

Comparisons of Lateral Pinch Strength in Bead Embroiderers and Sedentary Workers in Dhaka Metropolitan City

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Abstract

Pinch means to squeeze or hold an object between the thumb and the fingers without contacting the palm. Among four types, the lateral pinch is defined as a pinch where force is generated between the pad of the thumb and the radial side of the middle phalange of the index finger. Workers in various occupations such as bead embroiderers, manual workers, musicians, health care professionals and agricultural workers use lateral pinch for their daily work. Sedentary workers such as security guards, grocery salesman did not frequently use the tools which are used by bead embroiderers. So, they did not involve the repetitive forces that are applied in the work of bead embroiderers. The present study aimed to compare lateral pinch strength of bead embroiderers with sedentary workers in Dhaka Metropolitan City. This cross-sectional analytical study was conducted in the Department of Anatomy, Dhaka Medical College, Dhaka from July 2016 to June 2017. Total 200 participants, 50 adult Bangladeshi male sedentary workers was in Group A and 150 adult Bangladeshi male bead embroiderers in Group B. Both groups residing within Dhaka Metropolitan City. Mean lateral pinch strength was 8.70(±0.96) kg and 9.26(±1.24) kg in group A and group B respectively with (p<0.01). There were differences in mean lateral pinch strength between bead embroiderers and sedentary workers. It will be helpful for designing hand held device for bead embroiderers for better performance.

Introduction

Pinch strength is one of the most important factors related to proper hand function.¹ Pinch is a compression or squeezing of the

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end of the thumb in opposition to the end of one or more of the fingers. There are four types of pinch techniques such as pulp pinch, tip pinch, lateral pinch and three- jaw- chuck pinch.² In the lateral pinch, the palm is faced medially. Force is exerted between the pad of thumb and opposing lateral side of the middle phalange of the index finger, through the opposing surface. Remaining fingers were bent and held together to support the index finger.^{3,4} Lateral pinch is used to hold the instrument used by bead embroiderers. This type of pinch is also used by general surgeon and laparoscopic surgeon during operation. The lateral pinch is also used in insertion and removal of a key or the Automated Teller Machine (ATM) card, operating a clothes zipper,

insertion or removal of a plug, stabbing food with the prongs of a fork, operating a remote control or holding a pen.⁵ Bead embroiderers adjust Kantan Couture bead embroidery needle with different types of threads for embroidery on fabrics like saree, salwar kameez etc. They hold the embroidery needle by using lateral pinch.⁶ In general, bead embroiderers require regular and repeated use of lateral pinch hundreds and thousands of times a day. Bead embroiderers work at their factory routinely 8-12 hours a day. Pinch grip is used for both precision control and high force application, for example opening a cylindrical jar cover.⁷⁻⁹

Pinch strength is important to ergonomists as a way of optimizing the requirements of work stations and tool design.¹⁰ Hand and finger strength is essential during industrial design of hand intensive tasks to minimize discomfort and the risk of upper extremity injuries.¹¹⁻¹³ The pinch grip is a design checklist for control of Cumulative Trauma Disorder. Strength requirement should be minimized when designing a task requiring pinch grip to minimize tendon loads, because pinch grip has greater tendon loads than power grip.⁸ Pinch strength is important factor for physical therapists especially those working specially with hand injuries, because they are interested in preventing deformities and preserving functional performance.

Bangladesh is the second largest apparel exporter in the world, after China. The market share of Bangladesh, in the \$503 billion global garment items is 5.1 percent, according to data from the International Trade Statistics of the World Bank in 2014 (<http://www.thedailystar.net>). Garments including bead embroidery meet a major part of export yearly. Lack of lateral pinch

strength may lead to lower work performance. The present study aimed at comparing the lateral pinch strength and anthropometric dimensions of hand between the bead embroiderers of Dhaka Metropolitan City and sedentary workers of the same region.

Methods

This cross-sectional analytical study was conducted in the Department of Anatomy, Dhaka Medical College & Hospital (DMCH), Dhaka from July 2016 to June 2017, after getting ethical clearance from the Ethical Review Board (ERB) of DMCH. The calculated sample size were 200 and cluster sampling done. The detail study procedure was given below:

Group A (n= 50): About 50 adult Bangladeshi male sedentary workers such as security guards, grocery salesman were selected. They did not frequently use the tools which are used by bead embroiderers and their work did not involve the repetitive forces that are applied in the work of bead embroiderers. Their age was between 25 to 50 years and also having at least 5 years working experiences. Their age was confirmed by their national ID cards. They have the same socio-economic status as that of bead embroiderers.

