



EFFECT OF TENDON GLIDING EXERCISE ON SPEED OF WRITING AMONG PARUL UNIVERSITY STUDENTS – A PILOT STUDY

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ABSTRACT

BACKGROUND:

Handwriting is a complex and dynamic task of manual function. Deficit or slow handwriting can have a negative effect on educational performance as well as in competitive exams, students who have slow handwriting skill may affect their performance but also, they experience frustration, adverse effect on their confidence. 10% and 34% of students have handwriting trouble and Students spend 31-60% of their college or college day performing handwriting and another fine motor task. Strength of the muscles, the position of the pen grip, affects the final output.

METHODOLOGY:

An experimental study was undertaken on 30 participants with age 18 to 25 years and Students having tripod grip. All the participants received treatment protocols for 4 days/week for 4 weeks. The Handwriting Speed Test (HST), Pinch Meter were used as an outcome measure before and after treatment. Data were analyzed using MS Excel 2019 and SPSS version 21 software.

RESULT:

28 participants completed the study. Paired t-test was used for within group comparison and unpaired t-test was used for between group comparisons. Before intervention mean score for HST was 104.43 wpm and for 3-Point Pinch mean score was 7.34 Kg. Exercise program showed statistically significant improvement in both areas measured. There was mean score 125.78 wpm for HST, 9.86Kg for 3-Point Pinch with p value 0.00.

CONCLUSION:

Based on analysis and result it was concluded that Tendon Gliding Exercise was highly significant for increasing writing speed. However, subjects who were receive TGE showed less but significant improvement in 3-Point Pinch.

KEYWORDS: Tendon Gliding Exercise, Pinch Meter, HST, Pinch Strength

INTRODUCTION

Handwriting is a complex and dynamic task of manual function. It requires visual motor coordination, motor planning, cognitive and perceptual adeptness^[1]. Inscribing is essential life adeptness, in daily life, as a form of communication, expression of ingeniousness and cognition^[2].

Handwriting is a result of two primary forms of kinetics, one horizontal from wrist, one vertical from finger and thumb, with the integration of a rightward translation of the whole arm^[3]. It is the most detailed form of communication since it is the transcription of concepts and conception through symbols. Function handwriting is depending on the variation of abilities, coordination and skillful fine motor. Fine motor skill permit for the demonstration of legibility and fluency of handwriting^[4].

Deficit or slow handwriting can have a negative effect on educational performance as well as in competitive exams or college exams, students who have slow handwriting skill may affect their performance but also, they experience frustration, anxiety and adverse effect on their confidence^[5,6].

Factors influencing in writing performance:

1. General health
2. Mental health
3. Anatomy of extremity
4. Kinesthetic perception
5. Visual perception
6. Fine motor and motor planning skill
7. Writing instrument and surface
 - Pen or pencil: - An awkward or unconventional grip affects the speed of handwriting.
 - Pressure on writing instrument and surface: -increased speed leads to increased variation in force application such that motor coordination is disrupted and handwriting legibility and fluency affected^[7].

TRIPOD GRIP (PEN HOLDING GRIP) MECHANICS:

The Tripod Grip is a grip using three fingers of the hand - the thumb, index and middle fingers. A child typically develops this grip around the age of three or four. The **thumb** is brought into opposition with an **index** and a **middle finger** that are flexed at the **metacarpophalangeal (MCP) joint**, slightly flexed at the **proximal interphalangeal (PIP) joint**, and extended at the **distal interphalangeal (DIP) joint**. The ring finger and little finger also are flexed at the identical joints, and lie against the paper when the hand is writing to provide support and a foundation for the actions of the middle and index fingers. Our capacity to write has superior our civilization significantly^[8]. For the Handwriting 3-Point Pinch strength are important because more Chuck pinch strength, Increase Handwriting Speed.

PREVALENCE:

Studies have located that among 10% and 34% of students have handwriting trouble (Alston & Taylor, 1987; Salvesen & Undheim, 1994; Sevrnsson, Lundberg & Jacobson, 2001). Students spend 31-60% of their college or college day performing handwriting and another fine motor task^[9].

TENDON GLIDING EXERCISE:

Tendon gliding exercise allow each tendon to reach its greatest amount of movement, by this finger motion is maintain as they are necessary for writing. These exercise increase blood supplies, release tension on muscle, improve flexibility and prevent muscle fatigue while writing. Tendon gliding exercise is as important to the hand as aerobic exercise is to the heart^[10].

