

A Study on Upper Limb Strengthening Exercises on Hand Writing Speed for Undergraduates

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Abstract

Introduction: Hand writing is an essential tool required by students. It is a complex process which involves speed and grip strength

Objective: To assess effectiveness of upper limb exercise on hand writing speed.

Methodology: An interventional prospective study involving undergraduate students was conducted. Structured exercise program was held five days a week (for about 20 minutes) for 4 weeks. Writing speed, grip strength was measured at beginning and four week later.

Result: At the beginning hand writing speed was 133.80 wpm. The grip strength was 24.33 kg. At the end hand writing speed was 142.7 wpm. The grip strength was 40.96 kg.

Conclusion: Upper limb exercise programs can be used to improve the hand writing speed.

Keywords: Upper limb exercise; Hand writing speed; Grip strength

Researchers have found that, students complain that they get tiered after writing for a few minutes. . Many factors influence handwriting such as anatomy of extremity, general health, mental acuity, writing instrument and surface. During the process of handwriting most of the movements come from the forearm while shoulder provides the power with minimum movement occurring at fingers and wrist [1]. Strength and flexibility of the muscles and the overall posture of the writer affects the final output. The most common pen-holding position, is keeping the pen between the index and middle fingers, and holding it in place by the thumb. Joint position sensation is the most important factor in determine handwriting. Though it seems paradoxical, since small muscles having better control, the shoulder- girdle group once trained, does the job better [4-7].

Slow handwriting or typing not only increases the time required to complete assignments, but it also changes the whole nature of writing. When the tempo of writing is slowed way down or the writing is constantly interrupted by the manual task, students never learn to flow through ideas and words. In competitive exams or regular school exams, a particular method for assessing an individual's ability is followed, wherein one's knowledge is tested within a particular time. Failure to do so not only affects the performance, but also has an adverse effect on the confidence of the student. Further, research has indicated that slow handwriting leads to avoidance of writing thus resulting in low self-esteem, evading academic work and possibly ending with learning difficulties and behavior problems [7-9].

Endurance during hand writing task has not been given much attention and importance on improving the hand writing speed by strengthening exercise.

Strengthening of forearm and intrinsic muscles of hand can improve hand writing speed. During resistive training muscle undergoes an isotonic contraction that is increase in intramuscular tension along with the change in length of muscle [10].

Introduction

Handwriting speed plays an important role in academic success since it is directly related to the ability to express knowledge about different subjects. It is one of the most unique features of human's cultural development. It continues to be an essential life skill, in daily-life, as a form of communication, archiving, expression of creativity and knowledge. Therefore it is an essential skill one should possess in today's context and it forms an integral part of a student's life whether primary, secondary, or tertiary [1-3].

Writing is an essential life skill, in daily life, as a form of communication, expression of creativity and knowledge.

Resistive training leads to increase in intramuscular tension. As intramuscular tension increase there is gradual increase in muscle power leading to hypertrophy.

Due to hypertrophy of muscle tone there is improvement in endurance and strength of muscle. This study attempts to find the effect of hand exercise on writing speed also relation of grip and pinch strength related to long writing task of college student.

For an adult population (age range 18-64) the average speed of writing is 68 letters per minute, with the range from a minimum of 26 to a maximum of 113 letters per minutes

Strength and flexibility of the muscles, the position of the pen grip and the overall posture of the writer, affect the final output. The most common pen-holding position, is by keeping the index and middle fingers, and held in place by the thumb using palmar grip. Joint position sensation is the most important factor in determine handwriting. Though it seems paradoxical, since small muscles having better control the shoulder-girdle group, once trained [11,12].

Girls on average achieve a maximum writing speed earlier than boys. The average rate is 14.7 wpm for girls and 13.8 wpm for boys.

The essential tool used for this study is words per minute's test and hand dynamometer.

Need for the Study

The most of the student in our department have a slow handwriting speed during the exam. So I decided to perform these studies for students in our department.

Materials and Methods

Materials required

- Piece of cloth
- Dumbbell
- Rubber band
- Pen
- Stop watch
- Grip dynamometer
- A4 size paper

Source of data

Subjects will be collected from Roever College of physiotherapy in Perambalur.

Method of collecting data

30 subjects will be selected using random sampling method.

Study design

Experimental study design

Duration of study

1 month.

Session

Morning session = 20 min/day, 5 days/week, 4weeks/month.

Statistical tool

- Hand dynamometer
- Wpm test

Sample size

Sample size is 30.

Inclusion criteria

- Male and female collegiate
- Subject age should be between 19 yrs to 21 yrs
- Subject should be right handed person

Exclusion criteria

- History of upper or lower limb injury within past 6 months
- Systemic illness
- Subjects with musculoskeletal and neurological disorders
- Recent surgeries
- Any hearing, visual impairments

Study of method

Pre tests

- Words per minutes test
- Hand dynamometer

Post tests

- Words per minutes test
- Hand dynamometer

Procedure

The test was taken in a single lecture room with similar writing surface and seating facility. We provide standardized pen and a A4 sheet to perform hand writing speed test .

After getting informed consent 30 subject were selected using random sampling technique and were assigned in pretest and posttest.

- Pretest using measured by words per minutes test and hand dynamometer and

- Posttest using Upper Limb Exercise was evaluated by using words per minutes and hand dynamometer after the session [13-21].

