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ASSESSMENT OF PINCH GRIP STRENGTH AND HAND GRIP STRENGTH IN PROFESSIONAL MAKEUP-ARTISTS

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ABSTRACT

Background: Professional makeup artists perform repetitive and precision-based hand movements for prolonged durations, requiring sustained grip and pinch strength. Continuous use of fine motor skills, static postures, and prolonged tool handling may predispose these professionals to reduced hand strength and work-related musculoskeletal disorders. However, limited literature is available assessing hand grip and pinch grip strength specifically in professional makeup artists. **Method:** A cross-sectional observational study was conducted among 85 professional makeup artists aged 18–40 years using convenient sampling. Hand grip strength was assessed using a Jamar dynamometer, while tip-to-tip, palmar, and lateral pinch strength were measured using a pinch gauge for both dominant and non-dominant hands. Pain intensity was recorded using the Numerical Pain Rating Scale (NPRS). Descriptive statistics and correlation analysis were performed using Microsoft Excel.

Result: The results demonstrated that 100% of participants exhibited poor hand grip strength in both hands. In contrast, pinch grip strength showed higher functional performance, with the majority of participants classified under manual and skilled grades across all pinch types. A significant positive correlation was observed between hand grip strength and tip-to-tip, palmar, and lateral pinch strength on the dominant (right) hand. On the non-dominant (left) hand, significant correlations were noted for tip-to-tip and palmar pinch strength, while lateral pinch strength showed no significant association. **Conclusion:** Professional makeup artists demonstrate relatively well-developed pinch grip strength due to repetitive fine motor

demands of their occupation; however, overall hand grip strength remains poor. This imbalance may increase the risk of fatigue and work-related musculoskeletal disorders. The findings highlight the need for preventive physiotherapy interventions, ergonomic modifications, and targeted hand strengthening programs for this population.

KEYWORDS: Hand grip strength; Pinch grip strength; Professional makeup artists; Fine motor skills; Work-related musculoskeletal disorders; Hand dynamometer.

INTRODUCTION

The term “makeup" is often associated with altering the facial features, although it can actually be applied to the entire body.[1] A professional makeup artist (PMA) is a type of profession that aims to enhance an individual's appearance through the use of cosmetic materials tools with years of experience.[1]

Makeup artists rely heavily on their hands to perform intricate tasks, such as applying makeup and handling small brushes.[2] The hand is a vital tool for professionals, particularly those in creative fields like makeup artistry.[3]

Prolonged and repetitive use of the hands can lead to musculoskeletal disorders, including wrist and hand pain.[4,5]

Grip strength is the force exerted by your hand when you squeeze an object. It's essential for everyday activities like lifting groceries, opening jars, and shaking hands.[6] Grip Strength: Measured as the maximum force exerted by the hand, reflects overall hand function and strength in tasks requiring forceful grasping of objects.[7]

A study found that 71% of makeup artists reported experiencing hand and wrist pain, while 45% reported experiencing finger pain.[2]

Pinch strength refers to the ability to grasp small objects between your fingers and thumb. It's necessary for fine motor skills like writing, buttoning clothes, and picking up coins.[7] Pinch Strength: Measured as the force exerted by specific finger combinations (e.g., thumb and index finger), is crucial for fine motor control in activities like applying makeup.[7] Pinch grip strength and hand grasp strength are essential for performing daily tasks, and decreased strength can significantly impact an individual's ability to work efficiently.[8,9]

Previous research, Prevalence of 49.7% wrist and hand pain in painters has been

identified.[10] Research has shown that professionals who perform repetitive hand tasks are at a higher risk of developing hand and wrist pain, which can lead to decreased productivity and job satisfaction.[11,12]

And they said that one of the reasons for pain was due to prolonged hours of work, static loading due to holding of brushes and fatigue.[13] The world of makeup artistry is a fascinating blend of art, science, and manual dexterity. Makeup artists use their hands, wrists, and fingers to create intricate designs, blend colour, and transform faces. However, this repetitive and precise work can take a toll on their hands and wrists, leading to pain, fatigue, and decreased productivity.[2,3]

MATERIALS AND METHODOLOGY

Study Design

This study was a cross-sectional observational study conducted to assess hand grip strength and pinch grip strength in professional makeup artists.

Study Setting

The study was conducted at beauty parlours, makeup studios, and freelance work settings in and around Thane, Maharashtra, India.

Study Population

Professional makeup artists actively engaged in makeup application work were included in the study.

Sample Size

The sample size consisted of 85 professional makeup artists. The sample size was calculated using OpenEpi software with a 95% confidence interval.

Sampling Method

A convenient sampling method was used to recruit participants based on availability and willingness to participate.

Inclusion Criteria

- Professional makeup artists with a minimum of 2 years of work experience
- Age group between 20 and 40 years
- Makeup artists working for a minimum of 20 hours per week

- Male and female professional makeup artists
- Makeup artists using manual brushes and makeup tools

Exclusion Criteria

- Any diagnosed neurological or musculoskeletal condition affecting the hand or wrist
- Wrist or hand pain more than 7 on Numerical Pain Rating Scale
- History of carpal tunnel syndrome, arthritis, tendinitis, fractures, or dislocation
- Recent acute hand or wrist injury within the past 3 months

Outcome Measures

Hand grip strength was measured using a Jamar dynamometer, which is a reliable and valid instrument for assessing maximum voluntary grip force. Pinch grip strength was measured using a pinch gauge to assess tip-to-tip pinch, palmar pinch, and lateral pinch strength.

