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Anatomical Variations in Palmar Creases and Their Correlation to The Intelligence Capacity of Libyan Medical and Dental Students of Omar Al-Mukhtar University

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Background: For centuries, clinicians, anthropologists, and palmists have found the creases in the palm interesting. However, only in the last fifty years has research started to examine the variations in these creases. Based on the three main palmar creases, thenar, proximal, and distal transverse creases, four patterns of palmar creases are identified; nonvariant, Sydney, Suwon, and simian. Previous studies of palmar creases revealed that familial components, race, sex, and age are factors that influence the expression of palmar crease patterns. Simian patterns of palmar creases are linked to various congenital diseases, some characterized by low levels of intelligence. **Aim:** This paper aims to investigate the variations in palmar crease patterns among medical and dental students of Omar Al-Mukhtar University and to study the range of intelligence capacity associated with each pattern. **Materials and methods:** The study was conducted on 183 students. A paper-based IQ test was performed and photos were taken from both palms of all participants. **Results:** Out of 183 participants, the nonvariant pattern of palmar creases was found in 92%, in which, 100 students have bilateral 2 points of origin palmar creases and 48 students have bilateral 3 points of origin palmar creases, whereas 18 participants have one palm of 2 points and the other palm of 3 points of origin. Unilateral simian was the dominant type in the aberrant palmar creases, followed by bilateral Sydney, then unilateral Sydney, and Suwon. **Conclusion:** The students with unilateral simian have the highest average score of 47.166 followed by bilateral nonvariant and unilateral nonvariant. Students with unilateral Sydney have the lowest average score of 41.

Keywords: Palmar Creases, Nonvariant, Sydney, simian, Suwon, IQ

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Introduction

The normal human palm has three major creases. The thenar or vertical crease, the proximal transverse crease (PTC), the distal transverse crease (DTC), and several minor creases. The PTC begins at the radial side of the palm, curves proximally, and ends at the medial border of the hypothenar eminence, the DTC is found closest to the fingers, beginning at the interdigital space between the index and middle fingers and curving proximally toward the ulnar side of the palm, the thenar crease begins near the proximal transverse crease at the radial side of the palm and runs toward the wrist [1,2]. Depending on the point of origin of the three major creases on the radial side of the palm, creases are classified into one, two, or three points of origin. Based on the relationships between PTC and DTC, palmar creases are classified into Simian, Sydney, and Suwon creases [1-3]. The Simian crease is a single transverse crease formed by the fusion of PTC and DTC and extends through the entire width of the palm [4]. The Sydney crease represents a very long version of the PTC, which crosses the whole width of the palm, while the DTC appears normal. It was first described and named in Sydney, Australia [5]. The Suwon crease was identified for the first time in Suwon, Korea. The Suwon crease spans the entire palms and it is the extended version of the distal transverse crease, with an accessory proximal transverse crease [2,5], The patterns of palmar creases are established between 7 and 9 weeks of embryonic life and remain unchanged thereafter, Therefore, the first 2 months of gestation are critical for the formation of palmar creases5. Consequently, interactions between genetic and environmental factors, various genetic abnormalities, and teratogens may affect the pattern of palmar creases. An extensive analysis of 29 papers demonstrated that dermatoglyphics, palmar creases, and digit ratio hold varying degrees of potential in indicating mental disorders [6]. Simian and Sydney's creases are associated with several diseases and genetic disorders [7], some of which are characterized by intellectual disabilities such as Down syndrome, Cohen syndrome, and fetal alcohol syndrome. Specific patterns of palmar crease have more likelihood of association with certain diseases [7]. Kanazawa found that people with a single transverse palmar crease on the right hand have a higher chance of getting COVID-19 than People with normal creases [8]. Also, deep palmar and plantar creases are seen in Costello syndrome, C-like syndrome, and other diseases [9] but the presence of these creases does not necessarily mean an anomaly, as they have been observed in some normal individuals and some were exceptionally intelligent [10].

Aim of the study

To investigate the variations in the palmar crease patterns among the medical and dental students of Omar Al-Mukhtar University and to explore and compare the range of intelligence associated with each pattern.

