

# A Study to Evaluate the Correlation between Pinch Grip and Handwriting among School Going Children in Rural Areas

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## ABSTRACT

**Background:** The handwriting is an important skill for the school going children's who needs to express fluent legible writing for communication and educational purposes. The production of functional handwriting depends on the complex interplay of number of abilities including skillful motor and also precise force regulation. Handwriting is an important childhood task in the academic environment, self-care activities are an important childhood task in the home environment. Limited research has investigated the relationship between pinch and grip strength and functional performance. The purpose of study is to evaluate the correlation between palmar pinch grip strength and handwriting among 9 to 10 year school going children.

**Materials and Methods:** A descriptive study was conducted in 2019, among the school going children. The target population consisted of school going children's out of which 100 participants were selected by simple random sampling. All the participants were assessed by using pinch gauge for palmar pinch grip strength and the assessment of handwriting was done by Handwriting Legibility Scale (HLS).

**Result:** Using student 't' test in which the t value=3.91, the correlation between palmar pinch strength and handwriting legibility scale score shows significant results i.e., p value <0.001.

**Conclusion:** This study concludes that there is significant correlation between pinch grip strength and handwriting among school going children.

**Keywords:** Palmar pinch grip, handwriting, Handwriting Legibility Scale (HLS).

## INTRODUCTION

Proficient handwriting is important for education and child's performance during academics. Handwriting is a crucial skill for school going children who have to fluently and legible writing for expressing, communicating, and recording.<sup>1</sup> Students who struggle for handwriting skills may experience frustration and anxiety, which may negatively affect their overall school performance. Children spend their 31-60% of school day performing handwriting and another fine motor task. Difficulty during this phase can interfere with academic skills.<sup>2</sup> Grip strength of an individual is understood to be the force exerted by the thumb and fingers on barrel of writing implement. The production of functional handwriting depends on the variety of abilities, including skillful fine motor coordination and precise force regulation.<sup>3</sup> Fine motor skills become increasingly important when it is time for children to learn handwriting. Fine motor skills involve the utilization of the tiny muscles of the body that enable movement and functions such as handwriting and grasping small objects.<sup>4</sup>

Karl & Whishaw stated that Development of the skills necessary for handwriting begins around 3 months of age when babies start to grasp and hold items. First, they use their whole hands, and,

before their first birthdays, they should be able to use the tips of their thumbs and index fingers like a pincer and begin adapting their grasp to the shape of the object. These abilities eventually lead to gripping writing instruments and can be fostered through play with building blocks, pegboards, dough, and motion board. Assessment of handwriting should incorporate observations of execution, legibility, and speed of writing. Execution includes correct and consistent pencil hold, posture, and letter formation.<sup>5</sup>

The hand is a complex and well differentiated musculoskeletal structure which has the largest representation in the nervous system in relation to its size.<sup>6</sup>In order to cope with the demands of daily life, full function and adequate strength of the hand is necessary.<sup>6</sup> Many activities of daily living involve use of hand with various pinch grasps or hand grips for doing tasks. Pinch grip involves use of any one finger or combination of fingers along with the thumb without contact with palm to manipulate objects.<sup>7</sup>

Limited research has investigated the relationship between pinch and grip strength

and functional performance. Li-Tsang found that dexterity, not hand strength, correlated with functional deficits.<sup>8</sup>Therefore, in this study was aimed to find the correlation between pinch grip strength and handwriting.

#### **PROCEDURE:**

The study received approval from Institutional Ethical Committee of reference no. is PIMS/DR.APJAKCOPT/IEC/2019/456. The participants in the study were screened according to the inclusion and exclusion criteria. 9 to 10 years old school going boys and girls who were willing to participate were included. Children with Attention Deficit Hyperactivity Disorder (ADHD), Dysgraphia, and Cognitive developmental disorder were excluded. The informed written consent was taken from participant's guardian regarding procedure and purpose prior to study.

Each participant was asked to write 10 lines on A4 size paper within six minutes time, then written content was assessed by HLS (Handwriting legibility scale) and HLS score was noted.



Picture1-Assement of palmar pinch strength



Picture 2-Assesment of handwriting

The position was according to that given by American Journal of Occupational Therapy. For each test of pinch strength, the subjects were seated with their shoulder adducted and neutrally rotated, elbow flexed at 90°, forearm in neutral position and wrist between 0-15° extension and between 0-15° ulnar deviation.<sup>9</sup> A Baseline mechanical gauge was used to measure palmer pinch strength in kilograms. For each strength test, standard instructions were followed, and

scores of three successive trials were recorded for hand he or she used for writing purpose.<sup>10</sup>

#### **Outcome Measure:**

Handwriting legibility scale - The purpose of this scale is to obtain your overall impression of the quality of the written product, not content of the writing. The scale provides an overall assessment to identify those with difficulties in producing legible and/or sufficiently fast handwriting.