Pain intensity was assessed using the Numerical Pain Rating Scale (NPRS) to document the presence and severity of hand or wrist pain.

Procedure

Ethical clearance was obtained from the institutional ethical committee prior to commencement of the study. Participants were screened based on inclusion and exclusion criteria. The purpose and procedure of the study were explained in detail, and written informed consent was obtained from all participants.

Demographic data including age, gender, work experience, weekly working hours, and hand dominance were recorded. Hand grip strength assessment was performed using the Jamar dynamometer with the participant seated comfortably, shoulder adducted, elbow flexed to 90 degrees, forearm in neutral position, and wrist in slight extension as per American Society of Hand Therapists guidelines. Three trials were recorded for each hand, and the mean value was used for analysis.

Pinch grip strength was assessed using a pinch gauge for tip-to-tip pinch, palmar pinch, and lateral pinch. Each measurement was performed three times for both hands, and the average value was recorded.

Data Analysis

Data was entered into Microsoft Excel and analyzed using descriptive and inferential statistics. Mean and standard deviation were calculated for continuous variables. Pearson and Spearman correlation analyses were used to assess the relationship between hand grip strength and pinch grip strength.

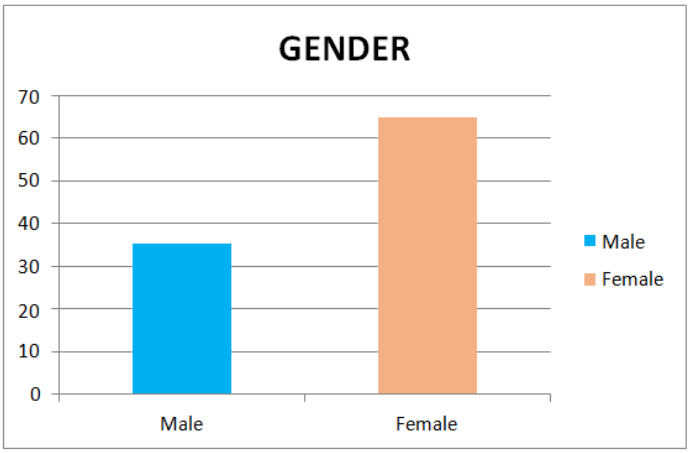
Statistical significance was set at $p < 0.05$.

RESULT

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	85	18	40	31.19	5.762
Experience	85	2	10	4.40	1.678
Hours Spent Weekly	85	1	5	2.20	1.632
Valid N (listwise)	85				

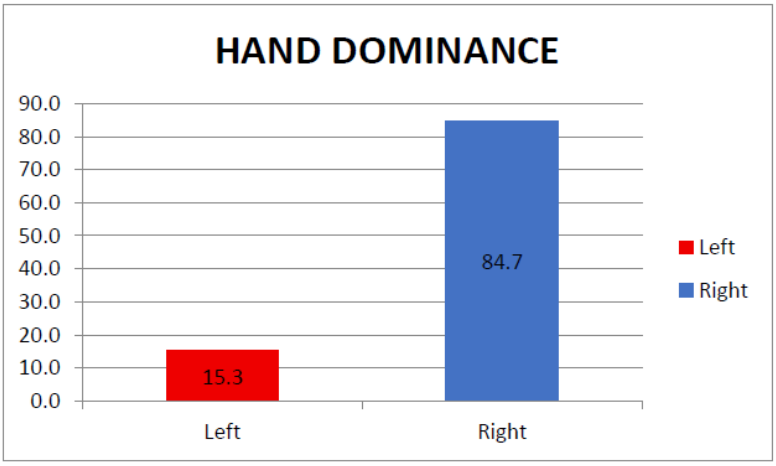
A total of 85 participants were included in the study. The ages of the participants ranged from 18 to 40 years, with an average age of 31.19 years (SD = 5.76), indicating that most participants were young to middle-aged adults. Participants reported between 2 and 10 years of experience in their respective fields, with a mean experience level of 4.40 years (SD = 1.68), suggesting that the sample largely consisted of individuals with a moderate amount of professional experience. In terms of weekly engagement, participants spent between 1 and 5 hours per week on the specified activity, with an average of 2.20 hours (SD = 1.63).



Graph 1: Distribution of Participants by Gender.

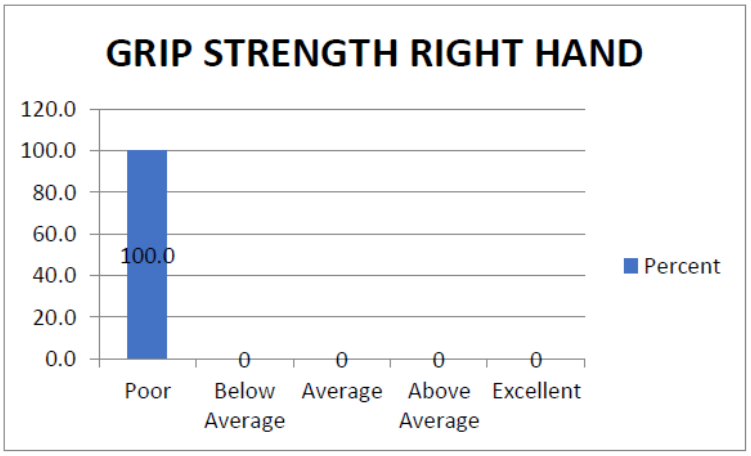
The above graph shows that the study sample consisted of 85 participants, of whom 30 were male (35.3%) and 55 were female (64.7%). This indicates that the majority of participants were female, representing nearly two-thirds of the total sample, while just over one-third

were male.



