

# The Effect of Forearm Stretching and Tendon Gliding Exercise to Improve Writing Pace of Young Adults

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## Abstract:-

### ➤ Background:

Good writing pace contributes to more effective time management, higher quality of work, and improved overall performance in various areas of life. Strength and flexibility of the muscles and the overall posture of the writer affects the final output of writing. There are no sufficient studies regarding techniques to improve handwriting speed. So most of the students have a slow handwriting speed during exams and they can not express their full knowledge in paper. To achieve good handwriting speed, stretching and strengthening of forearm and intrinsic muscles of hand is important.

### ➤ Methods:

Based on inclusion and exclusion criteria 30 students were selected. Pre test done by words per minute test and hand dynamometer. Then Flexor stretching and tendon gliding exercises for given 6 months. After that post test was done using words per minute test hand dynamometer and.

### ➤ Result:

Statistical analysis was done. Pre and post test done for hand dynamometer test and words per minute test. There is a significant difference in pre and post test values, hence it proved forearm stretching and tendon gliding exercise improve writing pace of young adults.

### ➤ Conclusion:

According to this study ,forearm stretching and tendon gliding exercise is effective in improving writing pace.

**Keywords:-** Hand Dynamometer Test, Words Per Minute Test.

## I. INTRODUCTION

The movements in writing influence the characteristics of handwriting of an individual. Few characteristics of handwriting of an individual. Few characteristics of handwriting are line quality, alignment, size, spacing, connecting strokes, pen lifts, pen pressure and slant<sup>2</sup>.

The Importance of writing pace encompasses several aspects, including academic performance, professional efficiency, and personal productivity.

Further, research has indicated the 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<sup>6,7</sup>.

The children who do not succeed in developing proficient handwriting are called “poor writers” and “dysgraphic”. Dysgraphic is a disturbance or difficulty in the production of written language that has to do with the mechanics of writing. Other problems of handwriting are problems with letter shapes, problem with spacing, problems with grip and posture.

It is reported that the prevalence of handwriting difficulties among school aged children varies between 10-34%. Handwriting difficulties are especially prevalent among children diagnosed with developmental coordination disorder, learning disabilities and among those children defined as clumsy by their teachers<sup>8</sup>.

Dysgraphia affect men more often than women, and can go hand-in-hand with other learning disabilities or a related condition like ADHD or autism<sup>9</sup>.

Research have found that , students complain that they get tired after writing for a few minutes. Many factors influence hand writing such as:

- Anatomy of extremity
- General health
- Mental acuity
- Pencil grip

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<sup>3,10</sup>.

➤ *The Most Common Pen Holding Position is Known as the ‘Dynamic Tripod Grip’. in This Grip:*

- The thumb holds the pen on one side.
- The index finger rests on top of the pen, controlling the movement.
- The middle finger supports the pen from underneath, providing stability.
- These fingers rest against the writing surface, helping to stabilize the hand.

This grip is widely recommended because it allows for good control, precision, and reduced hand fatigue during writing. Joint position sensation is the most important factor in determining handwriting. Though it seems paradoxical, since small muscles having better control, the shoulder girdle group once trained the job better<sup>11,12</sup>.

#### ➤ *Need of the Study*

Most of the student have a slow writing pace during the exam, because of this they cannot express their full knowledge in paper. Poor handwriting can have a pervasive effect on school performance. Writing pace plays an important role in academic success. There are no sufficient studies regarding techniques to improve writing pace. So this study aims to determine whether tendon gliding exercise and forearm stretching can improve writing pace of young adults.

#### ➤ *Objective of the Study*

- To find the effect of forearm stretching to improve writing pace of young adults.
- To find the effect of tendon gliding exercise to improve writing pace of young adults.

## II. MATERIALS AND METHODOLOGY

### A. *Materials Used*

- Stylus
- Sheet
- Timer watch
- Bell
- Permission form
- Hand dynamometer

### B. *Methodology*

- Type of Study: Experimental study
- Study Design: Pre and post test
- Study Setting: Co-Operative Institute Of Health Science, department of physiotherapy, Thalassery.
- Sample Size: 30
- Sampling Method: Purposive random sampling
- Study Duration: 6 months
- Outcome Measures
- ✓ Hand dynamometry
- ✓ Words per minute test

### C. *Selection Criteria*

#### ➤ *Inclusion Criteria*

- Young adults (19 to 24 years)
- All genders
- Tripod grasp user
- Right handers

#### ➤ *Exclusion Criteria*

- Any orthopedic or neurologic conditions
- Systemic diseases
- Recent surgeries
- Any hearing , visual impairment

### D. *Study Procedure*

- 30 subjects were selected based on selection criteria,
- Pre test assessment done by words per minute test and hand dynamometer.

