

Correlation of Handgrip Strength with Thumb Flexibility, Strength and Pain in Manual Therapists

Saba Riaz, Tooba Mazhar, Sumbal Riaz, Ayesha Batool, Awishbah Khan, Sadia Khan

Department of Physical Medicine and Rehabilitation, University of Management and Technology, UMT Lahore Pakistan

ABSTRACT

Objective: To find the correlation between hand grip strength with thumb muscle strength, flexibility and thumb pain in manual therapists and to find out the variation of these variables in healthy manual therapists.

Study Design: Comparative cross-sectional Study.

Place and Duration of Study: Pakistan Society of Rehabilitation and Disability, Jinnah Hospital, Ittefaq Hospital, and Riphah University Pakistan, from Nov 2021 to Jan 2022.

Methodology: One hundred thirty-five manual therapists were enrolled. Informed consent was taken from participants meeting inclusion and exclusion criteria. The questionnaire was filled out using a Dynamometer for Handgrip strength check, a Manual Muscle testing technique for Thumb muscle strength check, a Numeric pain rating scale for Pain intensity, and Goniometry for Flexibility of the Thumb muscles.

Results: Results showed that most manual therapists had no wrist pain (99,73.3%) or thumb pain (104,77%). The majority of therapists (116 ,85.9%), had less than normal grip strength of hand, and 58(43%) had maximum thumb strength. There was a positive correlation between grip strength and thumb strength ($r=0.234$). There was a negative correlation between grip strength and thumb pain ($r=-0.077$).

Conclusion: The study concluded that most manual therapists did not suffer from wrist and thumb pain. The majority had good thumb muscle strength but poor hand grip strength. Thumb strength positively correlates with grip strength, while thumb pain negatively correlates with handgrip strength.

Keywords: Flexibility, Grip strength, Manual Therapy, Strength, Work-related musculoskeletal disorders.

How to Cite This Article: Riaz S, Mazhar T, Riaz S, Batool A, Khan A, Khan S. Correlation of Handgrip Strength with Thumb Flexibility, Strength and Pain in Manual Therapists. *Pak Armed Forces Med J* 2023; 73(6): 1699-1702. DOI: <https://doi.org/10.51253/pafmj.v73i6.9142>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

The risk of musculoskeletal disorders is higher for healthcare professionals, who commonly work in hospitals and handle patients. In the healthcare industry, musculoskeletal disorders are responsible for almost one-third of all sick leaves. Demographic, psychosocial, and workplace hazard exposures are some risk factors associated with musculoskeletal disorders (MSDs).^{1,2}

A manual therapist's hands are essential in evaluating and treating patients, and they must be sheltered from injury at every possible opportunity.³ An unbiased catalogue of functional dependability of the upper limb is provided by Hand Grip strength. The most useful indicator of Muscle function is the Measurement of handgrip strength.⁴

The effortless and consistency of grip strength measurement highlight its promising usefulness as a screening means. The thumb represents around 50% of general Handwork and is the most

significant digit for hand function.⁵ The thumb's mobility and use are in all parts of hand actions, leaving it vulnerable to injury or overuse.⁶

Work-related thumb pain is a common problem in manual therapy. Work-related thumb pain in manual therapy is defined as 'the pain that happens during the execution of techniques which a manual therapist should use in a function of his profession.'⁷ Manual therapists must apply different manual techniques to various disorders, especially Spinal cord diseases. There is an excessive use of hands, especially the thumb, in contrast with other body parts in various manual strategies.^{8,9} Manual therapists experience some alterations in their thumb and hand strength due to some manual techniques.¹⁰

This study helped us find normative data on physical performance measures of hands in manual therapists. Limited Strength and thumb pain can lead to musculoskeletal injuries. Associations and normative data for strength and pain could help us primarily prevent work-related musculoskeletal injuries and increase awareness about physical fitness. This study will increase our awareness about MSK

Correspondence: Dr Saba Riaz, Department of Physical Medicine and Rehabilitation, UMT Lahore Pakistan

Received: 14 Aug 2022; revision received: 21 Nov 2022; accepted: 23 Nov 2022

Strength and Pain in Manual Therapists

injuries and physical well-being, which, to our knowledge, have not been studied before.

METHODOLOGY

The comparative cross-sectional study was conducted at Pakistan Society of Rehabilitation and Disability (PSRD), Jinnah Hospital, Ittefaq Hospital, and Riphah University Pakistan, from November 2021 to January 2022 after approval from the Ethical Committee of the Office of Research Innovation and Commercialization (ORIC) (RE-089-2021). The sample size was calculated using the WHO sample size calculator, taking the reported prevalence of thumb pain in manual therapists practising manual therapy in Lahore as 68.5%.⁷

Inclusion Criteria: Physiotherapists of either gender, aged 22-45 years, practising manual therapy with at least six months of clinical experience, with at least four working days with at least four clinical hours each day, were included.