HANDWRITING SPEEDTEST (HST):

The 'Handwriting Speed Test' (HST) was developed by Wallen et al. (1996) in New South Wales, Australia to provide a quick and convenient, but also objective and reliable. HST was developed to help physiotherapist and occupational therapist to analyze the speed of individual person's handwriting. The HST assessment identifies words/minute in relation to national averages, under both test and non-test conditions. Margaret Wallen et al, (1998) concluded that Handwriting Speed Test (HST) which is 3-minute test, is a standardized, norm by increasing the writing speed of an individual through exercise^[11].

PINCHMETER:

The purport of this test is to quantify the maximum isometric strength of the hand and forearm muscles when doing a pinching action. Pinch strength quantification evaluates the collective action of a large number of intrinsic and extrinsic hand muscles as well as a number of different joints. Monitoring the progression of muscles strength separately for pinch grip is relevant for functional activities that require finer movement. Pinch meter quantifies a subject's pinch strength from 0.1kg to a maximum of 22kg and readings are display immediately. Pinch dynamometer was reliable (the ICC were 0.872 and 0.886 in rater A and rater B respectively).

Handwriting is one of those skills that we generally learn when we are small kids and never try to actively improve it as we grow up. However, being able to write faster has some significant benefits for people who often need to write things by hand for a prolong period of time, such as university students who appear for exam. It is observed that many students face difficulty in completing their exam paper on time due to less speed. Hence, the need of current study is to see the effect of Tendon Gliding Exercise on handwriting speed of the students there by improving the writing speed which may help them to overcome the challenges related to writing speed during exam.

METHODOLOGY:**A. SOURCE OF DATA: -**

- Students of Parul University, limda, Ta-waghodia, dist, Vadodara.

B. METHOD OF COLLECTION OF DATA: -

- Study design: - A Pilot Study
- Sample size: - 30
- Treatment intervention: - 4 days/week for 4 weeks

C. INCLUSION CRITERIA:

- Age between 18 to 25year
- Male and female collegiate
- Both Right and Left-handed
- Students having tripod grip

D. EXCLUSION CRITERIA:

- Subject with musculoskeletal problems related to dominant upper limb and neurological disorder
- Recent surgeries of the dominant hand
- Any visual and hearing impairment