Methodology

183 medical and dental students volunteered to participate in the study,147 were female students and 36 were male students, the students were grouped in two big lecture halls, and every student was handed two sheets with a unique case number from 1 to 200. The first sheet includes the age, sex, blood grouping, and a list of 25 common diseases of young adults such as error of refraction, allergy, and sinusitis. The second sheet includes a paper-based Raven's standard progressive matrix IQ test that was prepared according to Vass11. All the participants were given 10 minutes to fill out the datasheet and then they were given 40 minutes to answer the paper-based Ravens standard progressive matrix IQ test. By the end of the given time, photos of both palms were taken from each student by mobile cameras. The photos included the palms and the case number as shown in Figure 1.

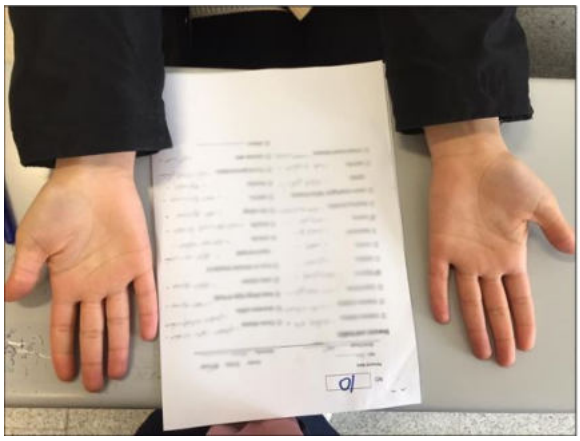

Figure 1: A photo of both palms with datasheet and case number. (OMU,FM, Al-Bayda, Libyaó)

Using the method of Albizu12, the grades were converted to percentile charts depending on the participant's age.

Table 1 shows how to convert the grades of the participants to percentiles based on the previously mentioned method.

Table 1, How to Convert the Grades to PercentilesThe percentile range then is mapped into intellectual capacity.

Table 2 shows how to convert from percentile range into intellectual capacity.

Table 2: How to convert the Percentiles to Intellectual capacity;

Intellectual Capacity	Percentiles
Intellectually Superior	At or Above 95th percentile
Above Average	Below 95th andAt or Above 75th percentile
Average	Between 25th and 75th percentile
Below Average	At or Below 25th andAt or Above 5th percentile
Intellectually Defective	Below 5th percentile

Results

Each photo was analyzed independently by the four members of the team and the participants were classified based on their palmar creases. The team then compared the results together to validate the classification.

Three cases were excluded from the sample because of the unclarity of the creases. Depending on the origin of the thenar crease, PTC, and DTC, and on the relation of PTC to DTC as well as on the similarity of both palms or not, seven categories of palmar creases were identified.

Figure 6 illustrates the distribution and percentage of each category: Nonvariant bilateral 2-point creases, as depicted in Figure 2, were observed in 100 students (55.56%), Nonvariant bilateral 3-point creases, as shown in Figure 3, were found in 48 students (26.67%), Nonvariant unilateral 2-3 point creases were present in 18 students (10%), Unilateral simian creases, represented in figure 4, were identified in 6 students (3.3%), Unilateral Suwon creases, as illustrated in figure 5, were unique to 1 student (0.56%), Bilateral Sydney creases, shown in figure 5, were observed in 4 students (2.22%), Unilateral Sydney creases were present in 3 students (1.67%).

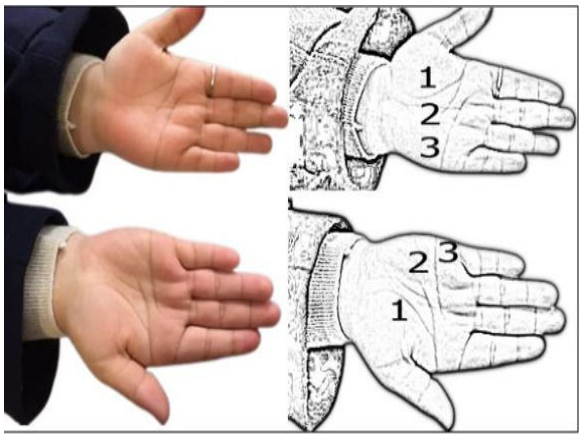

Figure 2: Bilateral non-variant type with 2 points of origin,1=thenar crease, 2=PTC, 3=DTC. (OMU, FM, Al-Bayda, Libyaó)