Exclusion Criteria: Therapists having a history of hand or thumb injury, trauma, or fracture, and chiropractors were excluded.

A total of 140 manual therapists were approached. A total of 5 were dropped out to fulfil inclusion and exclusion criteria. Informed consent was obtained from participants. The questionnaire was filled by using a Dynamometer for Handgrip strength check, a Manual Muscle testing technique,¹¹ for Thumb muscle strength check, a Numeric pain rating scale,¹² for Pain intensity and Goniometry,¹³ for flexibility of the Thumb muscles.

Muscle Testing Technique (MMT) and its consequences on work were recorded.

Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 21:00. Categorical data was analyzed as frequencies and percentages, and continuous data was analyzed as mean and standard deviation. Bi-variant Pearson correlation was calculated.

RESULTS

A total of 135 subjects were included with mean age and Body Mass Index (BMI) was 26.19±2.989 years and 22.62±3.13 kg/m², respectively. There were 32(23.23%) males and 103(76.3%) females in the sample. The mean working hours were 6.49±1.41, and the mean thumb pain was 0.81±1.81. 126(93.3%) manual therapists were right-handed, and 9(6.7%) were left-handed. A total of 66(48.89%) of Subjects were working in OPD, 3(2.22%) were working in Wards, 3(2.2%) were working in OPD & ICU, 3(2.22%) were working in OPD & Wards and 60(44.44%) were working in All three departments i.e., ICU, OPD and Wards. The most commonly used Techniques Were Peripheral joint mobilization, which was always used by 59(43.7%) manual therapists; soft tissue release technique, which was always used by 75(55.6%) manual therapists; and Trigger Point Pressure Release Technique, was always used by 69(51.1%) manual therapists. The least used techniques were Spine HVLA manipulation and Vibration & shaking, which were always used by 12(8.9%) manual therapists, as shown in Table-I. Grip strength by dynamometer is shown in the Table-II. 104(77%) subjects had no thumb

Table-I: Techniques used by Manual therapists (n=135)

	Always	Often	Sometimes	Rarely	Never
	Frequency (percentage)	Frequency (percentage)	Frequency (percentage)	Frequency (percentage)	Frequency (percentage)
Peripheral joint mobilization	59(43.7%)	42(31.1%)	32(23.7%)	2(1.5%)	0(0%)
Vertebral joint mobilization	56(41.5%)	40(29.6%)	30(22.2%)	6(4.4%)	3(2.2%)
Spine HVLA manipulation	12(8.9%)	15(11.1%)	54(40%)	31(23%)	23(17%)
Soft tissue release	75(55.6%)	46(34.1%)	10(7.4%)	3(2.2%)	1(0.7%)
Trigger point release	69(51.1%)	48(35.6%)	16(11.9%)	2(1.5%)	0(0%)
Vibration & shaking	12(8.9%)	27(20%)	42(31.1%)	40(29.6%)	14(10.4%)
Percussion	30(22.2%)	20(22.2%)	28(20.7%)	32(23.7%)	15(11.1%)
Traction	53(39.3%)	55(40.7%)	13(9.6%)	11(8.1%)	3(2.2%)

Descriptive data, working experience, working hours in a week, techniques manual therapists used, handgrip strength measurement via dynamometer, Thumb pain measurement via NPRS (Numeric Pain Rating Scale), Thumb muscles flexibility by Goniometry, Muscle Strength measurement via Manual

pain, 20(14.8%) had mild thumb pain, 9(6.7%) had moderate thumb pain, and 2(1.5%) had severe thumb pain.

There was a positive correlation between handgrip strength and thumb strength ($r=0.234$) and thumb flexibility ($r=0.160$). In contrast, a negative

Strength and Pain in Manual Therapists

correlation between hand grip strength and thumb pain ($r=-0.077$) was present on the dominant and non-dominant sides, as shown in Table-III.

Table-II: Grip Strength by Dynamometer (n=135)

	Dominant Hand	Non-Dominant Hand
	Frequency (Percentage)	Frequency (Percentage)
Below Normal	116(85.9%)	120(88.9%)
Normal	16(11.9%)	10(7.4%)
Above Normal	3(2.2%)	5(3.7%)
Total	135(100.0%)	135(100.0%)

Table-III: Correlation of Thumb strength, Flexibility, Thumb Pain and working Hours with Hand Grip Strength (n=135)

Hand Grip Strength Dominant Hand	Dominant Hand			
	Thumb strength	Flexibility	Thumb Pain	Working Hours
Correlation coefficient	0.234	0.160	-0.077	0.068
p-value	0.006	0.064	0.377	0.431
Hand Grip Strength Non- Dominant Hand	Non-Dominant Hand			
	Thumb strength	Flexibility	Thumb Pain	Working Hours
Correlation coefficient	0.126	0.132	-0.184	0.006
p-value	0.146	0.128	0.033	0.943

