

# Dermatoglyphic characteristics in panic disorder

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## Abstract

**Objectives:** Panic disorder is one of the most common anxiety disorders. There are various etiological factors in panic disorder. *Dermatoglyphics* are special patterns formed by epidermal ridges in fingertips, palms and soles. They form during the intrauterine period and remain unchanged throughout life. Genetic diseases can change the form and structure of *dermatoglyphics*. The aim of this study was to evaluate fingertip and palmar *dermatoglyphic* samples of panic disorder patients and to compare these with the control group.

**Materials and methods:** *Dermatoglyphic* data was collected from 50 patients diagnosed with panic disorder according to DSM-IV diagnostic criteria and from a control group consisting of 50 healthy people. Data was collected using a digital scanner and was transferred to computer medium. Using the Image J program, atd, dat, adt angles, a-b ridge counts, sample types of all fingers and ridge counts were calculated. Data was analyzed using t-test, Mann Whitney U and chi-square tests.

**Findings:** It was found that the a-b ridge count in both hands and the ridge count in the thumbs of panic disorder patients were significantly higher those of the control group. It was found that, in the right hands of panic disorder patients, there was a significant increase in ridge counts in the ring finger, total ridge count and adt angle when compared to the control group. However, there was no significant difference between the groups in terms of dermal ridges, and the most common characteristic in both groups was ulnar loops.

**Results:** Analyzing *dermatoglyphics* is non-invasive, straightforward, quick and economical. The

use of *dermatoglyphics* can facilitate identification and early diagnosis of those at risk of panic disorder, allowing preventive measures to be taken.

**Key words:** Dermatoglyphics, Panic Disorder, Etiology, Genetic Tendency

## Introduction

Panic disorder (PD) is a chronic anxiety disorder, characterized by panic attacks, physiological signs of anxiety and anticipatory anxiety. The prevalence of panic disorder within society is 1.5-4.8% and the female/male ratio is 2.<sup>1,2</sup> PD can occur due to genetic, petrochemical, neurophysiological, psychological and environmental factors. The prevalence of PD in first degree relatives of PD patients is 3-17 times higher than in the first-degree relatives of healthy people.<sup>3-5</sup> Studies carried out on twins indicated that, in monozygotic twins, the concordance ratio is 2-3 times higher than in dizygotic twins (11%-24%).<sup>4,6</sup> Previous studies have suggested that, in PD, sensitivity to panic is inherited, rather than the PD itself.<sup>7</sup>

The nervous system centers which cause PD have not yet been accurately identified.<sup>8,9</sup> Gorman et al. reported that panic attacks can result from a pathology in the cerebral peduncle; while agoraphobia can result from a situation in the frontal lobe cortex.<sup>10</sup> The central nervous system is probably affected prior to week 30 of intrauterine life, during the period when dermatoglyphic samples are formed.<sup>11</sup>

*Dermatoglyphics* are special patterns formed by epidermal ridges in fingertips, palms and soles. They form between 11-24 weeks of intrauterine



life and remain unchanged throughout life. During this period, any genetic disorder that can affect the nervous system may cause changes in *dermatoglyphics*. Therefore, abnormalities observed in *dermatoglyphic* samples may be used during the prenatal period to indicate a genetic disorder.<sup>11</sup>

Within the literature, *dermatoglyphics* were compared to many diseases, such as autistic disorder,<sup>12</sup> trisomy-2,<sup>13</sup> Down syndrome,<sup>14</sup> epilepsy,<sup>15</sup> breast cancer<sup>16</sup> congenital heart disease,<sup>17</sup> myocardial infarcts,<sup>18</sup> systemic lupus erythematosus<sup>19</sup> and were compared to healthy control groups. Among psychiatric disorders, *dermatoglyphics* were investigated in depression,<sup>20</sup> schizophrenia,<sup>21-24</sup> bipolar disorder,<sup>23,25</sup> and borderline personality disorder,<sup>23</sup> and significant differences were found when compared to control groups. A review of the literature identified no prior study analyzing *dermatoglyphics* in panic disorder.