E. OUTCOME MEASURES:

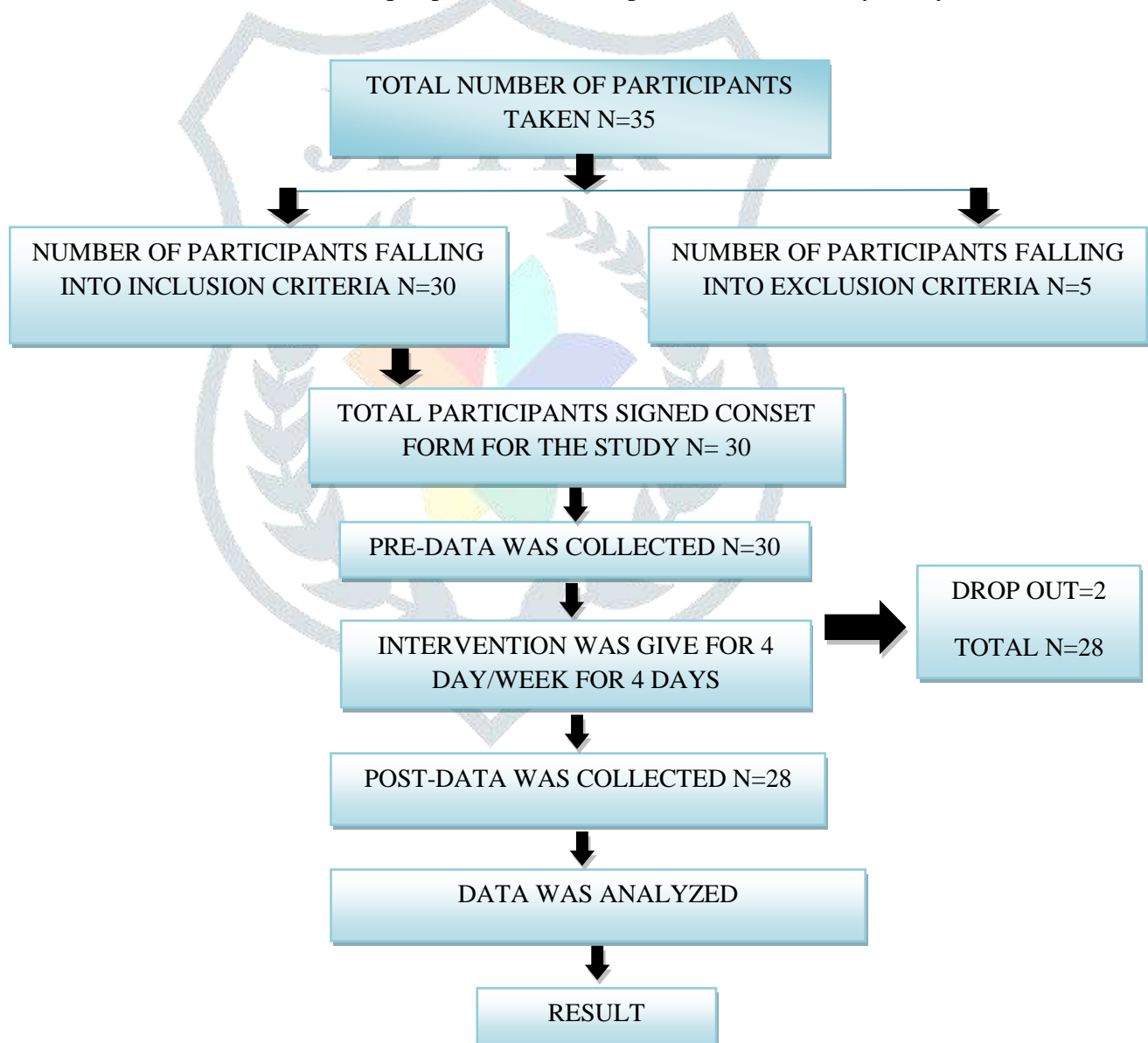
- Handwriting Speed Test – For writing speed
- Pinchmeter – for pinch strength

F. MATERIAL USE:

- Assessment Form
- Consent form
- Pen
- Pencil
- Rubber
- Bench
- A4 size paper
- Stopwatch
- Pinch meter

PROCEDURE:

- The subjects for the study were selected from Parul University's Students. Total 35 subjects were selected out of these 30 subjects were falling into the inclusion criteria, remaining were excluded because some had injuries to the dominant hand, some did not have Tripod grip. Ones falling into inclusion criteria were explained in detail about the study and their role and importance in the study. Then asked to sign the written informed consent form. 30 subjects willing to participate were asked to give a written informed consent. Subjects were having complete freedom to refuse from participating in the study. Once the consent was signed by the subjects, Outcome measure was recorded before intervention and Tendon Gliding Exercise given for 4 Days/Week For 4 Week At the end of the study at 4th week 1 subjects were discontinued intervention the reason for that was subjects not came regularly for the intervention and 1 subject were discontinued because injury occurred at his dominate hand at 2nd week and drop out from the study. So total Number of subjects was N=28. And outcome measure was re – evaluated at the end of 4th week, then pre-post data ere compared. Data was analyzed by SPSS 21.



❖ PREDICTOR AND OUTCOME MEASURES

GRIP STRENGTH MEASUREMENT

Figure 1: - Pinch Meter

For measuring Pinch strength Saehan Corporation, Model SH 5005 Pinch meter was use. Pinch meter, ranging from 0 to 22kg, used for the measurement.

- Participant was seated, elbow flexed to 90° with arm adducted at side, and forearm neutral, proceed as follows. (Figure: -2)
- 1. Lateral pinch (key pinch): - Place the pinch meter between radial side of index finger and thumb, and instruct the subject to pinch as hard as possible.
- 2. Three – point pinch (three jaw chuck pinch): - Place the pinch meter between the pulp of the thumb and pulp of the index and middle fingers. Instruct the subject to pinch as hard as possible.
- 3. Two – point pinch (tip to tip pinch): - Place the pinch meter between the tip of the thumb and tip of the index finger, and instruct the subject to pinch as hard as possible.
- Repeat test 3 times and calculate an average.