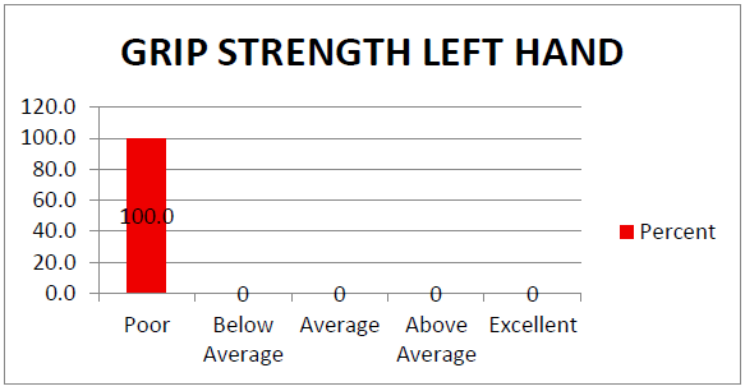
Graph 2: Distribution of Participants by Hand Dominance.

Graph 2 illustrates the distribution of participants based on hand dominance. The majority of participants (84.7%) were right-hand dominant, while only 15.3% were left-hand dominant. This indicates that right-hand dominance was substantially more prevalent among the participants in the study.



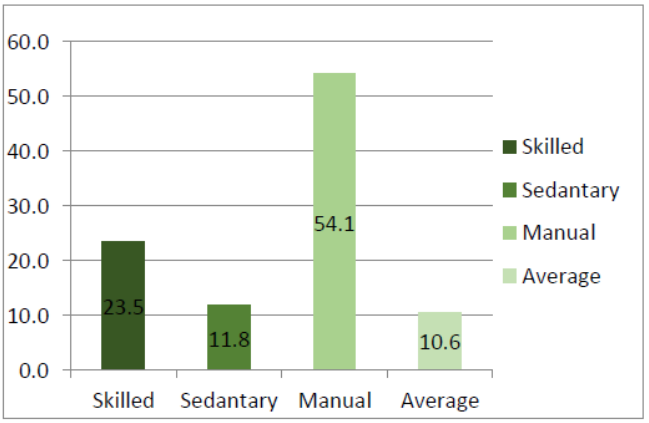
Graph 3: Distribution of Participants by Grip Strength Grade Right Hand

Graph3 shows the distribution of participants according to their grip strength grade for Right Hand. All participants (100%) were classified in the "Poor" category, with no participants falling into the "Below Average," "Average," "Above Average," or "Excellent" categories. This indicates that the entire sample demonstrated a low level of grip strength performance for Right Hand.



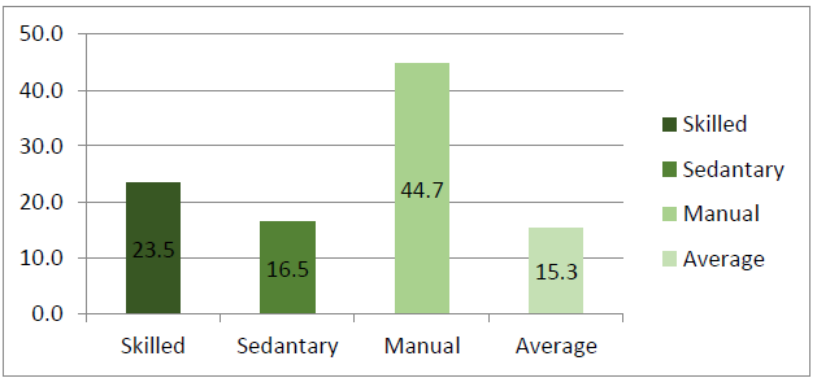
Graph 4: Distribution of Participants by Grip Strength Grade Left Hand.

Graph 4 shows the distribution of participants according to their grip strength grade for Left Hand. All participants (100%) were classified in the "Poor" category, with no participants falling into the "Below Average," "Average," "Above Average," or "Excellent" categories. This indicates that the entire sample demonstrated a low level of grip strength performance for Left Hand.



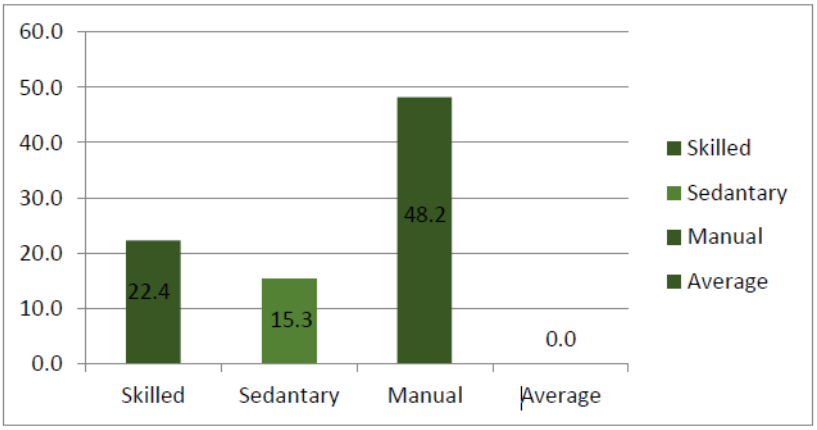
Graph 5: Distribution of Participants by Grade of Right-Hand Tip-to-Tip Pinch Strength.