The aim of this study was to evaluate fingertip and palmar *dermatoglyphic* samples of panic disorder patients and to compare these with the control group, to detect whether there are particular characteristics which would allow early diagnosis.

### Materials and methods

The patient group consisted of 50 patients diagnosed with panic disorder according to DSM-IV-TR<sup>26</sup> diagnostic criteria. The average age of the patients was  $40.06 \pm 1.03$  years; 28 of the patients were female. The control group consisted of volunteered students from the faculty of medicine; average age of the control group was  $19.80 \pm 1.03$  years; 25 were female, and 25 were male. The students in the control group had no history of panic disorder or any other psychiatric disorder in the family. Patient and control groups were informed about the study and their consent was obtained prior to participation.

*Dermatoglyphic* samples were collected using a Canon brand CanoScan LIDE 60 electronic scanner. In collection of samples, the thumb was placed at approximately 30-40 degrees, while other fingers were placed at 10-15 degrees abduction; the palm was placed to contact the scanner monitor. Four-color images at 300 dpi definition were taken for each patient. The images were saved on

a computer in "jpeg" file format. Fingertip samples, ridge counts, a-b ridge count, atd, dat and adt angles were detected using the Image J program (Figure 1).

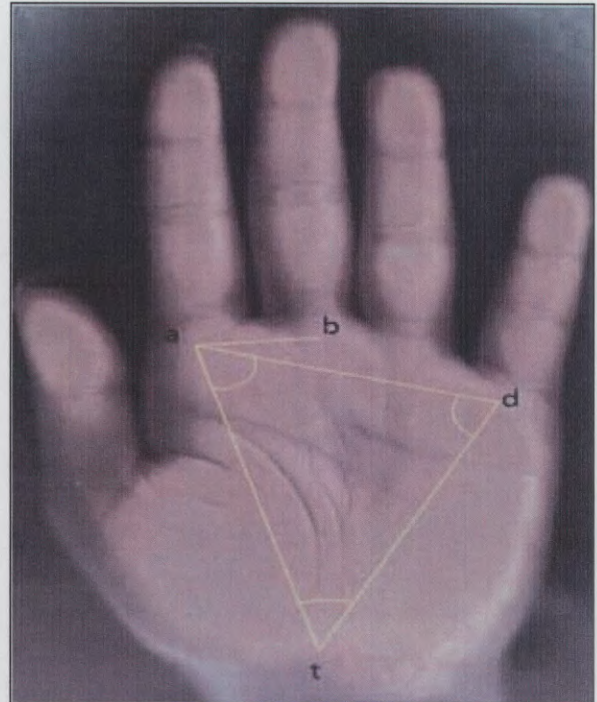


Figure 1. Measurements of angels (atd, adt, and dat angled) and a-b ridge count

### Statistical analysis

Data was uploaded to the SPSS statistical analysis program (Version 16). For statistical analysis t-test, Mann Whitney U and chi-square tests were used.

### Results

In the patient group, the a-b ridge count in both hands and thumb ridge counts was found to be increased. There was a statistically significant difference between the groups. In the patient group, there was a statistically significant increase in right hand ring finger ridge count, total ridge count and adt angle when compared to the control group (Table 1).

The distribution of dermal samples in the right hand fingertips of patient and control groups are



