand grip variable changes:

Mean test scores and SD for all hemiplegic C.P. children are displayed in table 6. The mean value of hand grip variables in both groups (assessed by hand-held dynamometer) at baseline measurement (pre-treatment) was insignificant (p>0.05). The average progress of hand grip variables moves toward being highly significant in the experimental group (6.93±1.22versus5.67±1.59, p=.0.0001)while significant result in the treatment group (6.00±1.65versus5.67±1.45, p= 0.0192). The percentage of progress of hand grip variables variable was (22.22%) in the study group while (5.8%) in control group.

Table 6: The average test of hand grip variable in both groups.

Hand grip variable	Study group Mean±SD	Control group Mean±SD	P-value (within groups)
Pre-treatment	5.67±1.59	5.67±1.45	0.6001
Post-treatment	6.93±1.22	6.00±1.65	0.1570
Improvment%	22.22%	5.8%	0.0123
P-value (within groups)	0.0001	0.0192	

IV. Discussion

Impaired fine motor skills in cerebral palsy occur due to interruption of the pyramidal system control. Its improvement is an indication of increased motor control and a decrease of spasticity. Hand manual dexterity test was a good evaluation of manual abilities of the hand which reflect the CNS neural plasticity.10,11

There are anatomical characteristics which allow the hand functions to be performed smoothly like the longer thumb and fingers which allow more hand control also the presence of web space allowing the thumb to act as a leader of hand functions addition to tips of the fingers are broad allow for more surface to distinguish between materials. Hand physiological characteristics contain a mapping representation in post-central gyrus because the hands contain great numbers of tactile receptors plus the hand contains an extensive count of muscle spindle and Golgi tendon organs which allow for a great hand motor control also the motor unit of the hand contain a great number of nerve supply which increases motor control. There are also biomechanical characteristics as the presence of hand arches which are three arches(distal and proximal arches plus longitudinal arches) allow the hand to be flexible in reshaping for facilitation of grasping and reaching. At the last, there are neurological characteristics as the hands are supra-spinal controlling by 15% of pyramidal systems descending directly to make synapses with hand motor neurons this give the hands more control for initiate movement and perform fine motor skills.12,13

Object characteristics and levels progression of hand skills:

The more practice and repetition are key components of training which lead to high afferent information, feedback and permanent changes as new strategies and motor plan produced lead to learning a recent skill or restore the lost skill.

The nervous system provides the:

1-Sensory processing: for awareness of body location in space produced by visual, vestibular, and somatosensory systems.

2-Sensory-motor integration: necessary for joining afferent impulses feedback to efferent replies (higher centers control attitude modifications that guide intended motion).

3-Mechanism of new motor strategy:

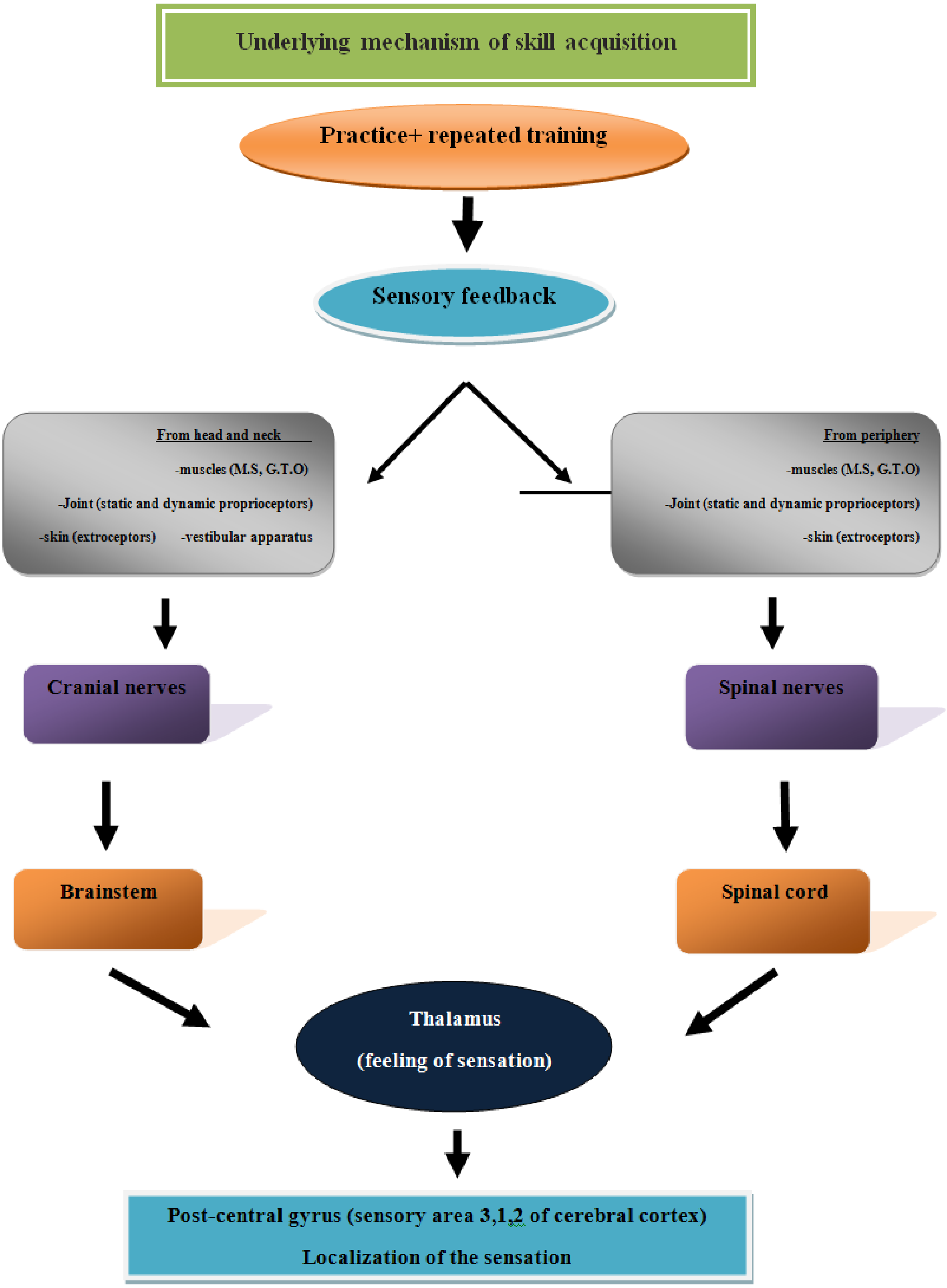
Sensory impulses arising from periphery reached to the spinal cord through spinal nerves, information coming from head and neck reached to brainstem through cranial nerves. All the previous information reached to the thalamus to be sensitized then to the post-central gyrus to be localized. Perception, cognition, the new sensory strategy will be produced by sensory areas which lead to increase of efficiency of synapses.

After that information reaches to the cerebellum and basal ganglion to be smoothening and prevention of excessive activity, then reach to pre-central gyrus to produce permanent changes and new motor behavior.

Which mean learning of new skill then the formation of motor command via tracts to the terminal regular path (alpha and gamma MN) to perform new behavior of skills or reacquisition of skill. Hand grip assessment is considered the most important indication for development of fine motor skills(Fig.2).

Neuro-physiological evidence that cortical rearrangement may develop as outcomes of continuous afferent information which activate the efficiency of synapses in sensory cortex and with long-run training produce anatomical and structural developing of activated synapses carrying the parameters of new skill acquisition producing a new neural circuit. The evidence for cortical plasticity, in the presence of such functional organization, may provide some understanding into the neuro-physiological basis for improved hand motor control.14

The underlying mechanism of Azzam hand skills progression scales for training:



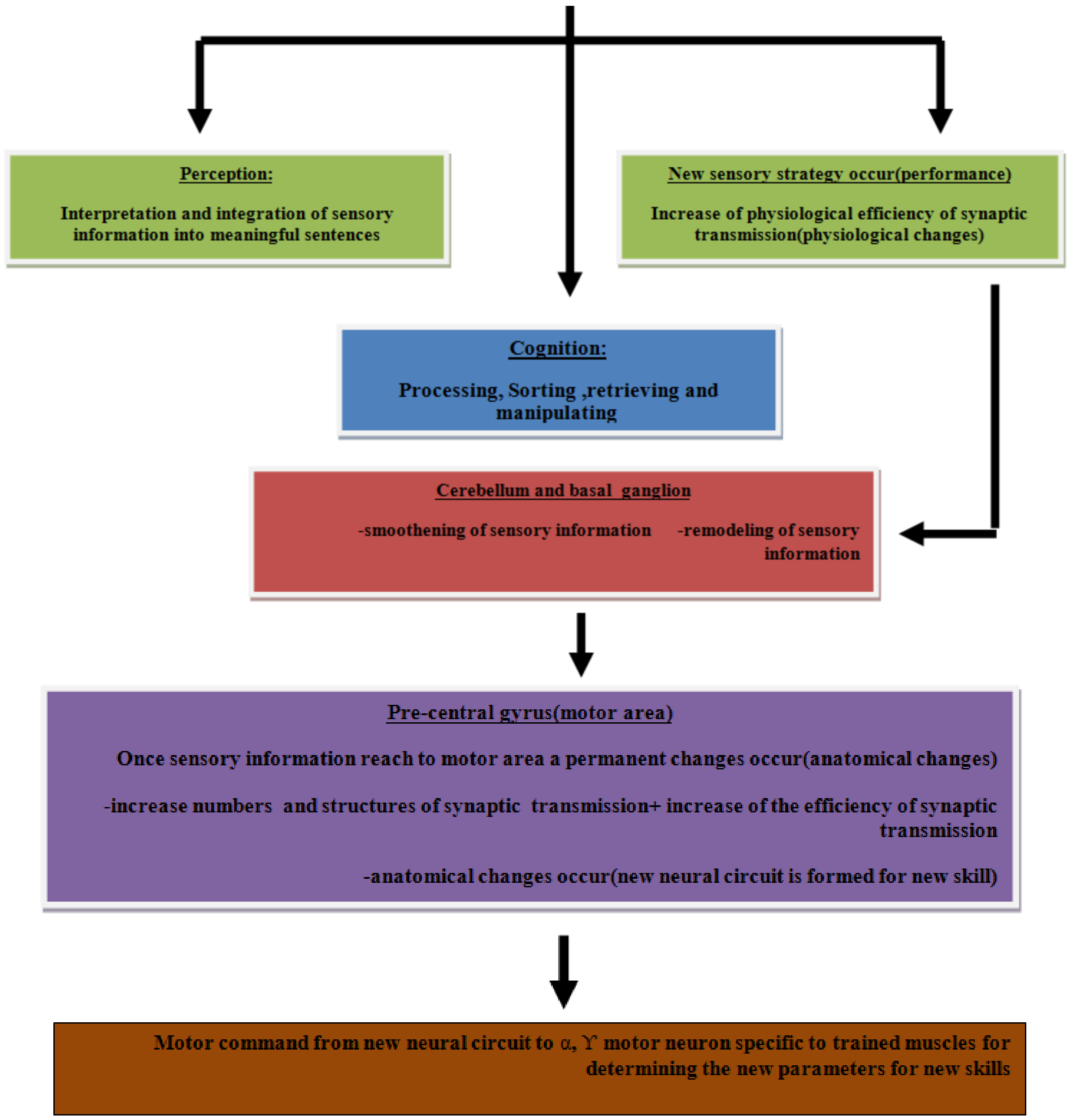


Fig.(2): Underlying mechanism of hand skill progression scale for training.14

V. Conclusion

According to the outcomes of this study, it can be terminated that the levels progression of hand dexterity via Azzam reacquisition skill grading scale plus routine regular physiotherapy program can be recommended for improvement hand functions in hemiplegic C.P. children.