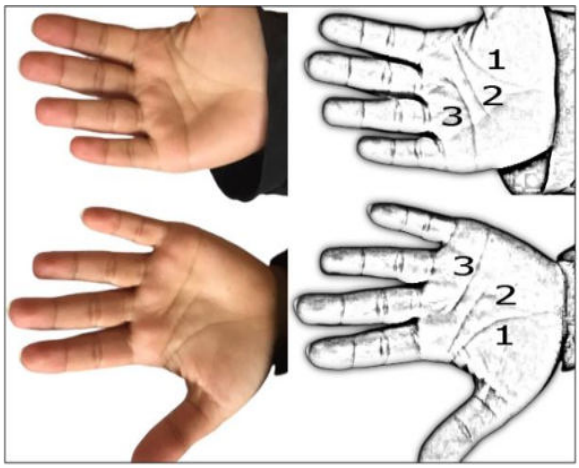

Figure 3: Bilateral non-variant type with 3 points of origin,1=thenar crease, 2=PTC, 3=DTC. (OMU, FM, Al-Bayda, Libyaó)

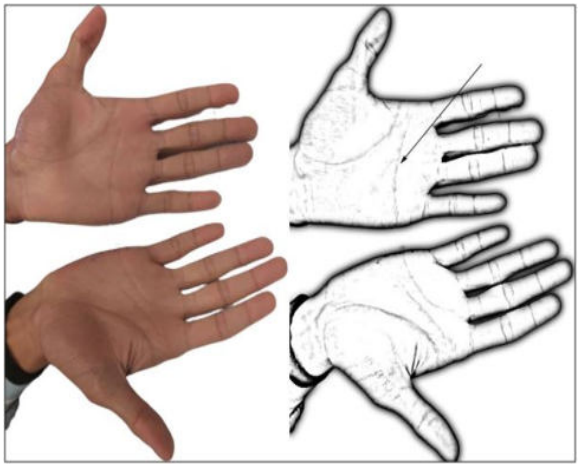

Figure 4: Unilateral simian crease of the left palm (the arrow) and non-variant 3 points of origin of the right palm. (OMU, FM, Al-Bayda, Libyaó)

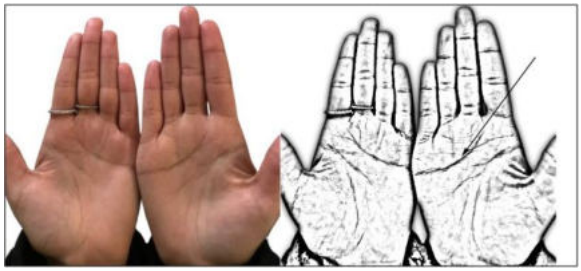

Figure 5: Unilateral Suwon, right hand, the arrow shows the DTC extends the entire length of the right palm. (OMU, FM, Al-Bayda, Libyaó)

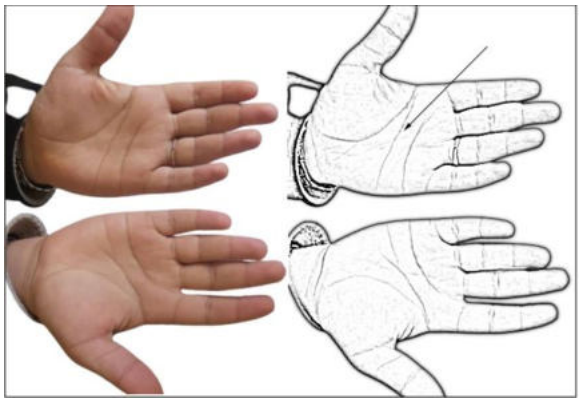

Figure 6: Both palms show the Sydney type, the PTC extends the entire length of the palm, the arrow. (OMU, FM, Al-Bayda, Libyaó)

