

Assessment of Hand Grip Strength and Pinch Grip Strength among Healthy Embroidery Workers: Cross-Sectional Study

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ABSTRACT

Background: Embroidery is a craft that decorates fabric or other materials by using a needle to apply thread or yarn. Hand and finger strength is essential during embroidery design to minimize discomfort and risk of upper extremity injuries

Aims and objective: This study aims to assess hand grip strength and pinch grip strength among healthy embroidery workers.

Methodology: 100 embroidery workers were recruited. Demographic details including BMI were taken in self-designed form. Hand grip strength was assessed by Jamar Hand Held Dynamometer. Pinch grip strength was assessed by a Pinch Guage Dynamometer. Statistical analysis was done using the Python software.

Results: The study included 100 subjects that involved all female subjects aged 20 to 40 yrs. with 4 or more than 4 years of experience. The study showed that the hand grip strength of embroidery workers was more affected than the pinch grip strength. This study also showed that age is not related to the hand grip and pinch grip strength. It also showed that an increase in the years of experience increases hand grip and pinch grip strength ($p < 0.05$) as well as grip strength was more in the dominant hand ($p < 0.0001$).

Conclusion: Hand grip strength was found to be affected more than the pinch grip strength. They found no correlation with the age and there was a correlation with years of experience.

KEYWORDS: Jamar Hand Held Dynamometer, Pinch Guage Dynamometer, strength, Age, skill workers.

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INTRODUCTION

In recent years the demand from the fashion industry is booming as well as the customer's desire for hand embroidery garments in India. The supply and demand of hand embroidery dresses are at an all-time high. In India, two or more of the members of the same family are involved in the job as embroidery homeworkers, and it is the only source of earning for the family [1]. Embroidery is a fine craft

that involves decorating fabric or other materials using a needle to apply thread or yarn [2]. Embroidered garments are made in stages, starting with fabric cutting and tailoring, followed by block printing and embroidering, and, finally, laundering [3].

Hand and finger strength is essential during embroidery design to minimize discomfort and risk of upper extremity injuries. They require regular and repeated use of pinch and hand

grip hundreds and thousands of times a day [4].

Hand grip strength and pinch grip strength are some of the most important factors related to proper hand function. The grip strength and pinch strength were reported to be higher in the dominant hand in the normal population [5].

Hand grip strength is an indicator of general muscle strength [6]. The fingers in the hand grip usually function in concert to clamp on and hold an object in the palm. The fingers assume a position of sustained flexion that varies in degree with the size, shape and weight of the object [7].

Hand grip strength will be measured by a Jamar handheld dynamometer [8].

Pinch is a compression or squeezing of the end of the thumb in opposition to the end of one or more of the fingers [4]. There are 3 types of pinch techniques such as:

lateral pinch (key pinch): An object is held between the pad of the thumb and the side of the index finger.

3-point pinch (3 jaw chuck pinch): It involves opposition of the pulp or pad of the thumb to the pulp or pad of the index and middle finger.

2-point pinch (tip-to-tip pinch): It involves the opposition of the tip of the thumb to the tip of the index finger.

Pinch grip strength will be measured by a pinch gauge dynamometer [9].

Physical fitness is the major mantra today and may it be yoga, aerobics, gym, etc.; many people around the world are conscious about their fitness. At the same time, many are suffering from diseases such as diabetes, hypertension and coronary artery disease, which are mainly due to sedentary lifestyles and unhealthy eating habits. The main aim of all physical activities, diet, and lifestyle measures is to maintain a normal range of body mass index (BMI) [10].

Body mass in adults can be classified using the body mass index, which is a simple index of weight for height [11].

Ehsanollan Habibi et.al. conducted a study

titled "Hand grip and pinch grip- Effects of workload, hand dominance, age and BMI" which describes that the grip and pinch strength of the dominant hand was higher than non-dominant. Studies showed no significant relationship between age with pinch and grip strength. They also concluded that BMI has a higher effect in moderate and heavy activities on grip and pinch strength compared to rest and light activities [5].

$$\text{Body mass Index} = \frac{\text{Weight (in Kg)}}{\text{Height (m}^2\text{)}}$$

So, our project aims to assess hand grip strength and pinch grip strength among healthy embroidery workers.