A total of 85 participants were assessed for their right-hand tip-to-tip pinch strength. More than half of the participants (54.1%) were categorized under the manual grade, indicating higher involvement in physically demanding tasks. Approximately one-fourth of the participants (23.5%) fell under the skilled category, while 11.8% were classified as sedentary and 10.6% as average. These results suggest that the majority of the participants demonstrated tip-to-tip pinch strength consistent with manual-level work performance.



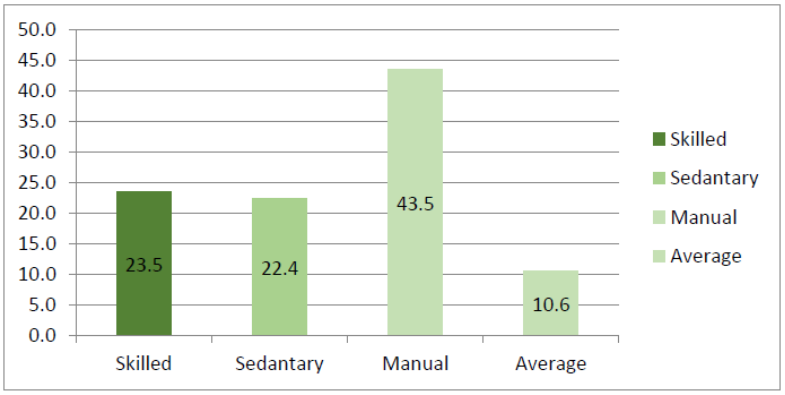
Graph 6: Distribution of Participants by Grade of Left-Hand Tip-to-Tip Pinch Strength

Graph 6 illustrates the distribution of participants according to the grade of left- hand tip-to-tip pinch strength. Nearly half of the participants (44.7%) were categorized under the manual grade, indicating higher levels of hand function typically associated with physically demanding tasks. Additionally, 23.5% of participants were classified as skilled, 16.5% as sedentary, and 15.3% as average. These findings suggest that the majority of participants demonstrated left-hand pinch strength consistent with manual or skilled occupational performance levels.



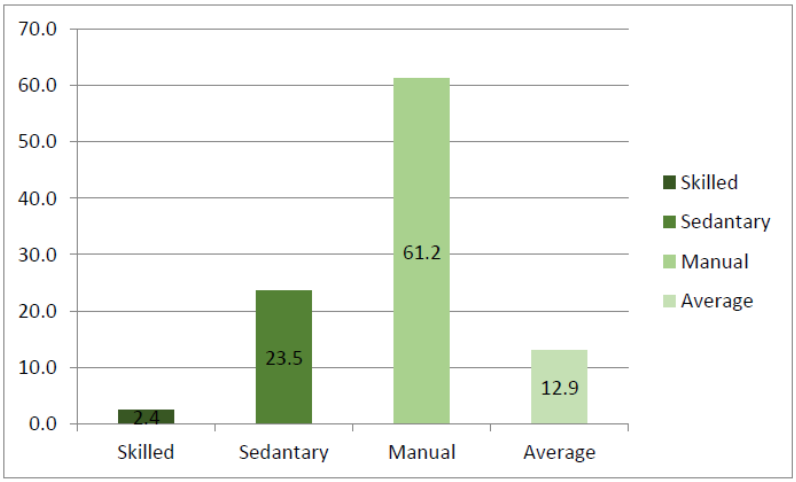
Graph 7: Distribution of Participants based on Grade of Right-Hand Palmar Pinch Strength.

Graph 7 presents the distribution of participants based on the grade of right-hand palmar pinch strength. Nearly half of the participants (48.2%) were classified under the manual grade, indicating greater strength levels associated with physically demanding work. Around 22.4% of participants were categorized as skilled, while 15.3% fell under the sedentary category. None of the participants were classified as average. Overall, the findings suggest that the majority of participants demonstrated palmar pinch strength consistent with manual or skilled activity levels.



Graph 8: Distribution of Participants Based on Grade of Palmar Pinch Strength (Left Hand).

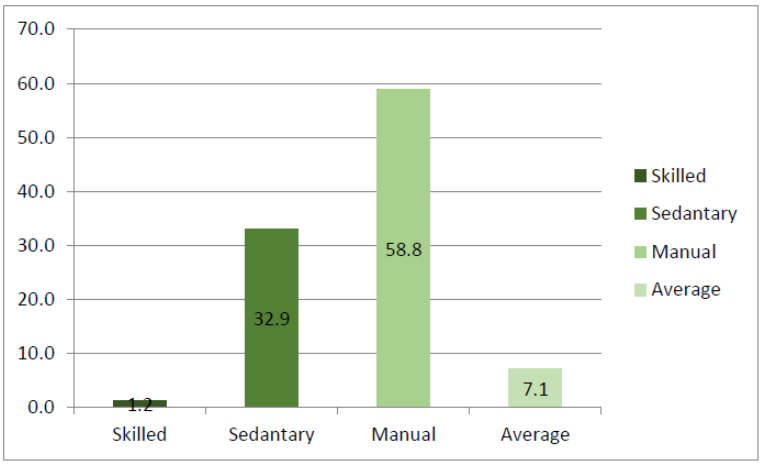
As illustrated in Graph 8, the majority of participants (43.5%) were categorized under the Manual grade of palmar pinch strength on the Left hand. This was followed by Skilled participants (23.5%) and those with a Sedentary grade (22.4%). The smallest proportion of participants (10.6%) fell into the Average grade category. Overall, the data indicate that most participants demonstrated manual-level palmar pinch strength, with fewer exhibiting average strength.