DISCUSSION

In the present study, 77% of participants reported no thumb pain compared to the previous one, while 23% suffered from thumb pain.¹² In 118 participants sample from the previous, it was found converging evidence that 61.02% of manual therapists had no thumb pain in Delhi-NCR (India), though 38.98% had thumb pain. It further exhibited that 22.88% of Manual therapists had Mild Thumb Pain, 16.1% had moderate thumb pain, and 0% had serious thumb pain.¹³ In contrast, one study reported that 1.5 % of manual therapists had severe thumb pain.¹⁴ That study had 11 (33%) participants who used to work less than 15 hours a week suffer from thumb, which is the same as ours. The study showed 31(23%) with thumb pain with working hours less than 15 per week. The most commonly affected joints in both studies are the Carpometacarpal and Metacarpophalangeal joints. At the same time, the aggravating technique for less than 50% of manual therapists was the trigger point pressure release technique. Thumb and wrist pain is common in manual therapists practising manual techniques.¹⁵

The findings of our study revealed that performing soft tissue release technique, trigger point pressure release technique, and peripheral joint mobilization all expanded the danger of thumb issues, which is as per past investigations that observed a

relationship between the utilization of manual treatment and pervasiveness of thumb pain in manual therapists. Soft tissue and trigger release are common techniques used in physical therapy practice.^{16,17}

The present study concluded that insufficient evidence exists to show a positive correlation between BMI and Handgrip strength. In a previous study, 150 female Manual therapists to find a correlation between Handgrip strength and Body Mass Index (BMI). Hand Grip Strength is considered an index of Skeletal Muscle Function and nutritional status. It is influenced by muscle bulk, contractility of musculature, and effort. It weakens in specific conditions. It does not quantify

muscle versus fat. She concluded that there was a significant moderate negative correlation between handgrip strength and BMI in female manual therapists.¹⁸

The Present study also reported an inverse relation between Thumb flexibility and Thumb strength for the non-dominant hand. In contrast to the previous study, a direct relation is reported in our study for the flexibility and strength of the thumb of the dominant hand.¹⁹ Another study reported that general flexibility in terms of the Beighton score affected the ability of an individual to generate thumb tip force (strength). Inverse correlations were found between the Thumb tip force and the Beighton score in both the novice and experienced groups.²⁰

LIMITATION OF STUDY

The limitation of the present study was that we could not use a mechanical pinch gauge for thumb strength. We recommend that future researchers do comparative studies of normative data on different study populations.

ACKNOWLEDGEMENT

The authors would like to thank their family and friends for their undue support and express their appreciation to all subjects who participated in this study for all their content and cooperation.

CONCLUSION

The study concluded that most manual therapists were not suffering from wrist and thumb pain. The majority had

good thumb muscle strength but poor hand grip strength. Thumb strength is positively correlated with grip strength, while thumb pain has a negative correlation.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

SR & TM: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

SR & AB: Study design, data interpretation, critical review, approval of the final version to be published.