#### ➤ *Following Treatment were Given to the Selected Students.*

- Flexor stretching: stretching of wrist flexors and extensors
- ✓ Flexor stretch – hold the palm of the hand with the other hand while keeping elbow straight on the right arm. Pull your hand back getting to just a stretch in the forearm
- ✓ Extensor stretch – extend right arm out with your elbow straight with the other hand to grasp it at the side of the thumb and bent the wrist downward.
- ✓ 3 repetitions, 30 sec in position of stretching, 30 sec in position of release with elbow extended 2 times/day
- Tendon gliding exercise: straight hand, hook fist, full fist, table top, straight fist( 5 sec hold 10 repetitions ) 2 times per day.
- Straight Hand: Start with hand open and fingers straight.
- Hook Fist: Bend the middle and top joints of fingers while keeping the knuckles straight, forming a hook shape.
- Full Fist: Make a fist by bending all finger joints into palm.
- Tabletop Position: Start with a straight hand, then bend only the knuckles so that fingers point straight up, resembling the shape of an “L.”
- Straight Fist: Bend your fingers to touch the base of fingers while keeping the top joints straight.
- Thumb Stretch: Extend thumb away from hand, then bring it across your palm to touch the base of little finger.
- After 6 months post test was taken using words per minute and hand dynamometer.

## III. RESULTS

The statistical analysis of hand dynamometer test and words per minute test shows significant increase in the handwriting speed. The pre test, mean value of writing pace using hand dynamometer is 56.17. The post test, mean value using hand dynamometer is 64.33. The pre test mean value of words per minute test is 28.27, the post test mean value of words per minute test is 39.17. The hand dynamometer shows mean difference of 8.16 and words per minute test shows mean difference of 10.9. As there is a significant difference in pre and post test values, hence it proves tendon gliding and forearm stretching is effective in improving writing pace of young adults.

#### IV. DISCUSSION

This study was focused on to find out the effectiveness of tendon gliding exercises and forearm stretching on writing pace of young adults.

Tools taken for measuring handwriting speed was handwriting speed test and hand dynamometry (Jamar hand dynamometry). The total duration of the study was 6 months.

According to Margeret Wallen (1998) handwriting speed test is a standardized, norm by increasing the writing speed of an individual through exercise.

In this study 30 students were selected randomly. Aim and objectives of the study was explained to the students and informed consent was taken .the pre interventional outcome measure was taken by counting the number of words written by the students in 1 minute and hand dynamometer. Later the students trained for 6 month with tendon gliding exercises and forearm stretching .

Tendon gliding exercises maintain the finger motion as they are necessary for the writing. Tendon gliding exercises are straight hand , hook fist, full fist, table top, straight fist. These exercises are important to the hand as the aerobic exercise to the heart which provide maximum range of motion at each finger joint as well as gliding of the extensor and intrinsic muscles. Maximum superficials excursion occurs in first position. Profundus tendon excursion occurs in hook position. Thumb flexion involves only one flexor tendon that is flexor pollicis longus.

Stretching improves flexibility and releases tension on muscles, increases blood supply needs to nutrient supply and energy. These benefits prevent muscle fatigue while writing. Stretching is the process of placing particular parts of the body into a position that will lengthen the muscles and their associated soft tissues. After 6 months, the post test measurement were taken.

The statistical result of this study showed that there was a statistically significant difference in pre test and post test of both dynamometer and 1 minute writing test.

Hence this study shows that tendon gliding exercise and forearm stretching can significantly improve writing pace.

#### V. CONCLUSION

In this study we investigated the impact of forearm stretching and tendon gliding exercises on the writing pace of young adults. The results indicate that participants who engaged in a regular regimen of these exercises showed a significant improvement in their writing pace compared to those who did not do the exercises. So we conclude in this study, forearm stretching and tendon gliding exercise can significantly improve writing pace of young adults

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Ms. Jahana  
Ms. Faheema Firoz  
Ms. Amegha P

#### VI. DATA PRESENTATION

##### ➤ Descriptive Data

Table 1: Descriptive Data

SL NO.	AGE	GENDER	HEIGHT(cm)	WEIGHT(kg)	SIDE
1	22	Female	161	56	Right
2	22	Female	160	43	Right
3	22	Female	163	61	Right
4	23	Female	164	62	Right
5	22	Female	160	58	Right
6	23	Female	158	55	Right
7	23	Female	159	55	Right
8	23	Female	168	56	Right
9	23	Female	160	44	Right
10	22	Female	160	42	Right