Table 1. The dermatoglyphic characteristics of patient and control groups

	Patient group (n=50)	Control group (n=50)	t	P	Patient group (n=50)	Control group (n=50)	t	P
	Right hand Mean±SD	Right hand Mean±SD			Left hand Mean±SD	Left hand Mean±SD		
Thumb	16.28±3.90	13.78±4.85	2.84	0.006	15.18±4.42	13.28±4.27	2.18	0.031
Index finger	11.98±6.16	11.24±5.43	0.64	0.526	11.34±6.00	11.18±4.86	0.15	0.884
Middle finger	11.94±4.82	11.60±5.36	0.33	0.740	11.76±5.44	11.40±5.34	0.33	0.739
Ring finger	13.94±3.69	11.98±4.80	2.29	0.024	13.44±4.07	11.70±5.33	1.83	0.070
Little finger	13.04±4.31	11.76±4.22	1.50	0.137	12.70±3.69	12.18±3.99	0.68	0.501
Total ridge count	67.18±17.34	59.50±20.70	2.01	0.047	64.26±17.49	59.70±20.92	1.18	0.240
atd angel (°)	42.73±6.98	42.52±5.17	0.18	0.861	42.11±7.55	41.28±5.32	0.64	0.524
dat angel (°)	56.37±6.51	57.55±4.95	1.01	0.313	56.65±7.31	57.66±5.66	0.77	0.443
adt angel (°)	81.12±4.28	79.35±4.15	2.09	0.039	80.97±4.78	80.44±4.75	0.56	0.578
a-b ridge count	35.94±5.12	32.84±4.69	3.15	0.002	36.76±5.17	33.44±3.99	3.59	0.001

Table 2. The distribution of dermal samples in the right hand fingertips of patient and control groups

Samples in the right hand fingertips								
	Patient group				Control group			
	Whorl	Ulnar loop	Radial loop	Arch	Whorl	Ulnar loop	Radial loop	Arch
Thumb	29	19	1	1	27	21	0	2
Index finger	25	11	7	7	24	12	7	7
Middle finger	12	34	0	4	12	30	2	6
Ring finger	30	20	0	0	29	16	1	4
Little finger	13	35	1	1	13	35	2	0
Total	109 (43.6%)	119 (47.6%)	9 (3.6%)	13 (5.2%)	105 (42%)	114 (45.6%)	12 (4.8%)	19 (7.6%)

Table 3. The distribution of samples in left hand fingertips of patient and control groups

Samples in the left hand fingertips								
	Patient group				Control group			
	Whorl	Ulnar loop	Radial loop	Arch	Whorl	Ulnar loop	Radial loop	Arch
Thumb	31	18	1	0	28	20	0	2
Index finger	25	14	5	6	24	12	10	4
Middle finger	17	27	0	6	15	29	0	6
Ring finger	29	19	0	2	21	24	0	5
Little finger	11	38	0	1	10	38	0	2
Total	113 (45.2%)	116 (46.4%)	6 (2.4%)	15 (6%)	98 (39.2%)	123 (49.2%)	10 (4%)	19 (7.6%)

given in Table 2; the distribution of samples in left hand fingertips are given in Table 3.

The most common sample type in both patient and control groups was the ulnar loop. In the patient group, ulnar loop was 47.6% in the right hand and 46.4% in the left hand, compared with 45.6%

in the right and 49.2% in the left hand in the control group (Tables 2 and 3).

The ridge count and a-b ridge count in the thumbs of female panic disorder patients were significantly higher than in healthy controls (Table 4).



Table 4. The dermatoglyphic characteristics of females in patient and control groups

	Patient group (n=28)	Control group (n=25)	Mann Whitn. U	P	Patient group	Control group	Mann Whitn. U	P
	Right hand Mean±SD	Right hand Mean±SD	z (-)		Left hand Mean±SD	Left hand Mean±SD	z (-)	
Thumb	15.85±4.31	12.52±4.50	3.45	0.001	14.92±4.71	11.52±4.31	2.96	0.003
Index finger	12.03±5.71	11.12±5.64	0.96	0.338	11.00±5.74	10.08±5.33	0.65	0.514
Middle finger	12.10±4.12	11.28±5.67	0.15	0.879	12.07±4.56	10.92±5.73	0.60	0.549
Ring finger	13.50±3.54	11.52±4.93	1.50	0.135	12.82±3.65	11.24±5.25	0.90	0.370
Little finger	12.67±4.16	10.84±4.73	1.54	0.124	12.42±3.53	11.76±4.08	0.69	0.489
Number of total line	66.17±16.45	55.96±22.26	1.68	0.092	62.96±17.13	55.48±22.06	1.38	0.167
atd (°)	43.95±8.65	43.46±5.48	0.27	0.789	43.44±6.95	42.31±5.37	0.50	0.618
dat (°)	55.90±7.50	56.42±5.13	0.37	0.708	56.47±7.52	55.97±5.51	1.00	0.318
adt (°)	80.40±5.01	79.28±4.22	0.84	0.402	80.15±4.70	81.26±5.37	0.89	0.373
a-b ridge count	35.96±5.09	33.00±5.03	2.50	0.012	37.14±4.68	33.72±4.00	2.64	0.008