Figure 2: - Participant Position



Figure 3: - 3-Point Pinch (Three Jaw Chunk Pinch)

HANDWRITING SPEED MEASUREMENT

The test was taken in single lecture room with similar writing surface and seating facility and provided standardized pen and an A4 sheet to performed HST. Standardized instructions were provided for test administration. Subject was asking to written the sentence ‘**The quick brown fox jumps over the lazy dog**’ as

‘quickly’ and as ‘neatly’ as they can for a 3-minute period. At the end the number of words was counted and writing speed was calculated.



Figure 5: - Hand Writing Speed Test

TREATMENT PROTOCOL:

Group B was received Tendon gliding Exercise which was included as below,

- Two series of exercises was provided. Follow these general instructions for both series:
 - Proceed from position 1 through 3 in sequence
 - Hold each position for 5 seconds 10 repetition 2 times per day

Step-by-Step directions for series A

- With your hand in front of you and your wrist straight, fully straighten all of your fingers (Figure 6)
- Bend your tips of the finger in to the “Hook” position with your knuckles pointing up (Figure 7)
- Make a tight fist with your thumb over your fingers (Figure 8)

Step-by-Step directions for series B

- With your hand in front of you and your wrist straight, fully straighten all of your fingers (Figure 6)
- Make a “tabletop” with your fingers by banding at your bottom knuckle and keeping the fingers straight (Figure 9)
- Bend your fingers at the middle joint, touching your fingers to your palm (Figure 10)



Figure:6 Starting Position



Figure:7 Hook Position



Figure:8 Full Fist



RESULT

SPSS version 21 was used for statistical analysis for this study. In the present study, 30 Subjects, age group between 18-25 years and who having Tripod Grip were taken. Total 28 subject completed the study program without any complications. Microsoft Excel 2019 was used for the data analysis. Normality variant done and there we found data was normality assumption. So; parametric test was used. So; for pre and post intervention comparison of within group, paired T test was used and for the between group comparison unpaired T test was used. Confidence interval for this study 0.95 taken.

Table:1 Age Distribution

| AGE IN YEARS | NO. OF SUBJECTS |
|--------------|-----------------|
| 18 | 2 |
| 19 | 6 |
| 20 | 9 |
| 21 | 4 |
| 22 | 1 |
| 23 | 4 |
| 24 | 3 |
| 25 | 1 |

Graph:1 Age Distribution

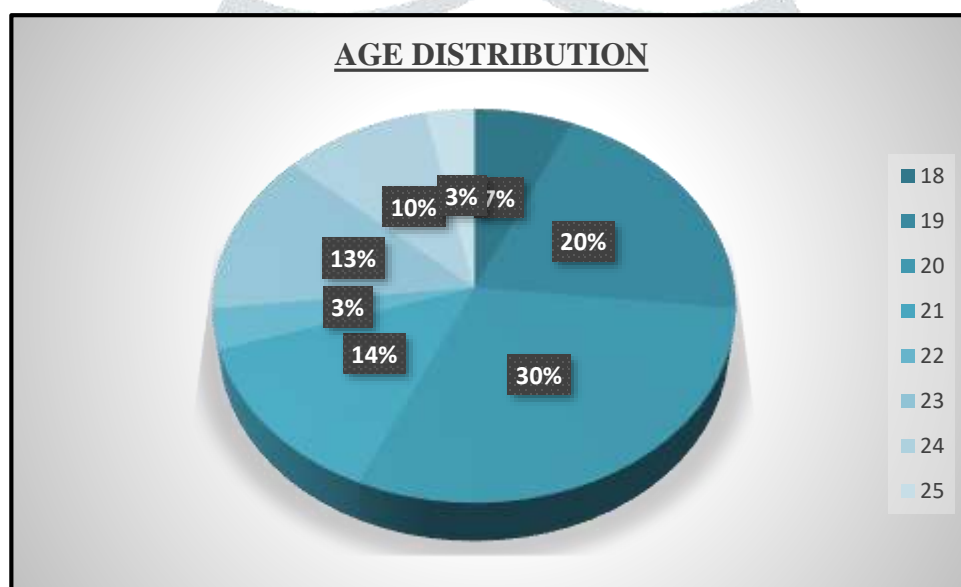
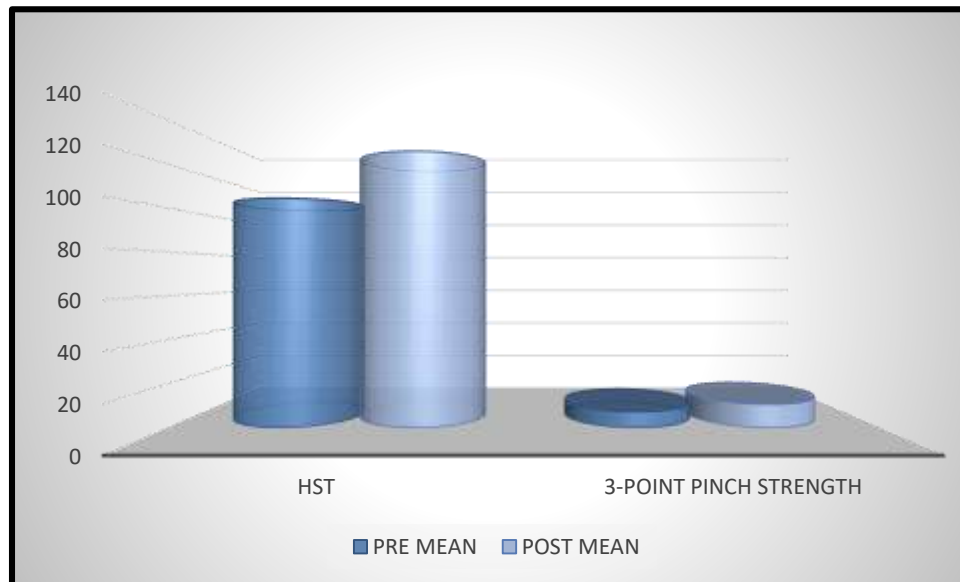