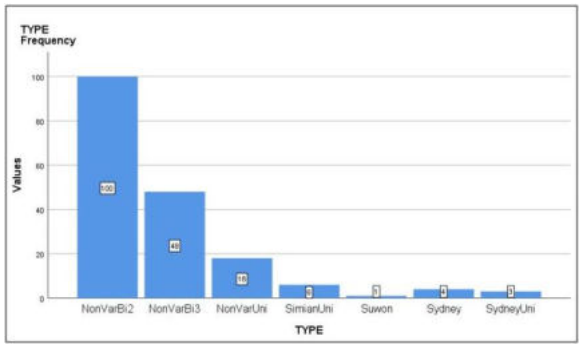

Figure 7, The number of participants in each type of the palmar crease

Participants' performance on Raven's standard progressive matrix IQ test showed that the highest average score of 47.166 belonged to students with unilateral simian creases, followed by students with bilateral nonvariant and unilateral nonvariant creases. Students displaying unilateral Sydney creases achieved the lowest average score of 41. The distribution of students across grades is depicted in Figure 8, while Figure 9 illustrates the distribution across percentile scores.

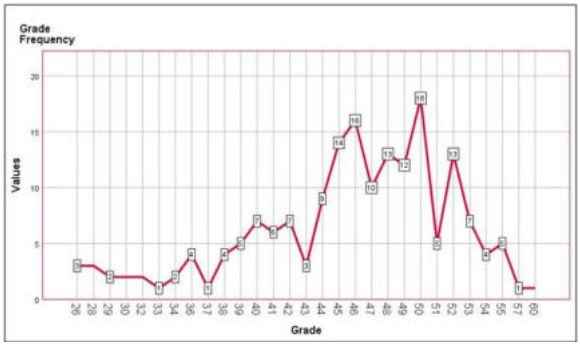

Figure 8: The number of students grouped by the grades they scored

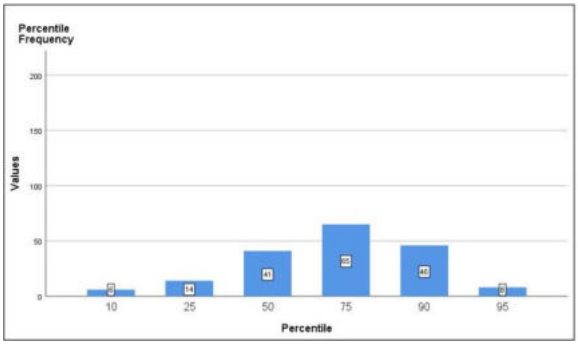

Figure 9: The number of students who fall into each percentile score

The conversion of the percentile chart into intellectual capacity showed that 106 participants (58.89%) have an average intellectual capacity, followed by 46 participants (25.56%) who fall into above-average intellectual capacity and 20 participants (11.11%) who have below-average intellectual capacity. Only 8 participants (4.44%) have a superior intellectual capacity in which the percentile score is above 95. Figure 10 represents the result of converting the percentiles into intellectual capacity.

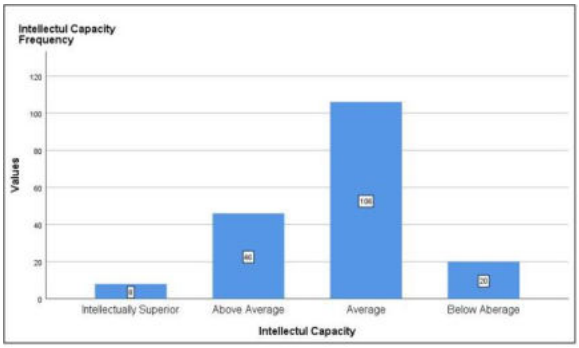

Figure 10: The number of students and the group of intellectual capacity they fall into

Although the participants with unilateral simian pattern have the highest means of grades and percentile as shown in figures 11 and 12, the ANOVA test shows no significant differences in the means of grades and percentile scores among the seven groups.