Table 5. The dermatoglyphic characteristics of men in patient and control groups

	Patient group	Control group	Mann Whitn. U	P	Patient group	Control group	Mann Whitn. U	P
	Right hand Mean±SD	Right hand Mean±SD	z (-)		Left hand Mean±SD	Left hand Mean±SD	z (-)	
Thumb	16.81±3.31	15.04±4.96	1.02	0.309	15.50±4.10	15.04±3.50	0.79	0.427
Index finger	11.90±6.82	11.36±5.32	1.06	0.288	11.77±6.43	12.28±4.15	0.09	0.932
Middle finger	11.72±5.68	11.92±5.13	0.01	0.991	11.36±6.49	11.88±4.99	0.28	0.780
Ring finger	14.50±3.88	12.44±4.73	1.14	0.256	14.22±4.51	12.16±5.48	1.43	0.151
Little finger	13.50±4.55	12.68±3.49	0.86	0.391	13.04±3.95	12.60±3.93	0.44	0.660
Number of total line	68.45±18.73	63.04±18.80	1.33	0.182	55.90±18.20	63.92±19.24	0.33	0.741
atd (°)	41.19±3.60	41.58±4.77	0.20	0.839	40.41±8.09	40.24±5.17	0.18	0.856
dat (°)	56.98±5.10	58.67±4.60	1.32	0.186	56.88±7.20	56.88±7.20	1.31	0.190
adt (°)	82.04±2.98	79.42±4.16	2.47	0.013	82.01±4.79	79.61±3.98	1.79	0.073
a-b ridge count	35.90±5.29	32.68±4.42	2.32	0.020	36.27±5.81	33.16±4.04	1.98	0.048



The a-b ridge count in both the right and left hands of male panic disorder patients were significantly higher than in the control group. In terms of angular values, right hand adt angle was significantly increased in the patient group (Table 5).

## Discussion

The present study compared palm *dermatoglyphic* samples of 50 PD patients and 50 healthy controls. There were significant differences between the groups in terms of a-b ridge count, ring finger ring count and adt angle. There was a significant difference between female PD patients and the controls in terms of a-b ridge count and thumb ridge count, while there was a significant difference between male PD patients and the controls in terms of a-b ridge count in both hands and adt angle.

*Dermatoglyphic* patterns form at the end of the first trimester and in the second trimester of pregnancy and remain unchanged throughout life. During this first six-month period, when the organs form in the fetus, any genetic disorder affecting the nervous system can result in abnormalities in fingerprints and palmar ridges.<sup>22,24</sup>

Panic disorder has multiple etiology. Previous family and twin studies have indicated that genetic factors have an important role in the etiology of panic disorder.<sup>3-5,7</sup> Although both PD and *dermatoglyphics* are genetic-based clinical conditions, a literature review found no previous study on the relationship between PD and *dermatoglyphics*. By analyzing *dermatoglyphic* samples, like in other genetic patients, the individuals with a tendency towards PD can be identified. Thus, early diagnosis can be made and treatment can be provided to assist risk groups to avoid situations that may trigger the disease.

In our study, the a-b ridge count and thumb ridge counts in both hands of PD patients were found to be significantly increased when compared to the control group (Table 1). Ridge count in the right hand ring finger and adt angle of PD patients were significantly higher compared to controls (Table 1). However, there was no statistically significant difference between the groups in terms of dermal ridge samples (Table 2 and 3).