Group B (n= 150): About 150 adult Bangladeshi male bead embroiderers age ranging between 25 to 50 years, having 5 years working experience were selected from different bead embroidery industries of Dhaka. According to their duration of working experience three subdivisions was made. Their age was confirmed by the national ID cards. They adjust Kantan Couture bead embroidery needle with different type of threads for embroidery on fabrics like saree, salwar

kameez etc. The needle is handled using lateral pinch for working purpose. They work 8 hours daily.

Results

In this cross-sectional analytical study, the mean lateral pinch strength was 8.70±0.96 kg and 9.26±1.24 kg in Group A and Group B respectively. The lateral pinch strength ranged from 6.33 kg to 10.83 kg in Group A and 7.16 kg to 13.50 kg in Group B. Significant difference was observed between both groups in the mean lateral pinch strength (p<0.01). Where mean lateral pinch strength was greater in Group B than that of Group A (Table I).

Figure 1 shows the Mean±SD of lateral pinch between two groups.

Table I Comparison of lateral pinch strength between Group A and Group B

Group	Lateral pinch strength in kg Mean±SD	p value
A (n= 50)	8.70±0.96 (6.33-10.83)	0.004**
B (n= 150)	9.26±1.24 (7.16-13.50)	0.004**

** Comparison between group done by unpaired Student's 't' test

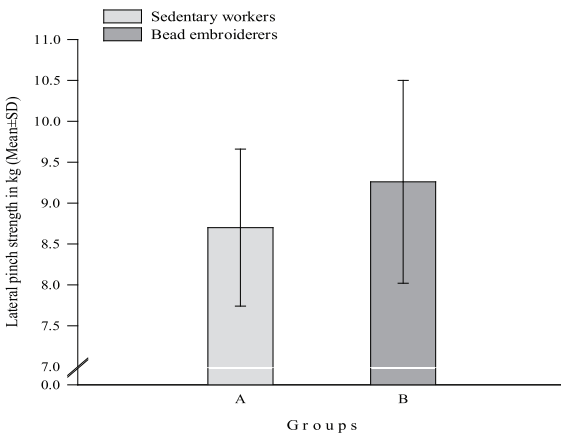


Figure 1 Lateral pinch strength of Group A and B

Discussion

A study was carried out by Lau and Ip on 64 male categorized to non-manual or sedentary and manual workers. They reported mean lateral pinch strength was greater in manual worker than non-manual or sedentary worker.⁹ Pinch strength is crucially important attributes and standard parameter related to the functional integrity of the hand. It is necessary to produce enough pinch strength to manage activity of daily life. The measurement of pinch strength is simple and inexpensive method to assess hand function. It is influenced by the health status and the level of occupational demand using hand.¹⁰⁻¹²

In the present study measurement of various anthropometric dimensions and lateral pinch strength of 50 adult Bangladeshi male sedentary worker (Group A) and 150 adult Bangladeshi bead embroiderers (Group B) were recorded. Bead embroiderers were selected for the present study on the basis of the observation that they regularly and repeatedly use lateral pinch to hold the instrument for their daily purpose. Sedentary workers don't use lateral pinch regularly and repeatedly in their work. Lateral pinch strength depends on age, sex, categorized occupational demand on the hand, body weight and height.¹³⁻¹⁹ According to Ng occupational activities with repetitive and large pinch force exertions may contribute to a higher average lateral pinch strength outcome.¹⁵

The present study reflect that the mean lateral pinch strength was 8.70+0.96 kg and 9.26+1.24 kg in Group A and Group B respectively. The mean lateral pinch strength was significantly higher (p<0.01) in the bead embroiderers (Group B) than in the sedentary workers (Group A). Similar

result was observed in several studies. Zakariya conducted a study on 200 health care professional groups, age ranging from 27-50 years in Mangalore Hospitals. They were divided in four groups, 50 in each group according to professions, i.e. surgeons, dentists, physiotherapist and nurses. They reported mean lateral pinch strength was greater in dentists due to repetitive motions of the fingers followed by surgeons, nurses and physiotherapists.²⁰ A study was carried out by Lau and Ip mentioned no significant ($p=0.170$) difference between mean lateral pinch strength among the non-manual and manual workers.⁹ Michael found significant ($p<0.01$) difference in mean lateral pinch strength in their study subjects which was significantly lower ($p<0.01$) than the findings of the present study.⁵

In the current study the mean lateral pinch strength was higher in bead embroiderers because of repetitive use of the tools. On the other hand as sedentary workers do not use same tools every day. So their pinch strength was less. There are some similarities and some variations in findings of different parameter. In cases of variations the findings of present study were less than the findings of other countries. The variations may be due to racial difference of the study populations. Further studies on large populations and or different occupation may be done to establish a complete data on Bangladeshi population.

Conclusion

The result of present study demonstrate the lateral pinch strength of the bead embroiderers (Group B) was significantly higher than that of sedentary workers

(Group A). The data that was obtained from this study may be also used as base line for bead embroiderers and also for other professions for further research in our country.

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