DOI Number: 10.5958/2320-608X.2019.00077.5

Assessment of Hand Grip Strength & Fine Motor Skills in Skilled & Non Skilled Persons

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Abstract

Introduction: Hand and finger strength is important as it is required for day to day activities. One of the most common methods of measuring muscle strength is by using a handgrip dynamometer. Hand grip strength is an indicator of muscle power. Pin dexterity & finger taping is a term used to explain a range of different hand abilities and performances.

Aim: To compare the Maximum Voluntary Contraction (MVC), Pin Dexterity test (PDT) and Finger tapping (FT) in skilled and non skilled persons.

Methodology: 50 skilled persons (computer operator) & 50 non skilled persons aged between 18 - 40yr in Narayana Medical Collage & Hospital were selected.

Informed consent was taken. All the subjects underwent a detailed clinical examination before being included in the study as per the study protocol. Institutional ethical clearance was taken.

MVC, PDT & FT were measured in skilled and non skilled persons (50 in each group) by using digital hand grip dynamometer, computerized finger tap recorder and modified O'Connor finger dexterity device which was in house built and calibrated.

Results: MVC values were 22Kg ± 9.2 and 26 Kg ± 12.6, PDT scores were 67± 7.9, & 66 ± 9.1 FT count was 111 ± 29.8 and 108 ± 29.2 in skilled non skilled persons. In both the groups there was -ve correlation between MVC & PDT & +ve correlation between MVC & FT. Whereas -ve correlation between MVC & PDT among 50 skilled persons.

Conclusion: Fine motor skill such as FT & PDT improves by decreasing the muscle strength in skilled persons when compared to non skilled persons.

Key words: *Maximum Voluntary Contraction, Finger Tapping, Pin Dexterity Test.*

Introduction

Muscle strength is the maximum force that can be generated by a specific muscle or muscle group. It is an index of body strength. Hand grip or grip strength means forceful flexion of all finger joints with the maximum voluntary force that the subject is able to exert under normal condition[1]. One of the most common method of measuring grip strength is by using a handgrip dynamometer. It is the only technique to asses muscle strength and a simplest method for assessment of muscle function in clinical practice[2].

Motor performance and motor skills are essential and important in various daily activities constituting a substantial part of human life, and their meaning is especially great in traffic, sports and unexpected situations. There are several motor performance such as reaction time, speed of movement, tapping speed, multi-limb coordination, complex coordination and eye - hand coordination[3] It helps in knowing the cerebellar dysfunctions. Dexterity is one of the fine motor coordination test & finger-tapping test gives information about the control and coordination of distal muscle groups in the upper limbs.

Aim : To compare the Maximum Voluntary Contraction (MVC), Pin Dexterity test (PDT) and Finger tapping (FT) in skilled and non skilled persons.

Participants

Case - 50 skilled persons (computer operator), aged between 18 - 40yr who are working in Narayana Medical Collage & Hospital were selected.

Control - 50 non skilled persons aged between 18 - 40yr who were attending outpatient department were selected.

Methodology

After getting clearance from ethics committee, informed consent was taken from all the participants and detailed clinical examination was done as per study protocol. All experiments were performed in the Department of Physiology, Narayana medical College, Nellore.

Inclusion criteria

- Males & Females
- Subjects aged 18 – 40 yrs
- Computer operators
- No History of systemic disorders
- No History of medication

Exclusion criteria

- Subjects aged < 18 and > 40 yrs
- Non computer operators
- Other systemic disorders
- History of medication
- Parameters recorded

Height & Weight

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- recorded by using Stadiometer & Digital weighing balance.

- Body Mass Index

- calculated by using a formula Weight in Kgs / Height in meter square.

- Maximum Voluntary Contraction
  - recorded by using Hand grip dynamometer.
- Finger Tapping
  - recorded by using Computerized finger tap recorder.
- Pin Dexterity Test
  - recorded by using Modified O'Connor dexterity apparatus (in house built and calibrated)

Methodology

Figure 1showing hand grip dynamometer to measure MVC

Subjects were asked to extend their arm horizontally parallel to the ground, without support and grip the dynamometer using maximum strength. 3 readings were taken, with 10 Sec gap between trials highest value was selected for analysis.

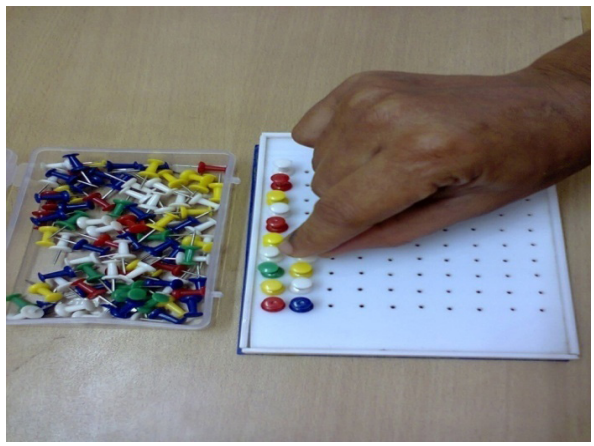

Figure 2 showing Acrylic rectangular plate with pins do Pin dexterity test

Acrylic rectangular plate which has 100 holes. Subjects should pick one pin at a time and place them

in the holes as quickly as possible. The number of pins placed within 180 sec was noted as score.

Results

Table- 1 Shows general characteristics of skilled and non skilled person

Parameters Subjects (Total=100)	Non skilled person (n=50) Mean ± SD	Skilled person (n=50) Mean ± SD
Age (yrs)	23.06 ± 2.6	25.6 ± 3.1
Height (Ft.)	5.4 ± 0.3	5.3 ±0.2
Weight (Kgs)	57.9 ± 9.9	61.9 ± 12.7
BMI	21.8 ± 3.5	23.3 ± 4.5

Results

Table – 2 Shows MVC, PDT, FT values in skilled and non skilled person

Parameters Subjects (Total=100)	Non Skilled person (n=50) Mean ± SD	Skilled person (n=50) Mean ± SD
MVC (Kgs)	26.8 ± 12.6	22 ± 9.2 *
PDT (Score)	66 ± 9.1	67.1 ± 7.9
FT (count)	108.8 ± 29.2	111.6 ± 29.8

FT & PDT improves by relative decrease in MVC in skilled person when compared to non skilled person

MVC values were 22 ± 9.2 Kg in non-skilled persons and 26 ± 12.6 Kg in skilled persons which was statistically significant. PDT scores were 67± 7.9, & 66 ± 9.1 FT count was 111 ± 29.8 and 108 ± 29.2 in skilled non skilled persons. In both the groups there was -ve correlation between MVC & PDT & +ve correlation between MVC & FT.

Whereas -ve correlation between MVC & PDT among 50 skilled persons.

Our study showed there was a decreased muscle strength and fine voluntary skilled movements were better in skilled persons when compared to nonskilled persons.

Discussion

Maximum Voluntary Contraction helps in assessing muscle strength. Finger-tapping test gives information about the control and coordination of distal muscle groups in the upper limbs. Dexterity is the "manual ability that requires rapid coordination of gross or fine voluntary movements, based on a certain number of capacities, which are developed through learning, training and experience"

Conclusion

So FT & PDT might be used as a tool to assess the motor functions and co-ordination in patients with Neurological disorders. Measurement of MVC by using hand grip dynamometer helps in assessment of muscle strength in neuromuscular disorder.

Conflict of Interest :- Nil

Source of Funding:- Self

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