Fearon et al. compared fingertip and palmar dermal ridge samples of 150 schizophrenia pati-

ents with those of 92 healthy controls. They reported that total a-b ridge count in schizophrenia patients was significantly lower. The researchers underlined that this significant decrease in total a-b ridge count increased the risk of schizophrenia.<sup>22</sup> In contrast to previous findings with schizophrenia patients, the a-b ridge count in PD patients was increased in both hands. Average a-b ridge count in the right hand was  $35.94 \pm 5.12$ , while average a-b ridge count in the left hand was  $36.76 \pm 5.17$ . The variations between patient and control group values were found to be statistically significant (right hand  $p=0.002$ , left hand  $p=0.001$ ).

Balgir et al. evaluated fingertip and palmar *dermatoglyphics* of 120 male and 120 female patients, both with and without a history of schizophrenia in first-degree relatives. The authors found significant *dermatoglyphic* differences between the patient and control groups in terms of fingerprint patterns, total finger ridge counts and adt angle. *Dermatoglyphic* patterns were found to be different from those of the healthy control group.<sup>21</sup>

van Os et al., analyzed *dermatoglyphic* patterns and structural brain abnormalities in 28 male schizophrenia patients and 19 healthy individuals using MRI. They found that a-b ridge count and 9 MRI characteristics were different between the patients and the controls; both frontal and fourth ventricle volume was larger in the patient group than the controls.<sup>24</sup>

Jelovac et al. analyzed *dermatoglyphic* patterns in 52 male patients with borderline personality disorder (BPD), 195 male schizophrenia patients and 200 male controls. They found that there was significant difference between BPD-control group and BPD-schizophrenia group in terms of palmar, right hand 1<sup>st</sup>, 4<sup>th</sup> and 5<sup>th</sup> fingers; and 4<sup>th</sup> and 5<sup>th</sup> fingers in the left hand. Qualitative analysis indicated that there was a significant difference between BPD-schizophrenia group and BPD-control group in terms of the left hand 3<sup>rd</sup> finger. The researchers concluded that *dermatoglyphic* patterns distinguished BPD from schizophrenia.<sup>23</sup>

Balgir analyzed *dermatoglyphic* patterns in 120 patient with unipolar depression, both with and without a history of similar disease in the family, and found significant differences between the two groups.<sup>20</sup>



Gutierrez et al. found that, in bipolar disorder patients, ridge dissociation and abnormal features, which are two congenital *dermatoglyphic* malformations, were significantly higher in than the control group.<sup>25</sup>

In the present study, thumb ridge count in both right and left hands and a-b ridge count of female patients were significantly higher than the control group; a-b ridge counts in both right and left hands and adt angle in the right hand of the male patients were significantly higher than the control group (Tables 4 and 5). In a review of the literature, we found no previous study analyzing the dermatoglyphics in psychiatrics according to gender. Significant differences were found according to gender in parents with Down syndrome<sup>13</sup> and in idiopathic epilepsy.<sup>5</sup> Matsuyama and Ito reported that arch samples increased and whorl samples decreased in the mothers of children with Down syndrome; the incidence of both loops and ulnar loops was lower in the fathers.<sup>13</sup>

Ranganath et al. compared a-b ridge counts and palmar angles (atd, dat, adt) of 100 idiopathic epilepsy patients with the data of 200 controls. They reported that there was no statistically significant difference between the groups; there was an increase in right hand dat angle of the male patients; adt angle decreased in both hands in male patients and in the left hand in female patients.<sup>15</sup> Unlike the findings of Ranganath et al., a-b ridge count was higher in both hands of PD patients. In terms of palmar angular values, there was a statistically significant increase only in the right hand of male patients (Tables 1 and 5).

## Conclusion

Genetic factors have an effect in the etiology of PD. There are certain dermatoglyphic patterns that distinguish PD from healthy individuals. Dermatoglyphic patterns are easy to examine, can be diagnosed in a short time and are non-invasive. These characteristic can be beneficial in identification of the risk group for PD, in taking preventive measures and in early diagnosis.

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