

TOPOLOGICAL FORMULATIONS OF FINGER TIP PATTERNS AMONG THE DOWN'S SYNDROME

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Abstract

Finger prints of 68 patients with Down's Syndrome and 93 controls have been collected and analyzed for topological of formulation of finger tip patterns suggested by Loesch(1975). The results showed that there may be great differences in the dictionary of the finger patterns of the patients and their controls. Mean ulnar and radial patterns showed mostly significant differences among the patients and their controls. Exact role of dermatoglyphic topology of finger patterns in Down's Syndrome will be found out only after doing many studies in many populations.

Introduction

Skin of the finger tips, palmar and plantar surfaces of human have been covered by ridges. Study of these ridges called dermatoglyphics. Dermal ridge differentiation takes place in fetal development and are genetically determined(Schaumann and Alter,1976).

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It has been shown that dermatoglyphics is not only useful in identification but also in population, genetic and medical studies. Many of the chromosomal disorders show interesting dermatoglyphic patterns, thus, dermatoglyphics may be used as a diagnostic tool in the above disorders. Among chromosomal disorders, trisomy 21 also called Down's Syndrome has showed many interesting dermatoglyphic features so that it can be used as the important diagnostic tool in Down's Syndrome. Schaumann and Alter (1976) have discussed in details the role of dermatoglyphics in medical disorders.

Topological classification of dermatoglyphics is a good tool in the studies of the individuals with medical disorders as well as various ethnic groups comparisons. The approach considers the variability of the pattern details which are not considered in traditional dermatoglyphic methodology. Penrose (1965,1967), Penrose and Loesch (1969,1970) have suggested a topological sole and palmar dermatoglyphics, and Loesch (1975) has also suggested a topological approach for finger tip patterns.

Present paper aims to report the topological formulations of the finger tip patterns among the patients with Down's Syndrome and their controls in Iran.

Materials and Methods

Bilateral finger prints of 68 Down's Syndrome patients (36 males and 32 females) and 93 controls (43 males and 50 females) have been collected in Tehran, Iran. The patients have been diagnosed by the Iranian ministry of welfare.

The data have been analyzed according to Loesch (1975) for topological formulation. She proposed that the finger patterns can be arranged in the form of dictionaries of total finger pattern types such as has already been devised for sole and palmar patterns. The details of the methodology can be summarized as follows:

- 1 - Finger patterns are expressed in terms of loops which can be specified as ulnar and radial. Therefore, the traditional whorl is specified as the presence of two opposite loops. The traditional composite patterns are accordingly expressed with regard to the number

- and direction of the loops of which they are composed. Traditional tented arch termed tented loop and expressed half ulnar and half radial. An arch is expressed as an absence of pattern.
- 2 - Each pattern element is represented by the number ; a tented loop is counted as half in each side. In order to avoid fractions, the number in all cases then multiplied by two.
 - 3 - The number representation two hands can be added together or considered separately in analogous manner.
 - 4 - The individual descriptions are then listed in dictionary order that is if two patterns differ in value in the first column, the one with the higher value is placed first. If they are alike in the first column but differ in the second, the order is determined by second column and so on.
 - 5 - The ulnar and radial sides can be summed for each finger separately and the appropriate means calculated. Normal and abnormal populations can be compared in respect of the mean radial and mean ulnar components on each finger and also in respect of the combined ulnar and radial components which would be a measure of pattern intensity on individual fingers.

Results and Discussion

The dermatoglyphic dictionary of the finger patterns of the patients and their controls shows that the following formula predominates among the male and female patient:

2-0, 2-0, 2-0, 2-0, 2-0, 2-0, 2-0, 2-0, 2-0

Its frequency distribution is 28.75% and 31.25% among the male and female patients , respectively. the other formulae have been scattered among them. The controls show different frequencies of the finger tip formulation and mostly have different formula than the patients. Therefore the formulation of the finger tip patterns among the Down's Syndrome patients are distinguished from that of the normal populations.

Table 1 shows means and standard errors of the ulnar.

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and radial finger patterns frequencies among the patients and their controls. It is evident that the ulnar patterns are more frequent in both male and female patients than their controls whereas the radial patterns appeared more frequently among the controls.

Table 2 shows the comparisons among the patients and their controls. Comparisons of the mean ulnar component of the patients and their controls showed significant differences for 6 out of the 10 fingers among males and 1 out of the 10 fingers among the females. While considering the two sexes combined, they showed significant differences for 4 out of the 10 fingers.

