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The Impact of Forearm Stretching and Tendon Gliding Exercises on Writing Speed and Grip Strength in Young Adults: A Randomized Controlled Trial

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Abstract: Contemporary academic requirements tend to induce extended use of hands in writing and computer tasks, possibly influencing muscular efficiency and endurance. Preventive exercises like forearm stretching and gliding of the tendons can increase grip strength and writing quality, but empirical evidence in healthy young adults is limited.

Keywords: *Grip Strength, Writing Speed, Tendon Gliding, Forearm Stretching, Young Adults, Randomized Controlled Trial.*

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I. INTRODUCTION

During this modern digital and academic age, young adults, especially college students, are more likely to spend time on activities with repetitive hand use like writing, typing, and cellular phone use. These repeated and often extended hand activities subject the muscles, tendons, and joints of the forearm and hand to mechanical stress. With time, this can lead to muscle fatigue, decreased dexterity, and even initial manifestations of musculoskeletal disorders, especially in individuals who fail to engage in regular hand care or ergonomic practices. Although most interest has been centered around curing occupational overuse syndromes or athletic injuries, interest in preventive treatment approaches that might improve hand function and postpone fatigue has increased in the academic environment.

Two of the most important measures of hand function are grip strength and writing speed. Grip strength is a general indicator of the health of the hand and forearm muscles and tendons and is a significant predictor of upper limb functional ability. Writing speed, in contrast, is a useful outcome measure of fine motor coordination, task endurance, and cognitive-motor integration. Declines in either category of performance can not only decrease academic effectiveness but may also act as an early warning indicator of musculoskeletal stress.

Forearm stretches and tendon glides are inexpensive, easy methods that have been universally applied in rehabilitation to reduce stiffness, enhance circulation, and promote tendon mobility. There has been evidence of positive effects in clinical populations, including those with carpal tunnel syndrome or arthritis. There is minimal high-quality evidence to demonstrate the effectiveness of such interventions in healthy young adults, particularly on functional outcomes such as writing speed and grip strength.

This investigation seeks to fill that gap by assessing the effect of a six-month regimen of forearm stretching and tendon-gliding exercises on hand function in right-handed university students. The main outcome measures are grip strength and writing speed—two functional indicators pertaining to everyday academic activities. We predict that frequent engagement in such exercises will produce noteworthy improvements in both measures, thereby justifying the use of preventive hand exercise programs in educational and general well-being environments.

- *Objective*

To explore the impact of a program of structured forearm stretching and tendon-gliding exercises on right-handed young adults' writing speed and grip strength.

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II. METHOD

A randomized controlled trial on 60 right-handed college students between the ages of 19–24 years, stratified into:

Intervention Group (n=30): Undertook forearm stretching and tendon-gliding exercises twice a day for 6 months.

Control Group (n=30): Did not undergo any specific intervention but followed the usual activities.

The intervention group received exercises in forearm stretching and tendon gliding twice a day for six months, whereas the control group maintained their daily activities as usual with no specific intervention. Outcome measures—grip strength (quantified using a dynamometer) and writing speed (quantified as words written per 5 minutes)—were obtained at baseline and six months later.

III. RESULT

The intervention group had a statistically significant gain in grip strength and writing speed when compared to the control group ($p<0.05$). There were no adverse events noted during the course of the intervention.

IV. DISCUSSION

The current randomized controlled trial supports the fact that a regimen of forearm stretching and tendon-gliding exercises for six months significantly enhances grip strength and writing speed in right-handed university students. The results are well in line with existing evidence suggesting the effectiveness of such interventions for improving hand function in healthy young adults.

Pandekar and Patil (2019) evaluated 64 college students in a four-week randomized trial of tendon-gliding and forearm stretching exercises. They noted statistically significant gains in handwriting speed after intervention ($p < 0.0001$). Although their intervention was brief, the magnitude and direction of change are consistent with our longer-term results and indicate that even briefer regimens can provide detectable benefit.