Table:2 Pre-Post Comparison HST And 3-Point Pinch

| Outcome Measure | TENDON GLIDING EXERCISE | | | | t-value | p-value |
|------------------------|-------------------------|--------|-----------|--------|---------|---------|
| | Pre test | | Post test | | | |
| | Mean | SD | Mean | SD | | |
| HST | 104.432 | 20.301 | 125.785 | 23.496 | 15.159 | 0.000 |
| 3-Point Pinch strength | 7.345 | 1.102 | 9.862 | 1.194 | 8.902 | 0.000 |

Graph:2 Pre-Post Comparison Of HST And 3-Point Pinch

DISCUSSION

Handwriting is an essential skill required in the educational setting and the speed of handwriting will have an impact on outcomes ^[12]. In current study only position given in 2 steps considering the feasibility and compliance. Exercises were user friendly and participants enjoyed. There were no exercise related complications. Also, it was reported that speed was higher in right hander's than left handers but Pinch ratio is equal. According to some studies, there is a correlation between pinch grip strength and handwriting of students. study done by Michele L. Alaniz et al¹³; grip strength was found to have been correlated with handwriting. other study accomplished by Vaibhav Kadaskar and Tejas Borkar¹⁴ has assessed the correlation among handwriting and palmar pinch grip strength amongst 100 children between age of 9-10 years. Tendon gliding exercises keep the finger motion as they're necessary for writing and releases tension on muscles, will increase blood supply ends in nutrient supply and energy. These benefits prevent muscle fatigue while writing. Pratibha Pradip Pandekar and Poonam H. Patil¹⁵ had similar study of Tendon Gliding with stretching on Writing Speed. Tendon glide exercises are a series of hand and wrist movements that improve the flow of the tendon through the carpal tunnel.

The present study is Experimental study. The purpose of this study was to evaluate the effect of tendon gliding exercise on speed of writing and on pinch strength among college students. In this study, the speed of writing was assessed by HST (Hand Writing Speed Test) and 3-Point Pinch was assessed by Pinchometer in Parul University students. The results revealed post intervention were made by using the statistical analysis test that is Paired 't' test in Microsoft Excel software 19 and SPSS version 21. Table 1, describes about the age distribution consisting of 28 students, of which age ranged between 18-25 years. The Graph 1 represents the age distribution. The maximum population ranged from 20 years of age.

Discussing about Speed of Writing measured with the help of HST is shown in Table 2 and graphically represented through Graph 2, where the mean value post intervention increased to, 125.785 from 104.432. Thus showing significantly improvement of Speed of writing with p-value <0.005.

Discussing about 3-Point Pinch strength measured with the help of Pinchometer is shown in Table 2 and graphically represented through Graph 2, where the mean value post intervention increased to 9.862 from 9.862. Thus, showing significantly of 3-Point Pinch strength with p-value <0.005.