11	23	Female	164	60	Right
12	22	Female	154	53	Right
13	22	Female	159	56	Right
14	21	Female	155	57	Right
15	22	Female	160	57	Right
16	22	Female	164	62	Right
17	22	Female	163	58	Right
18	22	Female	173	63	Right
19	23	Female	152	45	Right
20	22	Female	163	56	Right
21	22	Female	168	58	Right
22	22	Female	150	43	Right
23	23	Female	160	53	Right
24	23	Female	158	47	Right
25	23	Female	170	63	Right
26	22	Female	171	60	Right
27	22	Female	152	50	Right
28	22	Female	158	48	Right
29	22	Female	161	45	Right
30	24	Male	165	60	Right

➤ *Data of Outcome Measure*

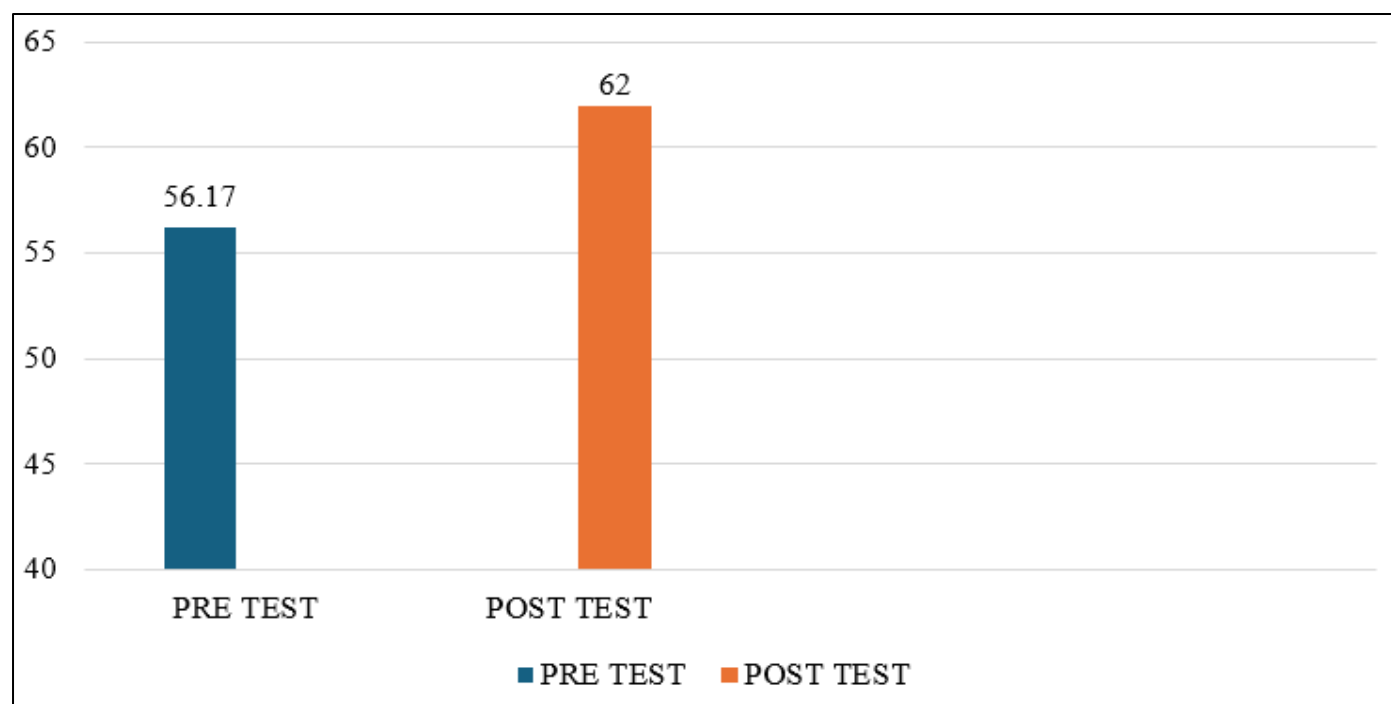
Table 2: Pre-Test and Post-Test Values of Hand Dynamometer Test

SL NO.	PRE-TEST	POST TEST
1	65	70
2	50	60
3	75	80
4	40	45
5	40	45
6	60	65
7	60	65
8	45	50
9	60	65
10	45	50
11	60	65
12	50	55
13	70	75
14	40	45
15	40	50
16	50	55
17	65	70
18	75	80
19	60	65
20	35	45
21	55	60
22	45	50
23	70	75
24	40	40
25	65	70
26	50	55
27	60	65
28	40	50
29	60	70
30	115	125