METHODOLOGY

Type of Study- Cross-sectional

Sampling method- Purposive sampling

Sample size-100

Place of study- Metropolitan study

INCLUSION CRITERIA:

- Embroidery workers willing to participate
- Age- 20 yrs. to 40yrs
- Gender-female
- Work experience of more than 4 years.
- No of hours working- 8---12 hours a day
- BMI-18.5-24.9kg/m²

EXCLUSION CRITERIA:

- Embroidery workers with less than 1 year experience
- History of musculoskeletal disorder (e.g. carpal tunnel syndrome, rheumatoid arthritis etc)
- History of traumatic hand injury
- Surgical history of hand
- Any co-morbidities- Diabetes, Hypertension, etc
- Peripheral neuropathy

OUTCOME MEASURES:

Jamar hand dynamometer

Pinch dynamometer

Procedure: Selection of the subject will be done as per the inclusion and exclusion criteria. A written informed consent will be taken from the subjects in the language best

understood by them. Further subjects who are willing to participate will be included in this study. The purpose of the study and procedure will be explained to the subject. Demographic data will be taken. BMI will be calculated by height (in m²) and body weight (in kg). Assessment of hand grip strength will be done by Jamar’s hand-held dynamometer and assessment of pinch grip strength will be done by Pinch gauge dynamometer. The data will be compared with normative data on Hand grip strength and Pinch grip strength.

Data Analysis and Interpretation: The data was collected. All statistical analysis was done using the Python software.

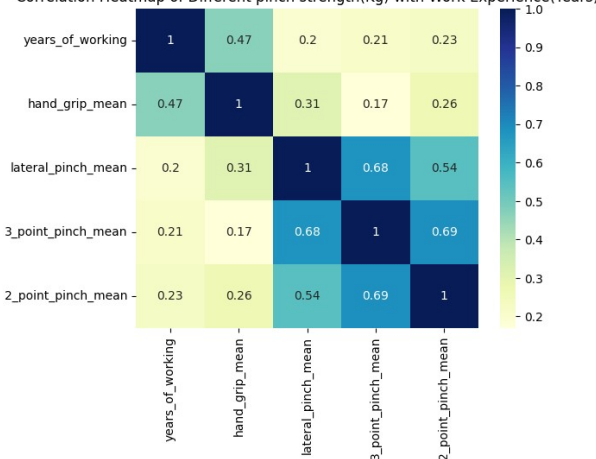
Pearson’s correlation was used to check the correlation between grip strength and years of experience as well as grip strength and age. The chi-square test was used to test the correlation between hand dominance and grip strength.

RESULTS

Table 1: Co-Relation Of Grip Strength Vs Years Of Experience.

Variable	Co-Relation Coefficient	P Value
Hand Grip Strength	0.466	0.000001
Lateral Pinch Strength	0.197	0.0484
3 Point Pinch Strength	0.212	0.0336
2 Point Pinch Strength	0.227	0.0229

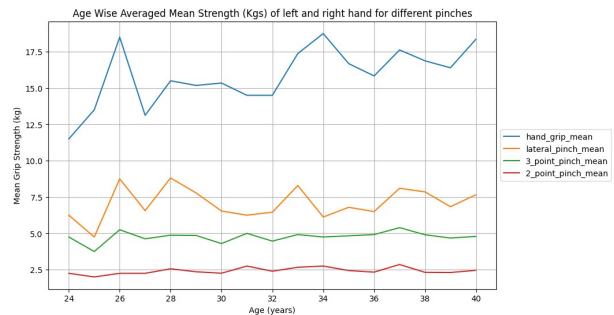
Correlation Heatmap of Different pinch strength(Kg) with Work Experience(Years)



Inference: The Pearsons correlation was used to assess whether the grip strength was affected by the working years of experience. The correlation demonstrated that all the grip strength was affected by the working years of experience.

Table 2: Co-Relation Of Grip Strength Vs Age.

Variable	Co-Relation Coefficient	P Value
Hand Grip Strength	0.3633	0.000203
Lateral Pinch Strength	0.1049	0.298777
3 Point Pinch Strength	0.1747	0.082055
2 Point Pinch Strength	0.065	0.520096

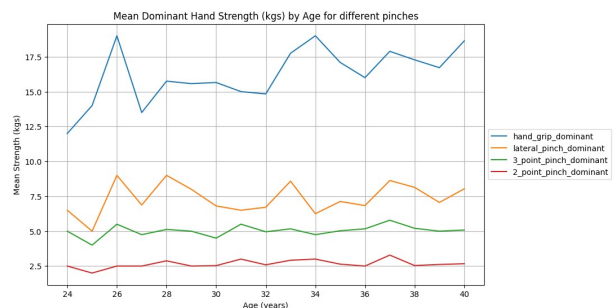


Inference: The Pearsons correlation was used to assess whether the grip strength was affected by the age. The correlation demonstrated that all the grip strength was not affected by the age.