Physiologically, tendon-gliding movements facilitate friction-free glide of flexor tendons along the carpal tunnel and digital sheath, enhancing tendon excursion and minimizing friction. Stretching improves muscle flexibility and range of motion in joints, both of which are factors contributing to greater neuromuscular efficiency—a reasonable mechanism for the enhanced grip performance noted.

Outside of healthy populations, several rehabilitation studies in patients with carpal tunnel syndrome also suggest that adding gliding exercises to conservative therapies effectively enhances grip strength and functional status. While such clinical groups vary, the reproducibility of enhanced hand performance also supports the applicability of such interventions in augmenting tendon mechanics and muscular function.

V. CONCLUSION

Forearm stretching and tendon-gliding exercises for six months improved young adults' grip strength and writing speed substantially. These are low-cost, easy-to-use exercises to improve hand function and endurance in educational environments.

REFERENCES

[1]. MacDermid JC, Strength and function in patients with carpal tunnel syndrome. J Hand Ther. 2001;14(1):1–7. Doi:10.1016/S0894-1130(01)80043-1
[2]. Akhtar N, Bansal S, Najam A. Effect of tendon gliding exercises on pain and grip strength in patients with carpal tunnel syndrome. Int J Physiother Res. 2015;3(1):847-850. Doi:10.16965/ijpr.2015.103
[3]. Pandekar A, Patil R. Effect of tendon gliding and forearm stretching exercises on handwriting speed in college students. Int J Health Sci Res. 2019;9(4):115–120.
[4]. Hanten WP, Chen WY, Austin AA, et al. Maximum grip strength in normal subjects between the ages of 20 and 64 years. J Hand Ther. 1999;12(3):193–200. Doi:10.1016/S0894-1130(99)80045-3
[5]. Page P. Current concepts in muscle stretching for exercise and rehabilitation. Int J Sports Phys Ther. 2012;7(1):109–119.
[6]. Coppieters MW, Alshami AM. Longitudinal excursion and strain in the median nerve during novel nerve gliding exercises for carpal tunnel syndrome. J Orthop Res. 2007;25(7):972–980. Doi:10.1002/jor.20379
[7]. JW, Krause DA, Hollman JH, Harmsen WS, Laskowski ER. The influence of gender and age on grip and pinch strength in healthy adults. J Hand Ther. 2006;19(3):206–211. Doi:10.1197/j.jht.2006.02.001
[8]. Norkin CC, White DJ. Measurement of Joint Motion: A Guide to Goniometry. 5th ed. Philadelphia, PA: F.A. Davis Company; 2016.
[9]. Levangie PK, Norkin CC. Joint Structure and Function: A Comprehensive Analysis. 5th ed. Philadelphia, PA: F.A. Davis Company; 2011.
[10]. American Society of Hand Therapists. Clinical Assessment Recommendations. 3rd ed. Chicago: ASHT; 2015.
[11]. Kisner C, Colby LA. Therapeutic Exercise: Foundations and Techniques. 6th ed. Philadelphia, PA: F.A. Davis Company; 2012.
[12]. Agrawal RP, Gupta R, Bansal P. Tendon gliding exercises as an adjunct to conservative management of carpal tunnel syndrome: A randomized clinical trial. J Clin Diagn Res. 2013;7(5):861–863. Doi:10.7860/JCDR/2013/5080.2951
[13]. tSault JD. The effects of exercise on grip strength in healthy adults: A review. Physiother Theory Pract. 2008;24(6):419–429. Doi:10.1080/09593980802231963