Graph 9: Distribution of Participants Based on Grade of Lateral Pinch Strength (Right Hand)

As shown in Graph 9, the majority of participants (61.2%) demonstrated a Manual grade of lateral pinch strength in the right hand. This was followed by participants with a Sedentary grade (23.5%) and an Average grade (12.9%). Only a small proportion of participants (2.4%) exhibited a Skilled grade of lateral pinch strength. Overall, the data indicate that most participants possessed manual-level lateral pinch strength on the right side, with very few

showing skilled-level performance.



Graph 10: Distribution of Participants Based on Grade of Lateral Pinch Strength (Left Hand)

As shown in Graph 10, the majority of participants (58.8%) demonstrated a Manual grade of lateral pinch strength in the left hand. This was followed by participants with a Sedentary grade (32.9%) and an Average grade (7.1%). Only a small proportion of participants (1.2%) exhibited a Skilled grade of lateral pinch strength. Overall, the data indicate that most participants showed manual- level lateral pinch strength on the left side, similar to the pattern observed on the right side.

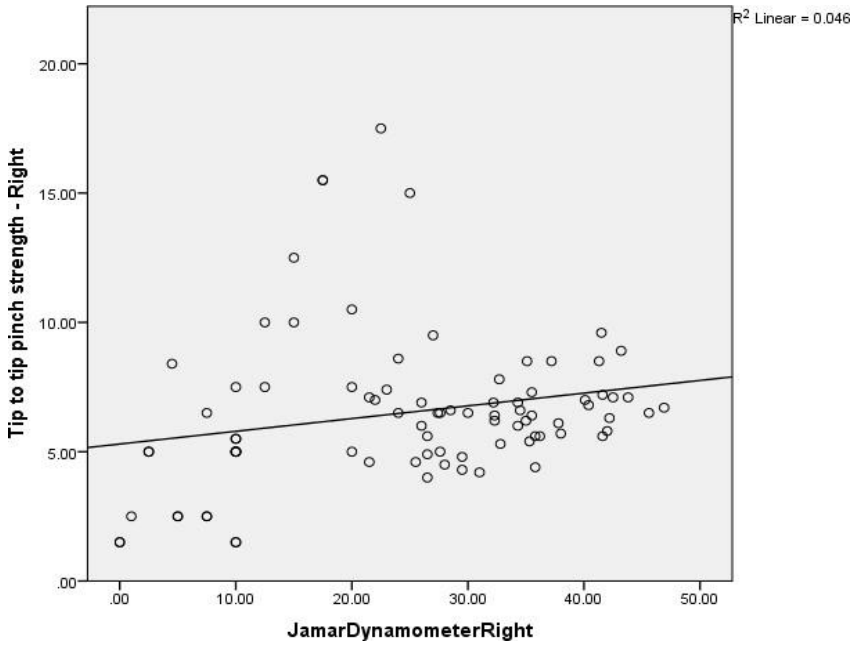


Figure 1: Scatter plot showing the relationship between Jamar dynamometer strength and tip-to-tip pinch strength of the right hand.

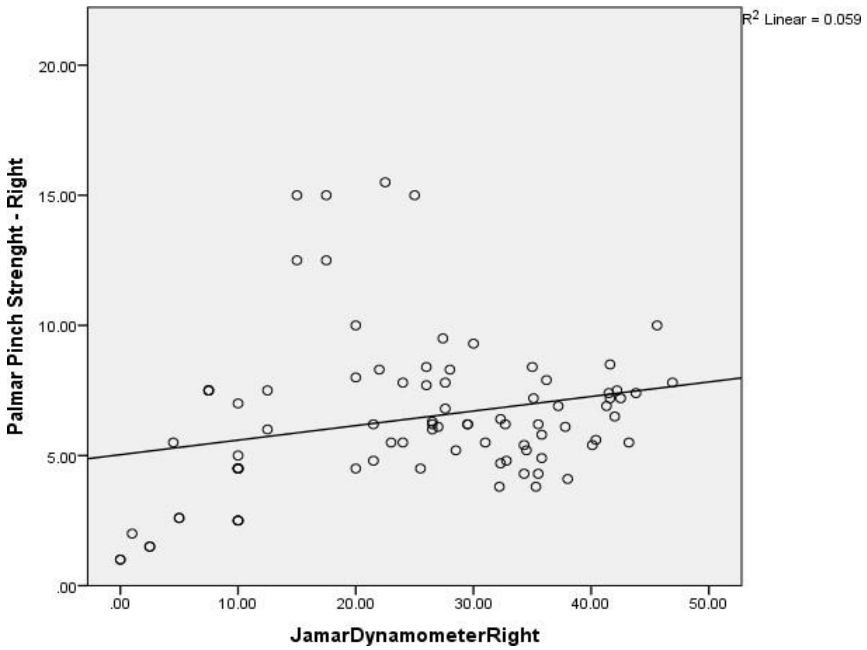


Figure 2: Scatter plot showing the relationship between Jamar dynamometer strength and Palmar Pinch Strength of the right hand.