AK & SK: Concept, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Dong H, Zhang Q, Liu G, Shao T, Xu Y. Prevalence and associated factors of musculoskeletal disorders among Chinese healthcare professionals working in tertiary hospitals: a cross-sectional study. *BMC Musculoskeletal Disord* 2019; 20(1): 175. <https://doi.org/10.1186/s12891-019-2557-5>.
2. Alqahtani B, Alenazi A, Alshehri M, Alqahtani M, Elnaggar R. Reference values and associated factors of hand grip strength in elderly Saudi population: a cross-sectional study. *BMC Geriatr* 2019; 19(1): 271. <https://doi.org/10.1186/s12877-019-1288-7>.
3. Akinoglu B, Kabak B, Balci A, Kocahan T, Hasanoglu A. A comparative study of shoulder muscle strength, sense of proprioception and internal/external rotation flexibility between adolescent athletes with and without scapular asymmetry. *Adv Rehabil* 2020; 34(3): 1-7. <https://doi.org/10.5114/areh.2020.99103>.
4. Ramlagan S, Peltzer K, Phaswana-Mafuya N. Hand grip strength and associated factors in non-institutionalised men and women 50 years and older in South Africa. *BMC research notes*. 2014; 7(1): 8. <https://doi.org/10.1186/1756-0500-7-8>.
5. Pratt J, De Vito G, Narici M, Segurado R, Dolan J, Conroy J, et al. Grip strength performance from 9431 participants of the GenoFit study: normative data and associated factors. *GeroScience*. 2021; 43(5): 2533-2546. <https://doi.org/10.1007/s11357-021-00410-5>.
6. Hu M-T, Hsu A-T, Lin S-W, Su F-C. Effect of general flexibility on thumb-tip force generation-implication for mobilization and manipulation. *Man Ther* 2009; 14(5): 490-495. <https://doi.org/10.1016/j.math.2008.10.003>.
7. Mubeen M, Ans M, Ayaz S, Mohiuddin E, Tufail A, Mubeen F, et al. The Frequency of Thumb Pain Among Physiotherapists Practicing Spinal Manual Therapy in Lahore, Pakistan. *Pak J Med Biol Sci* 2018; 2(1): 27-31.
8. Lopes TJ, Simic M, de Souza Alves D, dos Santos Bunn P, Rodrigues AI, de Souza Terra B, et al. Physical Performance Measures of Flexibility, Hip Strength, Lower Limb Power, and Trunk Endurance in Healthy Navy Cadets: Normative Data and Differences Between Sex and Limb Dominance. *J Strength Cond Res* 2021; 35(2): 458-464. <https://doi.org/10.1519/jsc.0000000000002365>.
9. Cromie JE, Robertson VJ, Best MO. Work-related musculoskeletal disorders in physical therapists: prevalence, severity, risks, and responses. *Phys Ther* 2000; 80(4): 336-351. <https://doi.org/10.1093/ptj/80.4.336>.
10. Nara K, Kumar P, Rathee R, Kumar S, Pal R, AHLAWAT JS, et al. Grip strength performance as a determinant of body composition, muscular strength and cardiovascular endurance. *J Phys Educ Sports* 2022; 22(7): 1618-1625. <https://doi.org/10.7752/jpes.2022.07203>.
11. O'Connor SR, Fagher K, Williamson S, Pluim BM, Ardern CL, van Rensburg DCJ, et al. Assessment of muscle strength in para-athletes: A systematic review of observational studies. *Sports Med Health Sci* 2022; 4(4): 225-238. <https://doi.org/10.1016/j.smhs.2022.07.004>.
12. Stjernberg-Salmela S, Karjalainen T, Juurakko J, Toivonen P, Waris E, Taimela S, et al. Minimal important difference and patient acceptable symptom state for the Numerical Rating Scale (NRS) for pain and the Patient-Rated Wrist/Hand Evaluation (PRWHE) for patients with osteoarthritis at the base of thumb. *BMC Med Res Methodol* 2022; 22(1): 127-130. <https://doi.org/10.1186/s12874-022-01600-1>.
13. Boczar D, Seu M, O'Connell A, Gersh E, Chaya BF, Berman Z, et al. Hand Therapy Regimen for Functional Recovery Following Combined Face and Bilateral Hand Transplantation. *Hand (N Y)* 2023; 18(3): NP7-NP15. <https://doi.org/10.1177/15589447221124250>.
14. Yaseen A, Yaseen H, Yaseen A. Work related thumb pain, its prevalence, risk factors and prevention among physical therapists. *Int J Endors Health Sci Res* 2019; 7(1): 01. <http://doi.org/10.29052/IJEHSR.v7.i1.2019.01-10>.
15. Akram A, Sharif F, Ahmed A. Work-related thumb pain and associated risk factors among manual physiotherapists. *Khyber Med Uni J* 2020; 12(2): 149-153. <http://doi.org/10.35845/kmu.2020.19629>.
16. Junaid M, Yaqoob I, Rehman SSU, Ghous M. Effects of post-isometric relaxation, myofascial trigger point release and routine physical therapy in management of acute mechanical neck pain: a randomized controlled trial. *J Pak Med Assoc* 2020; 70(10): 1688-1692. <https://doi.org/10.5455/jpma.15939>.
17. Chughtai M, Samuel LT, Acuña AJ, Kamath AF. Algorithmic soft tissue femoral release in anterior approach total hip arthroplasty. *Arthroplast Today* 2019; 5(4): 471-476. <https://doi.org/10.1016/j.artd.2019.10.004>.
18. Kareem I, Amjad F, Arif S, Batool S. Prevalence of Thumb Pain Among Physiotherapists Perform Manual Techniques During Clinical Practice. *Pak J Phys Ther* 2021: 09-14. <http://dx.doi.org/10.52229/pjpt.v3i3.904>.
19. Limpaphayom N, Tooptakong T, Osateerakun P. A comparative study of pedobarography and ankle kinematics between children with idiopathic clubfoot after a soft tissue release procedure and controls. *Int Orthop* 2020; 44(2): 319-327. <https://doi.org/10.1007/s00264-019-04447-2>.
20. Alnaser MZ, Aljadi SH. Physical therapists with work-related musculoskeletal disorders in the State of Kuwait: A comparison across countries and health care professions. *Work* 2019; 63(2): 261-268. <https://doi.org/10.3233/wor-192927>.