Table 3: Co-Relation Of Hand Dominance Vs Grip Strength

Variable	P Value
Hand Grip Strength	3.69*10 ⁻⁷
Lateral Pinch Strength	8.49*10 ⁻¹¹
3 Point Pinch Strength	1.468*10 ⁻⁹
2 Point Pinch Strength	3.226*10 ⁻⁹

Inference: Chi square test was used to test the correlation between the hand dominance and the grip strength. This test demonstrated that the grip strength dominant hand was more affected than the non-dominant hand.



This study also found that the hand grip strength was more affected than the pinch grip strength.

All statistical analysis was done using the Python software.

Grip and pinch strength were recorded for 100 participants. Demographic details taken were age, years of experience, hand dominance and

BMI. The age of the embroidery workers taken was 20 to 40 yrs. The years of experience of working women was 4 or more than 4 yrs. The BMI for all the individuals taken was 18.5 to 24.5 kg/m².

DISCUSSION

Hand grip and pinch grip is important for daily life activities. Embroidery work is a very tedious profession requiring long hours of work being in a static posture. Majority of the participants were on daily wages working 6 days per week for 7 to 8 hours while maintaining static posture for about 4 hours continuously. Majority took a break only for one hour [2]. Hand grip strength and pinch grip strength plays a crucial role in people doing embroidery work. Embroidery workers work 8 to 10 hours per day by continuously using their hand grip and pinch grip [4]. Embroidery workers continuously use their hand grip and pinch grip for doing embroidery work.

The study included 100 subjects that involved all female subjects aged 20 to 40 yrs. with more than 5 years of experience. Demographic details were taken including BMI. The hours of working and years of experience were also noted.

Our study is different as this study focuses on assessing the hand grip and pinch grip strength including lateral, 3point and 2point pinches of all the participants and to check whether the hand grip or pinch grip is affected more. And if the pinch grip is affected, so which type of pinch grip is affected more. In relation to this, this study also checks the correlation between hand grip and pinch grip with the years of experience of all the participants. This study also correlates the hand grip and pinch strength with the age of an individual. This study also focuses on the relation between hand grip strength and pinch grip strength with the hand dominance of an individual.

This study aimed to check the hand grip and pinch grip strength of all workers. A research study was conducted by Parven I, Kishwara S, et.al. which demonstrated that lateral pinch strength was affected in people doing embroidery work. They found that the lateral pinch grip strength was affected in embroidery

workers [4]. Our study was able to demonstrate that the hand grip and pinch strength was affected in all embroidery workers. Our study also was able to demonstrate that the years of experience affected grip strength of an individual. Our study also demonstrated that the grip strength of an individual was not affected by age of the workers. It also demonstrated that the dominance of hand was affected.

A study conducted by Dhananjaya J R, Veena H C, et.al. showed that hand grip strength differs with underweight, healthy, overweight and obese individual [10]. So, in our study we took healthy embroidery workers whose BMI ranging from 18.5kg/m² to 24.5kg/m².

A study conducted by Lava Shrestha, Sanyukta Gurung, et.al. on Correlation of Body Mass Index with Handgrip Strength and Endurance of Dominant Hand in Medical Students proved that there was a correlation between hand grip strength and hand dominance [12].

So, this study resulted that the hand grip and pinch grip strength was affected more in the dominant hand than the non-dominant hand.

There are two studies in which one study showed that 33.33% of the fingers were involved in embroidery workers [2]. And in other study they compared lateral pinch strength between 2 groups that is bead embroiders and sedentary workers [4]. So, in our study we are focused on both hand grip strength and pinch grip strength which was measured by Jamar Hand Held Dynamometer and Pinch Gauze Dynamometer. So, in our study we found that the hand grip strength was more affected than the pinch grip strength.

The study, Comparison of lateral pinch strength in bead embroiderers and sedentary workers showed that the lateral pinch was increased after 5 or more than 5 years of working experience [4]. Our study resulted that increase in the years of experience increases the hand grip and pinch grip strength of the embroidery workers.