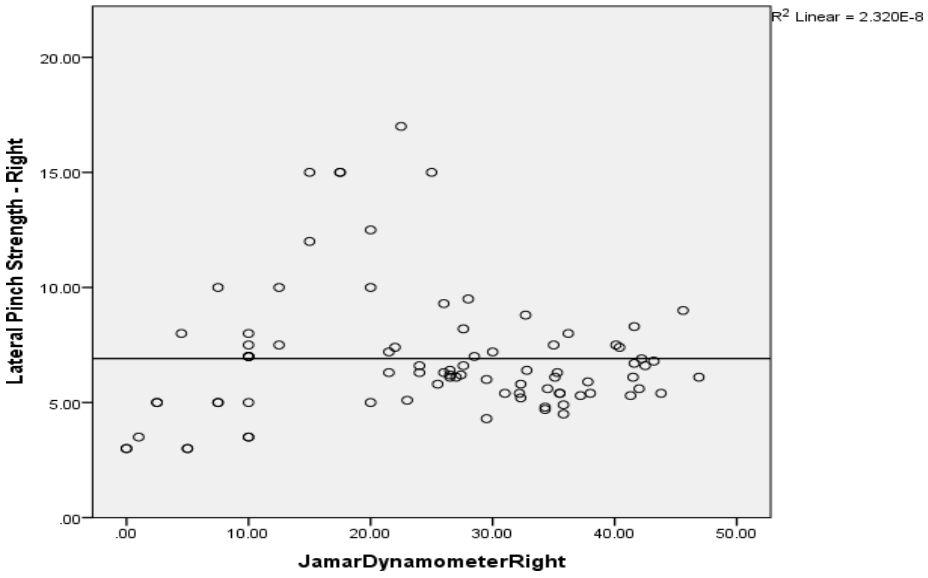


Figure 3: Scatter plot showing the relationship between Jamar dynamometer strength and Lateral Pinch Strength of the right hand.

Table 1: Correlation Between Jamar Dynamometer and Tip to tip Pinch Strength, Palmar pinch Strength and Lateral Pinch Strength (Right Hand)

Measure	Pearson's r	Sig. (p)	Spearman's rho	Sig. (p)
Tip-to-Tip Pinch Strength (Right)	.214	.049	.287	.008
Palmar Pinch Strength (Right)	.242	.026	.265	.014
Lateral Pinch Strength (Right)	.265	.014	.275	.011

Note. r = Pearson correlation coefficient; rho = Spearman rank-order correlation. All correlations are positive and significant at p < .05. N = 85.

A Pearson correlation was conducted to examine the relationship between Jamar dynamometer readings on the right hand and the three types of pinch strength: tip-to-tip, palmar, and lateral. The results indicated a significant positive correlation between Jamar dynamometer readings and tip-to-tip pinch strength, r(85) = .214, p = .049, suggesting that higher handgrip strength was associated with greater tip-to-tip pinch strength. A similar positive correlation was found between Jamar dynamometer readings and palmar pinch strength, r(85) = .242, p = .026, indicating that participants with stronger grip strength tended to exhibit higher palmar pinch strength as well.

For lateral pinch strength, the correlation was also positive, r (85)=.265, p=.014, demonstrating that increased handgrip strength was associated with greater lateral pinch performance. Corresponding Spearman correlation values for the three pinch types (tip-to-tip: rs=.287, p=.008; palmar: rs=.265, p=.014; lateral: rs=.275, p=.011) supported these findings, showing a consistent positive monotonic relationship across all measures.

Overall, these results indicate that individuals with higher general handgrip strength, as measured by the Jamar dynamometer, tend to demonstrate stronger pinch strength across all three types—tip-to-tip, palmar, and lateral—on the right side.

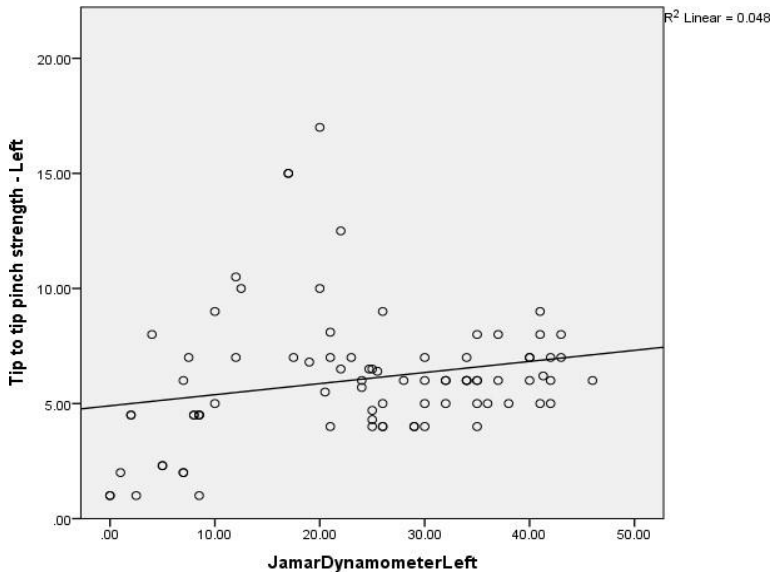


Figure 1: Scatter plot showing the relationship between Jamar dynamometer strength and tip-to-tip pinch strength of the Left hand.