Table-1
Means and Standard Errors of the Ulnar and Radial Pattern frequencies among the Patients and Controls

Fingers		Patient males	Patient females	Patients (M+F)	Control males	Control females	Controls (M+F)
RI	U	1.94±0.06	1.94±0.07	1.94±0.04	1.81±0.09	1.92±0.06	1.87±0.05
	R	0.33±0.14	0.25±0.12	0.23±0.03	1.34±0.14	0.81±0.14	1.06±0.10
RII	U	2.00±0.00	1.81±0.10	0.54±0.05	1.34±0.14	1.63±0.11	1.50±0.09
	R	0.17±0.09	0.12±0.09	0.24±0.06	1.30±0.14	0.81±0.14	1.04±0.10
RIII	U	2.00±0.00	2.00±0.00	2.00±0.00	1.79±0.09	1.87±0.07	1.89±0.05
	R	0.28±0.10	0.06±0.06	0.18±0.06	0.62±0.13	0.40±0.12	0.51±0.16
RIV	U	2.00±0.00	1.96±0.04	1.99±0.01	1.86±0.08	1.92±0.06	1.89±0.10
	R	0.67±0.15	0.71±0.17	0.69±0.11	1.48±0.14	0.81±0.17	1.13±0.12
RV	U	1.88±0.08	1.96±0.04	1.93±0.04	1.72±0.11	1.95±0.05	1.84±0.06
	R	0.44±0.13	0.34±0.13	0.40±0.10	0.79±0.15	0.52±0.11	0.54±0.09
LI	U	1.94±0.06	1.75±0.12	1.85±0.06	1.86±0.08	1.87±0.07	1.86±0.06
	R	0.28±0.12	0.25±0.12	0.26±0.08	0.93±0.14	0.95±0.15	0.94±0.10
LII	U	1.97±0.03	1.75±0.12	1.87±0.06	1.41±0.13	1.36±0.13	1.39±0.09
	R	0.14±0.08	0.06±0.06	0.18±0.06	1.27±0.14	1.20±0.14	1.23±0.10
LIII	U	2.00±0.00	1.93±0.07	1.97±0.03	1.83±0.07	1.71±0.10	1.77±0.06
	R	0.22±0.10	0.12±0.09	0.18±0.07	0.81±0.15	0.61±0.13	0.70±0.10
LIV	U	1.75±0.11	1.81±0.10	1.81±0.07	2.00±0.00	1.85±0.07	1.92±0.04
	R	0.92±0.16	0.84±0.17	0.88±0.12	1.02±0.15	1.04±0.14	1.03±0.10
LV	U	1.89±0.08	1.75±0.12	1.79±0.08	1.86±0.08	1.95±0.05	1.91±0.04
	R	0.44±0.14	0.50±0.15	0.71±0.08	0.51±0.13	0.40±0.12	0.45±0.09

Table 2. Comparisons of the mean ulnar and radial pattern frequencies among the patients and controls

Fingers	Patient males & Control males	Patient females & Control females	Patients & Controls (M+F)
RI U	1.20	0.11	0.97
R	5.10*	3.11*	6.48*
RII U	4.71*	0.27	3.98*
R	6.77*	4.16*	6.86*
RIII U	2.33+	1.86	2.20x
R	2.13	2.54+	1.93
RIV U	1.75	0.56	0.95
R	3.86*	0.42	2.70*
RV U	4.36*	0.16	1.25
R	1.55	0.12	1.04
LI U	0.80	0.85	0.12
R	3.53*	3.65*	5.31*
LII U	4.21*	2.20x	4.44*
R	7.02*	7.50*	9.01*
LIII U	2.43*	1.80	2.99*
R	3.28*	3.10*	4.26*
LIV U	2.27x	0.33	1.36
R	0.45	0.91	0.96
LV U	0.27	1.54	1.35
R	0.37	0.52	2.16x

+ $P < 0.02$ x $P < 0.05$ * $P < 0.001$

Comparisons of the mean radial component among the patients and their controls showed significant differences for 7 out of the 10 fingers of males and 6 out of the 10 fingers of females and 7 out of the 10 fingers of the both sexes combined.

However, the dictionary of finger patterns showed various combinations of the pattern types among the patients and their controls. The dictionary of finger tip patterns of the patients is distinguishable from that of their controls. There are also considerable differences in the variability of patterns from finger to finger as eva-

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luated by the mean numbers of total pattern types in the dictionary among the patients and their controls.

The results therefore suggest distinct differences among the patients and their controls. For finding out the exact differences more studies should be done with this methodology.

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