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APPENDIX

Fig (2): Azzam reacquisition skill grading scale

Skill grade	Description	Characteristics	Levels of progression	Initial assessment	Levels training
I	**Lost skill**	**Can not perform the first level of skill progression**	**1-Big object, rectangular shape, rough, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials 2-Big object, rectangular shape, rough, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials 3-Big object, square shape, rough, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials 6-Big object, rectangular, rough, light, ↓time, ↑speed, ↓accuracy, ↑number of trials 8-Big object, rectangular, smooth, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials 10-Big object, circular, rough, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials 14-Big object, circular, smooth, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials 17-Big object, rectangular, rough, light ↑time, ↓speed, ↑accuracy, ↓numbers of trials 20-Big object, square, rough, light, ↓time, ↑speed, ↓accuracy, ↑number of trials 22-Small object, rectangular, rough, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials 24-Small object, square, rough, heavy, ↓time, ↑speed, ↓accuracy, ↑number**	**For locating the skill level of progression Then by re-evaluation for locating the new level**	**Gaining of the specific level of progression obtained by massed practice at that level**
II	**Poorly developed skill**	**Can perform less than 10th levels of progression**		**4-Big object, square shape, rough, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials 5-Big object, rectangular, rough, light, ↑time, ↓speed, ↑accuracy, ↓numbers of trials 7- Big object, rectangular, smooth, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials 9-Big object, circular, rough, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials 11-Big object, rectangular, smooth, light, ↑time, ↓speed, ↑accuracy, ↓numbers of trials 12-Big object, rectangular, smooth, light, ↓time, ↑speed, ↓accuracy, ↑number of trials 13-Big object, circular, smooth, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials 15-Big object, circular, smooth, light, ↑time, ↓speed, ↑accuracy, ↓numbers of trials 16-Big object, circular, smooth, light, ↓time, ↑speed, ↓accuracy, ↑number of trials 18-Big object, rectangular, rough, light, ↓time, ↑speed, ↓accuracy, ↑number of trials 19-Big object, square, rough, light ↑time, ↓speed, ↑accuracy, ↓numbers of trials 21-Small object, rectangular, rough, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials 23-Small object, square, rough, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials 25-Small object, circular, rough, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials 27-Small object, rectangular, smooth, heavy, ↑time, ↓speed, ↑accuracy, ↓numbers of trials 28-Small object, rectangular, smooth,**	
III	**Acceptable developed skill**	**Can perform less than 20th levels of progression**			
IV	**Nearly developed skill**	**Can perform all levels of progression except the last one**			
V	**Well developed skill**	**Can perform all levels perfectly**			

			of trials **26-Small object, circular, rough, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials** **29-Small object, rectangular, rough, light ↑time, ↓speed, ↑accuracy, ↓numbers of trials** **32-Small object, square, rough, light,↓time, ↑speed, ↓accuracy, ↑number of trials** **35-Small object, square, smooth, light,↑time, ↓speed, ↑accuracy, ↓numbers of trials** **37-Small object, circular, smooth, heavy,↑time, ↓speed, ↑accuracy, ↓numbers of trials**	**heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials** **30-Small object, rectangular, rough, light, ↓time, ↑speed, ↓accuracy, ↑number of trials** **31-Small object, square, rough, light ↑time, ↓speed, ↑accuracy, ↓numbers of trials** **33-Small object, rectangular, smooth, light, ↑time, ↓speed, ↑accuracy, ↓numbers of trials** **34-Small object, rectangular, smooth, light, ↓time, ↑speed, ↓accuracy, ↑number of trials** **36-Small object, square, smooth, light, ↓time, ↑speed, ↓accuracy, ↑number of trials** **38-Small object, circular, smooth, heavy, ↓time, ↑speed, ↓accuracy, ↑number of trials** **39-Small object, circular, rough, light, ↑time, ↓speed, ↑accuracy, ↓numbers of trials** **40-Small object, circular, rough, light, ↓time, ↑speed, ↓accuracy, ↑number of trials** **41-Small object, circular, smooth, light ↑time, ↓speed, ↑accuracy, ↓numbers of trials** **42-Small object, circular, smooth, light, ↓time, ↑speed, ↓accuracy, ↑number of trials.**

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