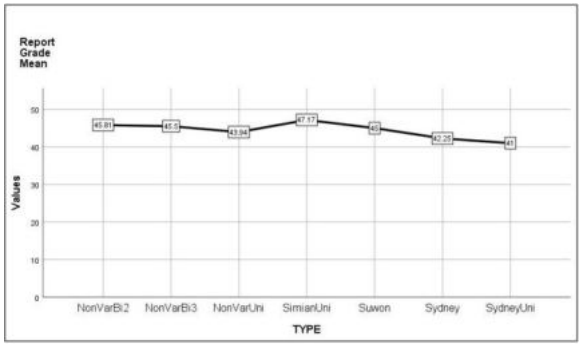

Figure 11: The mean grades of each group of the palmar crease.

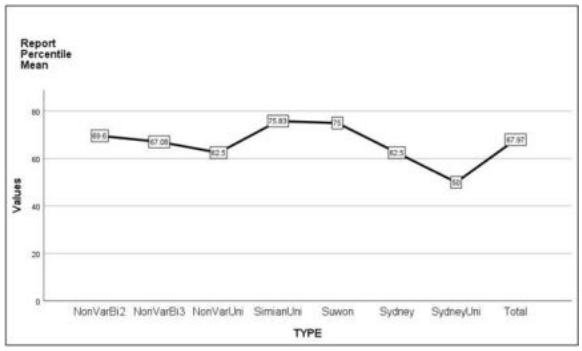

Figure 12: The mean percentiles of each group of palmar crease

The Spearman correlation test was used to investigate the correlation between the type of palmar creases and intellectual capacity, the correlation coefficient, and the P-value were 0.118 and 0.115 respectively, which indicated that there is no significant correlation between them.

Discussion

In a comparative analysis with Mekbeb's 2019 study on palmar crease patterns in a healthy Ethiopian population, the present research exhibits a shared interest in understanding variations in these creases [2]. Mekbeb's study primarily aimed to determine the prevalence of aberrant crease types among medical and dental students, without immediate correlations to disease conditions [2]. Conversely, the present study's focus aligns more closely with Sharma's 2011 investigation, which Explored the prevalence of Simian, Sydney, and Suwon creases within a Central Indian population, while also establishing associations with handedness, sex, and anomalies10. Mekbeb's study reported that 13.8% of palms exhibited aberrant creases, with the Simian crease being the most frequent variant, followed by Suwon and Sydney [2]. In the present study, out of 183 participants, the nonvariant pattern was found in 92% of subjects, with bilateral 2 points of origin palmar creases representing 55.5% and bilateral 3 points of origin creases at 26.6%. Remarkably, unilateral Simian was the most prevalent among aberrant crease types (3.3%), followed by bilateral Sydney (2.2%), unilateral Sydney (1.6%), and Suwon (0.5%). Among the aberrant palmar creases observed in this study, the Simian crease was the most frequent. This is consistent with reports by other authors [13,14,10]. The significant association of higher intelligence scores with unilateral Simian creases in the present research mirrors the comprehensive approach Sharma adopted in examining correlations between crease types and demographic attributes10. While the present study's scope remains confined to a specific cohort of university students (Omar Al-Mukhtar University), both Mekbeb's and Sharma's studies underscore the importance of wider investigations into palmar crease variations across diverse populations [2,10]. The collective emphasis on exploring potential connections between crease types and broader health and cognitive traits resonates with the present study's endeavor to establish correlations between palmar creases and intelligence capacity.

Conclusion and Recommendations

In conclusion, all types of palmar creases are present in the studied population. Furthermore, the various aberrant crease types detected may not be indicative of known disease conditions at the observed frequencies, as they occurred in apparently healthy individuals. The present study showed that the nonvariant bilateral 2 points palmar crease was the most common type among the participants, and the unilateral simian palmar crease was the common aberrant type followed by Sydney and Suwon, which differs from Ethiopia's study that showed that the Suwon type was higher

Than Sydney type. Despite the higher Raven's standard progressive matrix IQ test grades of students with unilateral simian crease and the existence of superior intellectual capacity in students with nonvariant bilateral 2 points and nonvariant bilateral 3 points palmar crease pattern, the Anova test, and the Spearman correlation test showed that there are no statistically significant differences and no significant correlation between the pattern of the creases and intellectual capacity among all the groups. The present study recommends conducting additional research to identify variations in palmar creases between males and females.

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