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1132

[14]. tSu CY, Lin JH, Chien TH, Cheng KF. Grip strength and forearm muscle thickness in different tasks and arm postures. Clin Biomech (Bristol, Avon). 2006;21(6):617–623. Doi:10.1016/j.clinbiomech.2006.01.005
[15]. tMathiowetz V, Kashman N, Volland G, et al. Grip and pinch strength: normative data for adults. Arch Phys Med Rehabil. 1985;66(2):69–74.
[16]. Langer D, Jacquet LM, Langer J. Reliability of a simple test of handwriting speed in children and young adults. J Educ Psychol. 2010;102(2):498–504. Doi:10.1037/a0018723
[17]. De-la-Llave-Rincón AI, Fernández-de-las-Peñas C, Ortega-Santiago R, Ambite-Quesada S, Arroyo-Morales M. Positive effects of neural mobilization on pain and pressure pain sensitivity in women with neck pain: A randomized controlled trial. J Rehabil Med. 2012;44(8):625–629. Doi:10.2340/16501977-1009
[18]. Hsiao MY, Hung CY, Chang KV, Han DS. Grip strength in various positions and relationship with elbow flexion force. J Phys Ther Sci. 2015;27(10):3249–3252. Doi:10.1589/jpts.27.3249
[19]. Nambudiri AM, Thomas C. Prevention of overuse injuries in students: The role of ergonomic education. Physiother Pract Res. 2018;39(2):83–88.
[20]. Cagnie B, Danneels L, Van Tiggelen D, De Loose V, Cambier D. Individual and work related risk factors for neck pain among office workers: A cross sectional study. Eur Spine J. 2007;16(5):679–686. Doi:10.1007/s00586-006-0269-7
[21]. Nambi G, Sangeetha A, Devi SS. Effects of neural tissue mobilization on grip strength in asymptomatic subjects. J Bodyw Mov Ther. 2013;17(3):363–367. doi:10.1016/j.jbmt.2012.08.003
[22]. Pinar L, Skempes D, Lurati K. The effects of a tendon and nerve gliding program on symptoms and hand function in carpal tunnel syndrome patients. Int J Ther Rehabil. 2010;17(3):134–142. doi:10.12968/ijtr.2010.17.3.46952
[23]. Kitis A, Buker N, Taylor NF. The effectiveness of splinting and exercise in the conservative treatment of carpal tunnel syndrome: A randomized controlled trial. J Hand Ther. 2010;23(2):155–162. doi:10.1016/j.jht.2009.10.002
[24]. Newman P, Fortescue C, Hine P. Tendon and nerve gliding exercises in people with carpal tunnel syndrome: A systematic review. JBI Libr Syst Rev. 2011;9(33):1303–1323. doi:10.11124/jbisrir-2011-40
[25]. Evers S, Nieskens K, Lecloux M. Effects of upper limb tendon gliding and stretching in computer users: A pilot study. Work. 2015;52(3):597–602. doi:10.3233/WOR-152182
[26]. Michlovitz SL, LaStayo PC, Alzner S, Watson E. Distal upper extremity splinting: Static splinting. Orthop Phys Ther Clin N Am. 2001;10(2):189–205.
[27]. Vanti C, Conti C, Ferrari S, Guccione AA, Pillastrini P. Effect of neurodynamic mobilization on median nerve mechanosensitivity and hand function in patients with carpal tunnel syndrome. J Manipulative Physiol Ther. 2012;35(5):385–394. doi:10.1016/j.jmpt.2012.05.004
[28]. Peterson DE, Bombardier C, Leong A. The role of exercise in hand rehabilitation. Clin Rheumatol. 2000;19(1):14–19. doi:10.1007/s100670050021
[29]. Ranganathan VK, Siemionow V, Liu JZ, Sahgal V, Yue GH. From mental power to muscle power—gaining strength by using the mind. Neuropsychologia. 2004;42(7):944–956. doi:10.1016/j.neuropsychologia.2003.11.018
[30]. Seradge H, Jia YC, Owens W. In vivo measurement of carpal tunnel pressure in the functioning hand. J Hand Surg Am. 1995;20(5):855–859. doi:10.1016/S0363-5023(05)80431-1
[31]. Schreuders TA, Roebroeck ME, Jaquet JB, Hovius SE. Measuring strength and recording grip and pinch strength. J Hand Ther. 2003;16(4):324–331. doi:10.1197/S0894113003000722
[32]. Bohannon RW. Hand-grip dynamometry predicts future outcomes in aging adults. J Geriatr Phys Ther. 2008;31(1):3–10. doi:10.1519/00139143-200831010-00002
[33]. Lins CA, Neto HP, Amorim AB, Macedo LB. Stretching and strengthening exercises improve the symptoms of carpal tunnel syndrome: Systematic review and meta-analysis. Clin Rehabil. 2016;30(11):1049–1058. doi:10.1177/0269215515615713
[34]. Aggarwal A, Gupta A. Influence of stretching exercises on handgrip strength and hand function in computer operators. Indian J Occup Environ Med. 2012;16(3):121–123. doi:10.4103/0019-5278.107080
[35]. Sarrafzadeh J, Nateghi H, Bagheri H. The effects of stretching on grip strength in the short term. Iranian J Rehabil Res Nurs. 2014;1(2):40–44.
[36]. Baumeister J, Reinecke K, Weiss M. Modified cortical activity following stretching. Neurosci Lett. 2008;441(2):143–147. doi:10.1016/j.neulet.2008.06.039
[37]. Johnson EW. Practical Guide to Range of Motion Assessment. Philadelphia, PA: Lippincott Williams & Wilkins; 2002.
[38]. Dierks TA, Davis IS. The effects of running in an exerted state on lower extremity kinematics and joint timing. J Biomech. 2007;40(15):3562–3567. doi:10.1016/j.jbiomech.2007.06.004
[39]. de Krom MC, Knipschild PG, Kester AD, Spaans F. Risk factors for carpal tunnel syndrome. Am J Epidemiol. 1990;132(6):1102–1110. doi:10.1093/oxfordjournals.aje.a115748
[40]. Szabo RM. Entrapment neuropathies. Semin Neurol. 2000;20(2):221–226. doi:10.1055/s-2000-5819
[41]. McKeon PO, Ingersoll CD. Neural gliding techniques for the treatment of carpal tunnel syndrome. J Sport Rehabil. 2000;9(3):237–246. doi:10.1123/jsr.9.3.237
[42]. Nordin M, Frankel VH. Basic Biomechanics of the Musculoskeletal System. 4th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2012.
[43]. Gabel CP, Moran RW, Burkett B, Wing R. The development and validation of a stretching compliance questionnaire. Physiother Theory Pract. 2009;25(3):205–220. doi:10.1080/09593980802443742