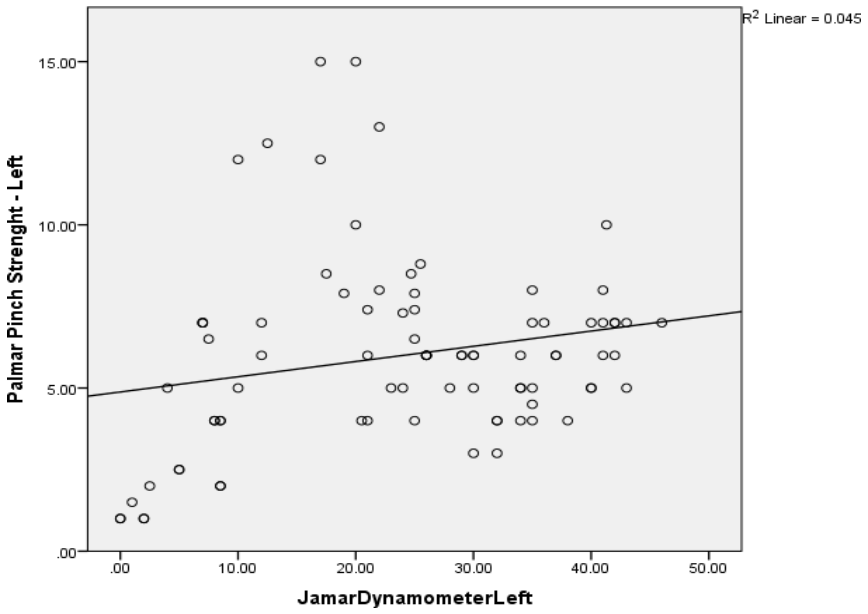


Figure 2: Scatter plot showing the relationship between Jamar dynamometer strength and Palmar Pinch Strength of the Lefthand.

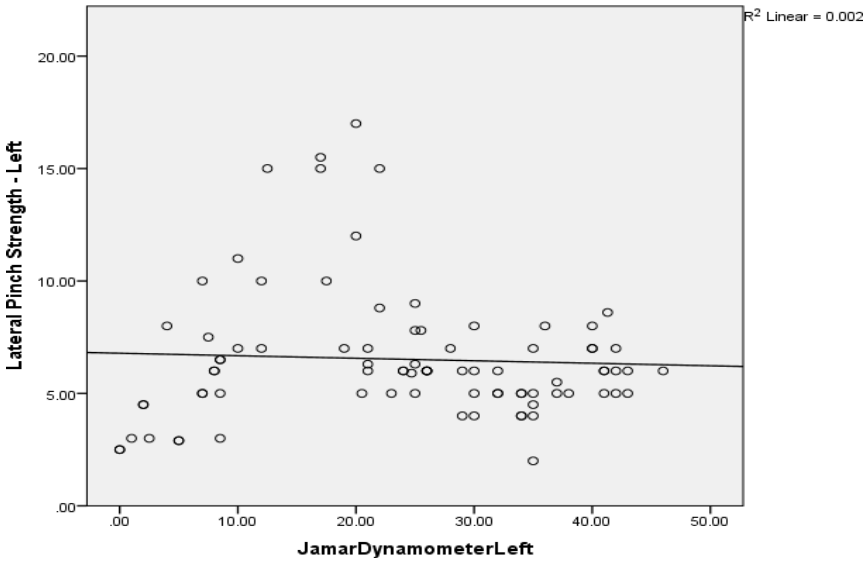


Figure 3: Scatter plot showing the relationship between Jamar dynamometer strength and Lateral Pinch Strength of the Left hand.

Table 2: Correlation Between Jamar Dynamometer and Tip to tip Pinch Strength, Palmar pinch Strength and Lateral Pinch Strength (Left Hand)

Measure	Pearson's r	Sig. (p)	Spearman's rho	Sig. (p)
Tip-to-Tip Pinch Strength (Left)	.220	.043	.280	.010
Palmar Pinch Strength (Left)	.211	.052	.227	.037
Lateral Pinch Strength (Left)	–.049	.656	–.010	.930

Note. R = Pearson correlation coefficient; ρ = Spearman rank-order correlation. N = 85.

A positive correlation was observed between Jamar dynamometer and both tip-to-tip and palmar pinch strength, while no significant relationship was found with lateral pinch strength.

As shown in Table 2, a positive correlation was observed between the Jamar dynamometer and tip-to-tip pinch strength on the left hand, with a Pearson's r value of .220 (p = .043) and a Spearman's rho of .280 (p = .010). This indicates that participants with greater handgrip strength also demonstrated higher tip-to- tip pinch strength, reflecting a moderate association between overall grip and fine motor performance. Similarly, a small positive correlation was found between the Jamar dynamometer and palmar pinch strength on the left hand (Pearson's r = .211, p = .052; Spearman's rho = .227, p = .037), suggesting a consistent relationship between grip strength and palmar pinch ability, though the Pearson's value was marginally above the level of statistical significance. In contrast, no significant correlation was observed between the Jamar dynamometer and lateral pinch strength on the left hand (Pearson's r = –.049, p = .656; Spearman's rho = –.010, p = .930), implying that overall grip strength did not correspond to variations in lateral pinch performance. These findings suggest that general handgrip strength, as measured by the Jamar dynamometer, is more closely associated with tip-to-tip and palmar pinch abilities than with lateral pinch movements on the left hand.