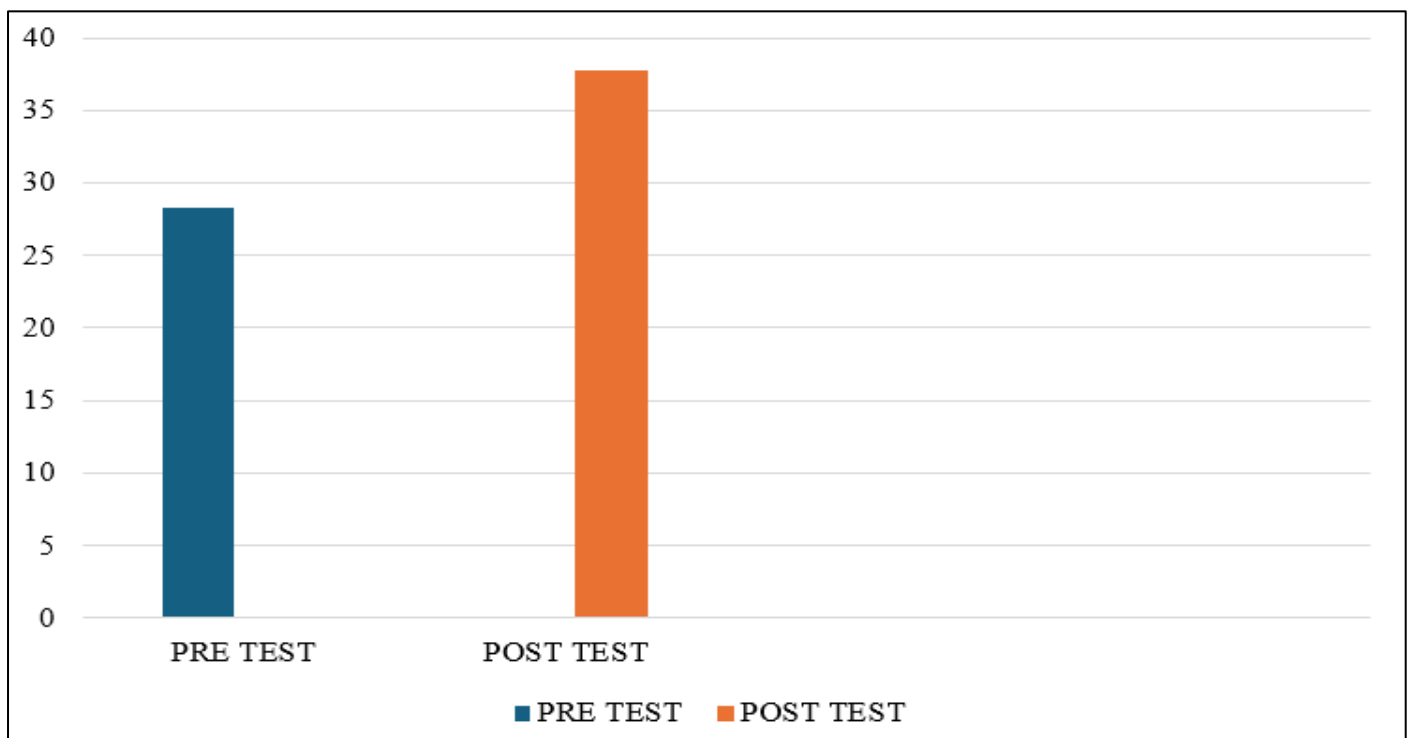
Table 3: Pre and Post Test Values of Words Per Minute Test

SL NO.	PRE TEST	POST TEST
1	30	43
2	33	45
3	33	44
4	25	36
5	20	32
6	31	46
7	31	39
8	21	31
9	30	45
10	34	42
11	33	46
12	30	36
13	31	40
14	29	39
15	33	45
16	25	33
17	25	36
18	31	39
19	25	32
20	22	29
21	27	41
22	30	31
23	26	38
24	31	32
25	26	40
26	29	34
27	29	32
28	29	38
29	25	34
30	24	36

## ➤ Graphical Representation



Graph 1: Comparison of Pre and Post Hand Dynamometer Test



Graph 2: Comparison of Pre and Post Words Per Minute Test

- **Ethical Clearance:** By College Ethical Committee
- **Conflicts of Interest:** Nil
- **Source of Funding:** Self

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