The scale is used for children aged 9 years and older. It contains five components, each of which should be rated on a five-point scale (1-5), with higher scores indicating poorer performance. Compute the total score by summing the five component scores.<sup>11</sup>

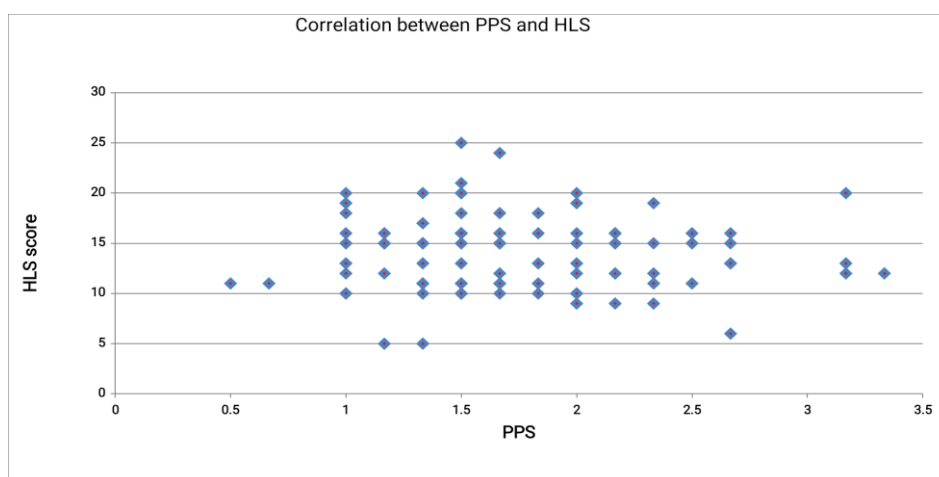
	HLS Total score	Interpretation
1)	16 to 25	Poor Handwriting
2)	11 to 15	Legible Handwriting
3)	5 to 10	Good Handwriting

## DATA ANALYSIS

TABLE NO 1: Mean score of PPS And HLS

	MEAN	SD
PPS	1.7266667	±0.5741925
HLS	14.01	±3.691363

The mean and standard deviation of Palmar pinch strength(PPS) as 1.7266667±0.5741925 and of Handwriting Legibility Scale (HLS) as 14.01±3.691363.



Graph no.1: Graphical representation of correlation between PPS & HLS.

By applying Karl Pearson's correlation coefficient that is 'r' = -0.043971 that mean correlation between palmer pinch strength and handwriting legibility score is negative. It's means when palmer pinch strength decreases handwriting legibility score increases.

\*HLS (Handwriting legibility scale), PPS (Palmer Pinch Strength)

## RESULT

The average score of Handwriting legibility scale is 14.01 & for palmer pinch strength average is 1.7266667, out of these in girls Handwriting legibility scale 14.87755 & in boys handwriting legibility scale 13.17649

By applying Karl Pearson's correlation coefficient that is 'r' = -0.043971 that means there is negative correlation between palmer pinch strength and handwriting legibility score. Thus, when palmer pinch strength decreases,

handwriting legibility score increases i.e. less is palmer strength poor is the handwriting.

By applying student 't' test the correlation between palmar pinch strength and handwriting legibility score is significant (value of t=3.91, p<0.0001)

The average of palmer pinch strength was 1.7266667 and SD±0.5741925.

Average Handwriting legibility scale score was 14.01 with SD±3.691363.

## DISCUSSION

One of the important functions of hand is the ability to grip an object. If the ability to hold the object is hampered then performance of activities of daily living is affected. Activities of daily living involve the use of atleast any one finger along with the thumb, without/with palm, in order to manipulate any object. When we make use of only one finger along with the thumb then we call it pinch grip strength. Palmar pinch grip is essential as it helps in holding

onto objects for example-a pen or a pencil.<sup>10</sup> There are three types of pinch grasp; tip to tip, pad to prehension or palmar prehension.

These days, handwriting is considered as an important factor in determining one's personality. The students who have illegible handwriting are often found to be frustrated and/or suffering from anxiety. Academic performance and achievements can be hampered because of difficulty in handwriting skills.<sup>2</sup>

According to some studies, there is a correlation between pinch grip strength and handwriting of students. There is also a difference between the pinch grip strengths of males and females which is attributed to increase in the muscular mass which peaks in early adulthood period during normal human development, as is found by Mohammadian M *et al.* He also found that there are significant differences in the pinch grip strength of males and females which can be due to differences in gender specific muscle fibers.<sup>12</sup> Another study conducted by Dr. Prajakta Namjoshi et al at Pune, showed that palmar pinch grip strength is more in males than in females.<sup>10</sup> In another study done by Michele L. Alaniz, Eleanor Galit, Isabel Necesito and Emily R. Rosario, grip strength was found to have been correlated with handwriting.<sup>8</sup>

The present study has assessed the correlation between handwriting and palmar pinch grip strength among 100 school going children between age group of 9-10 years. The participants were selected using Simple Random sampling method.

In present study we have found that there is significant correlation between the palmar pinch grip strength and the handwriting of the participants. It was found that the more the palmar grip strength of a participant, the better is their handwriting. In previous research they studied that a child needs to have strong muscles in their hands to grasp a pencil and manipulate it for functional use. The intrinsic muscle and external muscle need to be strong enough to hold and manipulate a pencil over time.

Further study can be conducted regarding pinch grip strength and speed of handwriting.

## CONCLUSION

This study provides evidence that there is significant correlation between palmer pinch grip strength and handwriting among school going children. We conclude that if palmer pinch strength is less then poor is handwriting and if palmer strength is good or more then the handwriting is good/legible. Also we have found that handwriting is more legible/good in girls than boys.

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