So now considering the hypothesis part, here as Tendon Gliding Exercise showed significant improvement, the alternative hypothesis made gets accepted and null hypothesis made here are rejected post intervention as Tendon Gliding Exercise have showed significant results by increasing in speed of writing & improvement in 3-Point Pinch strength.

Hence giving Tendon Gliding Exercise is more beneficial in increasing the writing speed as the results showed. For the 3-Point pinch strength Tendon Gliding Exercise is effective in increasing pinch strength as the results showed significant and according to results Tendon Gliding Exercise was highly significant on HST than 3-point Pinch strength.

CONCLUSION

The present study was aimed to check the effect of Tendon Gliding Exercise on Speed of writing and Pinch strength among college students. Based on analysis and result it was concluded that, Tendon Gliding Exercise was highly significant for increasing writing speed. However, subjects who were receive Tendon Gliding Exercise showed less but significant improvement in 3-Point Pinch.

LIMITATIONS

- The sample size of the study was small.
- Comparison of Male & Female's Writing speed and Pinch strength was not assessed separately.
- The participants in the study were taken from a single geographical area.
- The intervention duration of the study was short.
- There was no long duration follow up taken after the treatment to assess the beneficial effect of both groups.

FUTURE RECOMMENDATIONS

- A Further study can be conduct on comparison between Male and Female writing speed & Grip Strength.
- A multi centric study can be conducted by including participants from different geographical locations.
- A large duration study can be recommended along with follow-up sessions after a month of cessation of post intervention to check out the long-lasting benefits of both groups.
- This same study will also conduct on Drawing artist the improvement.

REFERENCES

1. Feder KP, Majnemer A. Handwriting development, competency, and intervention. *Developmental Medicine & Child Neurology*. 2007 Apr;49(4):312-7.
2. Gokulakrishnan J, John Franklin. A study on upper limb Strengthening exercises on hand Writing speed for UGs. *Journal of Physiotherapy Research*. 2020; 4:1-4
3. Rosenblum S, Weiss PL, Parush S. Product and process evaluation of handwriting difficulties. *Educational psychology review*. 2003 Mar;15(1):41-81.
4. Kadaskar V, Borkar T. A Study to evaluate the correlation between pinch grip and handwriting among school going children in rural areas. *International Journal of Research*. 2020;7(2):412-6.
5. Galbaraitis D, Roaf J, Rutherford SC. The role of handwriting in raising achievement. 2009
6. Graham S, Berninger V, Weintraub N, Schafer W. Development of handwriting speed and legibility in grades 1–9. *The Journal of Educational Research*. 1998 Sep 1;92(1):42-52.
7. Tseng MH, Cermak SA. The influence of ergonomic factors and perceptual–motor abilities on handwriting performance. *The American Journal of Occupational Therapy*. 1993 Oct;47(10):919-26.
8. Schneck CM. Joint position changes in the dynamic tripod grip in children aged three to seven years. *Physical & Occupational Therapy in Pediatrics*. 1991 Jan 1;10(4):85-104.
9. Pratibha Pradip Pandekar, Poonam H. Patil. Effect of tendon gliding exercises and forearm stretching on speed of writing among college students. *International Journal of Health science and Research*. 2019; 9:137-142

10. Wehbé MA. Tendon gliding exercises. *The American Journal of Occupational Therapy*. 1987 Mar;41(3):164-7.
11. Wallen M, Mackay S. Test-retest, interrater, and intrarater reliability, and construct validity of the Handwriting Speed Test in year 3 and year 6 students. *Physical & Occupational Therapy in Pediatrics*. 1999 Jan 1;19(1):29-42.
12. Wallen M, Bonney M-A, Lennox L. Interrater reliability of the handwriting speed test. *The Occupational Therapy Journal of Research*. 1997;17(4):280-287.
13. Alaniz ML, Galit E, Necesito CI, Rosario ER. Hand strength, handwriting, and Functional Skills in children with autism. *The American Journal of Occupational Therapy*. 2015;69(4).
14. Kadaskar V, Borkar T. A study to evaluate the correlation between pinch grip and handwriting among school going children in rural areas. *International Journal of Research and Review*. 2020; 7(2): 412-416.
15. Pandekar. PP, Patil. PH Effect of tendon gliding exercises and forearm stretching on speed of writing among college students. *Int J Health Sci Res*. 2019; 9(6):137-142.