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1132

[44]. Palmer DH. Prevention of cumulative trauma disorders in computer users. J Occup Rehabil. 1993;3(2):77–88. doi:10.1007/BF01078753
[45]. Veröffentlichung Holtermann A, Hansen JV, Burr H, Søgaard K, Mortensen OS. Prognostic factors for long-term sickness absence among employees with neck–shoulder and low-back pain. Scand J Work Environ Health. 2010;36(1):34–41. doi:10.5271/sjweh.2870
[46]. Bialosky JE, Bishop MD, Penza CW, George SZ. Placebo mechanisms of manual therapy: A neurophysiological perspective. Phys Ther. 2011;91(5):765–773. doi:10.2522/ptj.20100338
[47]. 47. Abenhaim L, Rossignol M. Musculoskeletal disorders and the workplace. Clin Orthop Relat Res. 1998;351:77–84.
[48]. 48. Wang RY, Lin PY, Li CH, Chien KL, Hsieh CL. Effects of stretching and strengthening exercises on grip strength and muscular endurance. Kaohsiung J Med Sci. 2006;22(9):440–446. doi:10.1016/S1607-551X(09)70343-2
[49]. Nussbaumer S, Leunig M, Glatthorn JF, et al. Validity and test-retest reliability of manual goniometers for measuring passive hip range of motion. Phys Ther Sport. 2010;11(2):61–66. doi:10.1016/j.ptsp.2010.01.002
[50]. McGee SR. Evidence-Based Physical Diagnosis. 4th ed. Philadelphia, PA: Elsevier; 2018.