A positive correlation was observed between Jamar dynamometer readings and both tip-to-tip and palmar pinch strengths for the right and left hands, indicating that participants with greater overall handgrip strength also demonstrated stronger pinch performance. The correlation was statistically significant for tip-to-tip and palmar pinch strengths on both sides, suggesting a consistent association across hands. In contrast, no significant correlation was found between Jamar dynamometer and lateral pinch strength on the left hand, whereas a significant positive correlation was evident on the right. Overall, these results indicate that higher grip strength measured by the Jamar dynamometer is generally associated with better tip-to-tip and palmar pinch strength, with lateral pinch strength showing side-specific variation.

These findings suggest that overall grip strength is more closely related to fine motor pinch abilities such as tip-to-tip and palmar pinch, which rely on coordinated finger flexor activity and intrinsic hand muscles. The stronger correlations observed on the right side may reflect the influence of hand dominance, as most participants are right-hand dominant. The absence of a significant relationship between grip and lateral pinch strength on the left hand could

indicate that this movement pattern is less dependent on overall grip force and more influenced by thumb-specific musculature and stabilization.

DISCUSSION

The present study aimed to assess **pinch grip strength and hand grip strength in professional makeup artists** using standardized outcome tools, including the **Jamar Dynamometer** and **Pinch Gauge**, to evaluate multiple types of pinch strength—tip-to-tip, palmar, and lateral grip. A total of **85 participants** were included, and demographic analysis revealed that the mean age group was **31.19 years** (SD = 5.76), indicating that most participants belonged to the working- age population actively involved in regular manual and precision-based tasks.

The mean clinical experience duration was **4.40 years**, reflecting that a majority of the group had moderate exposure to work-related repetitive hand tasks.

Sex distribution showed a higher percentage of females compared to males, which may reflect the higher representation of women in makeup artistry.

Additionally, **84.7% of participants were right-hand dominant**, suggesting that dominance could play a role in strength distribution.

One of the key findings of this study was that **grip strength among all participants for both right and left hand fell in the "Poor" category** based on available normative grading. This is an important observation, considering that makeup artistry involves continuous gripping of tools such as brushes, pencils, sponges, and cosmetic devices. Contrary to expectations that repetitive occupational use may enhance grip strength, the results suggest that prolonged static positioning and fine motor tasks may contribute to muscular fatigue or potential overuse rather than strength development.

In contrast, pinch strength assessment showed more variation. Tip-to-tip, palmar, and lateral pinch strengths demonstrated a wider grade distribution ranging from sedentary to manual level, with the **majority of participants falling in the "Manual" and "Skilled" range** across both hands. This suggests that while power grip may be compromised, the fine motor control required in makeup application results in greater functional endurance and neuromuscular adaptation in intrinsic muscles of the hand.

Correlation analysis revealed interesting relationships. There was a **significant positive correlation between hand grip strength and tip-to-tip pinch strength (r = .214, p = .049)** as well as palmar pinch strength (**r = .242, p =.026**) on the right hand. Similarly, lateral pinch showed a significant correlation with grip strength on the right hand (**r = .265, p = .014**). These findings indicate that improved power grip strength may contribute to increased efficiency in precise fine motor hand functions.

On the left hand, a significant correlation was also observed for tip-to-tip pinch (**r = .220, p = .043**) and palmar pinch strength (**Spearman's rho = .227, p = .037**). However, **no significant correlation was found between left-hand grip strength and lateral pinch**, suggesting that lateral pinch movements may rely more heavily on thumb stability and isolated intrinsic muscle function rather than overall hand strength.

The higher strength on the right side across all measures aligns with known physiological patterns seen in dominant hand functional adaptation. The data supports the hypothesis that repetitive precision-based occupational tasks may enhance intrinsic muscular activity and fine control more effectively than gross grip strength.

Comparing these findings to existing literature, previous studies on professionals performing repetitive skilled hand movements—such as dental workers, beauticians, musicians, and painters—suggest a higher prevalence of fatigue, overuse syndromes, and reduced power grip strength. The present results align with those trends and reinforce the need for ergonomic education, strengthening exercises, and workload modification in such professions.

Overall, the data indicates that professional makeup artists demonstrate **well- developed pinch strength patterns**, likely due to repeated fine motor occupational demands, but exhibit **below-average hand grip strength**, which could place them at risk for work-related musculoskeletal complications over time.

CONCLUSION

This study concludes that professional makeup artists exhibit **relatively high pinch strength performance**, particularly in tip-to-tip, palmar, and lateral pinch activities, consistent with the fine motor skill demands of their profession. However, despite frequent hand use, **overall grip strength in all participants fell within the poor category**, indicating insufficient global hand musculature strength.

A significant positive correlation was observed between grip strength and pinch strength in most variables, suggesting that stronger grip may enhance precision- based hand functions. However, dominance appeared to influence results, with stronger correlations and higher strength found in the right hand compared to the left.

These findings emphasize the importance of incorporating **hand strengthening exercises, ergonomic tool design, proper wrist positioning, and periodic rest breaks** to reduce fatigue and prevent musculoskeletal problems among makeup artists. The study provides baseline reference data that can be used clinically and academically to support preventive physiotherapy, occupational modifications, and future research.

LIMITATIONS

- The study used a **convenient sampling method**, which may limit generalizability to the wider population of makeup artists.
- The study design was **cross-sectional**, preventing long-term observation of strength decline or improvement.
- **Pain levels, fatigue, work posture, and workload intensity** were self- reported and not objectively measured.
- The study did not include follow-up or intervention-based comparison.
- External confounding variables such as **BMI, physical activity level, or dominant hand training habits** were not controlled.

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