Structured Exercises

- Biceps Strengthening
- Brachioradialis Strengthening:
- Wrist Extensor Strengthening:
- Thenar Eminance Endurance:
- Forearm Endurance:
- Hand Endurance (Table 1)

Grip strength measurement

Hand grip dynamometer, ranging from 0-120 kg, was used for the measurement. Subjects stood in up right posture in front of the examiner with shoulders abducted to 0° and neutrally rotated, elbow flexed to 90° and the wrist and forearm kept in neutral position. A single dynamometer was used throughout the study (Figure 1 and Table 2).

Hand writing speed measurement

Subjects were given a single audio recording in English medium, and were asked to transcribe on an A4 sheet in nine minutes. Test was done in a single lecture room with similar writing surface and seating facilities. At the end the number of words was counted and writing speed was calculated (Figure 2 and Table 3).

Table 1: Exercise protocol.

Muscle	Exercise	Material	Repetition
Biceps	strengthening	dumbbell	10 × 3
Brachio radialis	strengthening	dumbbell	10 × 3
Wrist extensor	strengthening	dumbbell	10 × 3
Thenar eminence	endurance	Rubber band	10 × 3
Hand, forearm	endurance	praying	10 × 3
Hand	endurance	Crumble cloth	a 10 × 3

Table 2: Grip strength of all subjects.

Test	Total		Male		Female	
	N	M	N	M	N	M
Pre test	30	24.33	15	25.13	15	23.53

Post test	30	40.96	15	43.4	15	38.53
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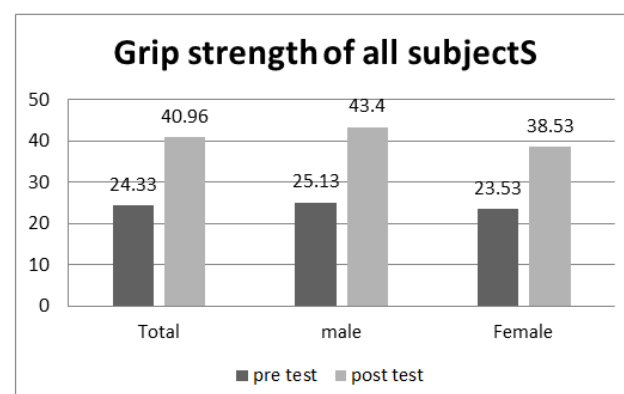


Figure 1: Grip strength of all subjects.

Table 3: Hand writing speed of all students.

Tests	Total		Male		Female	
	N	M	N	M	N	M
Pre test	30	138.8	15	134.38	15	133.22
Post test	30	142.7	15	142.04	15	143.36

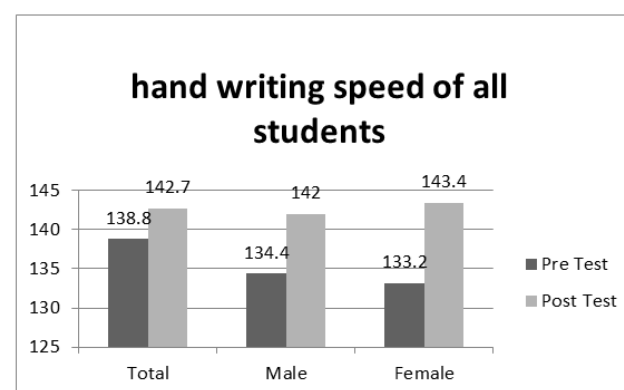


Figure 2: Hand writing speed of all students.

Results and Discussion

Comparison of the mean value of pre and post-test of grip strength and writing speed

- At the beginning the hand writing speed was 133.80 was wpm and the grip strength was 24.33 kg.
- At the end the hand writing speed was 142.7 wpm and the grip strength was 40.96 kg.

This study shows that males have higher grip strength and females have higher writing speed.

The Influence of the Upper limb strength over Handwriting skills can be improved When the large muscles of the shoulder girdle (the pectorals in front and the trapezius and rhomboidus muscles at the back) work effectively together, they provide stability for the smaller muscles in the hand and arm to do their job effectively. Other fine motor tasks such as craft work, tying shoelaces etc are also much easier to carry out when the shoulder girdle muscles give good stability. So hand gross and fine motor skills are highly influenced by upper limb strength.

Handwriting is an important skill for college students. The result of this study supports previous findings that upper limb exercises increase the hand writing speed.

The result can be seen because during resistive training muscles under goes isotonic contraction which gradually increase the muscle power, due to hypertrophy of the muscle there is improvement in strength and endurance of muscle.

The overall analysis of this study there was significant improvement in grip; fast twitch fibers show greater hypertrophy along with increase in contractile protein content.

The muscle hypertrophy increased strength associated with strength training has a substantial impact on the grip strength in students. The improvement ranged from (pre exercise) to (post exercise) from 1 week to 4 weeks with 1 session per day. Strength and flexibility of muscles, the position of the pen grip and the overall posture of the writer affect the final output.

Better hand writing speed will help quick assimilation of knowledge and perform well at examination.

Conclusion

In this study it is found that there is a high correlation between grip strength, and writing speed. Thus in essence, this study concludes that upper limb exercises are highly effective to improve hand writing speed.

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