This study includes female participants aged 20 to 40 years. This study resulted that the age of the individual does not affect the hand

grip and pinch grip strength among the embroidery workers.

This study resulted hand grip strength was more affected than the pinch grip strength among healthy embroidery workers which had experience of 4 or more than 4 years of experience. This study showed that increase in work of experience increase the grip strength with no relation with the age group.

Recommendation

The study can be done for underweight, overweight or obese individual

The study can include male participants

The study can include greater number of participants

Limitation

In our study we have included only healthy embroidery workers whose BMI ranging from 18.5kg/m² to 24.5kg/m². In our study we have included smaller number of participants

CONCLUSION

Hence, the study concluded that hand grip strength was more affected than the pinch grip strength. With increase in years of experience the grip strength was affected more. The study found no correlation between age and grip strength.

Hence the study concluded that hand grip was more affected than the pinch grip, there were no correlation between the age and hand grip strength

Conflicts of interest: None

REFERENCES

- [1]. Bishnoi, S.K. and Kapoor, S. A case study on fair compensation to hand embroidery workers in India. *Research Journal of Textile and Apparel*, 2020;24(2):7-110. <https://doi.org/10.1108/RJTA-07-2019-0030>
- [2]. Panhale VP, Walankar PP, Doshi D et.al. Evaluation of musculoskeletal pain and posture in embroidery workers of Mumbai - a cross-sectional study. *Int J Health Sci Res*. 2020; 10(1):121-126.
- [3]. Clare M. Wilkinson-Web. SKILL, DEPENDENCY, AND DIFFERENTIATION: ARTISANS AND AGENTS IN THE LUCKNOW EMBROIDERY INDUSTRY.21/06/2014.*Ethnology*, Vol.36, No. 1 (Winter, 1997), pp. 49-65. <https://doi.org/10.2307/3773935>
- [4]. Parven I, Kishwara S, Maqsood F, Narghis S.Comparisons of lateral pinch strength in bead embroiderers and sedentary workers in Dhaka Metropolitan City. *J Brahmanbaria Med College* 2019 July; 01(2).
- [5]. Habibi E, Kazemi M, Dehghan H, Mahaki B, Hassanzadeh A. Hand grip and pinch strength: Effects of workload, hand dominance, age, and body mass index.*February Journal of Medical Sciences*. 2013. [https://doi.org/10.12669/pjms.291\(Suppl\).3535](https://doi.org/10.12669/pjms.291(Suppl).3535)
- [6]. Ulrike Sonja Trampisch, PhD, Julia Franke. Optimal Jamar Dynamometer Handle Position to Assess Maximal Isometric Hand Grip Strength in Epidemiological Studies. *Biometry and Epidemiology and Department of Sports Medicine and SportsNutrition*. 2012. <https://doi.org/10.1016/j.jhsa.2012.08.014> PMID:23101534
- [7]. Pamela K.Levangie, Cynthia C.Norkin, Michael D.Lewek. *Joint Structure and Function-A Comprehensive Analysis*. 6th edition. Jaypee Brothers Medical Publishers. 2019
- [8]. John V. Bellace, Dwight Healy. Validity of the Dexter Evaluation System's Jamar Dynamometer Attachment for Assessment of Hand Grip Strength in a Normal Population. *JOURNAL OF HAND THERAPY*-1994..
- [9]. Klein LJ. Evaluation of the hand and upper extremity. *Fundamentals of hand therapy e-book: clinical reasoning and treatment guidelines for common diagnoses of the upper extremity*. 2014;12:67-86. <https://doi.org/10.1016/B978-0-323-09104-6.00005-5>
- [10]. Dhananjaya J R , Veena H C. Comparative study of body mass index, hand grip strength, and handgrip endurance in healthy individuals. *National Journal of Physiology, Pharmacy and Pharmacology*. 2017.
- [11]. Salam FA, Chinnakalai T. Relationship of Grip and Pinch Strength to Body Mass Index Among Dental Professionals-Cross Sectional Study. *International Journal of Current Research and Review*. 2016 Nov 1;8(21):29.
- [12]. Lava Shrestha, Sanyukta Gurung. Correlation of Body Mass Index with Handgrip Strength and Endurance of Dominant Hand in Medical Students. *Journal of Institute of Medicine Nepal* · December 2020. <https://doi.org/10.3126/jiom.v42i3.37583>

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