

DIFFERENCES IN FINGER LENGTH RATIO BETWEEN STUDENTS OF PSYCHOLOGY AND SPECIAL EDUCATION AND REHABILITATION

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Abstract

Background: The disproportionate length of human fingers has generated much interest among researchers. Attention has been drawn to the relationship between the palmar digit (2D:4D) ratio and personality, but the obtained results have been inconsistent. This pilot research project was a qualitative study that aimed to investigate the similarity or differences in the length of fingers 2 and 4 in two groups of students aged 20-21 years from different study programs (psychology and special education and rehabilitation) from Tetova University in Tetova to see if the selection of study program is influenced by the length of certain fingers. Materials and procedure: Single measures of the lengths of the 2nd and 4th digits from the fingertip to the ventral proximal crease of the left and right hand were collected using a ruler calibrated to 0.05 cm. The measurements were anonymous and performed in October of 2023 by the lecturer of teaching subjects in 30 consenting students who participated voluntarily and without any compensation in the participation. At the same time, the data analysis was done statistically using the paired samples test. Results: Means and standard deviations of the parameters with respect to group differences were calculated. We found a nonsignificant group difference in the 2D:4D ratio for the right hand ($p=0.402$) and for the left hand ($p=0.775$). Conclusion: Detailed information of finger length parameters and D2:D4 index in a sample study with more participants in the future period will be used from the perspective of neuropsychology.

Keywords: finger length parameters and the D2:D4 index

1. Introduction

There is growing evidence for specific associations of psychological traits with morphological features in humans. Recently, attention has been drawn to the relationship between the lengths of the second and fourth fingers, known as the 2D:4D ratio and various human traits (Lenz et al. 2023; Jägetoft et al., 2022; Myers et al., 2018; Mayhew et al, 2007), personality (Fusar-Poli et al., 2021; Zhu et al., 2014), body size and reproductive ability (Klimek et al., 2014), physical strength how it affects sports performance (Kowal et al., 2020; Longman et al., 2011; Hines M., 2010), disorders (Velez et al., 2017; Rizwan et al., 2007) autism spectrum disorder (Schieve et al., 2018; Manning et al., 2001) and some of the variation in the expression of different dimensions of psychopathy (Perez et al., 2022; Blanchard and Centifanti, 2017; Forouzan and Nicholls, 2015; Hönekopp, 2011) but the obtained results have been inconsistent (Leslie, 2019). In modern sciences, as an innovative method for personality observation (Mosca et al., 2023) the disproportionate length of human fingers has generated much interest among researchers, but as an idea of the multidisciplinary approach of modern sciences that also corresponds to the

development of the 21st century divided the researchers into supporters (McIntyre et al., 2005) and opponents of it (Barrett et al., 2021).

Venurkar et al. (2022) explains that decoding of human personality can be done through dermatoglyphics and claims that “determining genetic anomalies using dermatoglyphics can help identify congenital deformities, various other medical conditions, and how the brain functions well ahead of time”.

In the meantime, hand photocopies, caliper measurements, and calibrated finger tubes were used to obtain digit lengths by various authors (Nicholls et al., 2008; Mayhew et al., 2007). Among others there are studies that have measured the length of fingers in academic disciplines (Lehan & Smith, 2015; Brosnan, 2006) and sports (Kowal et al., 2020; Longman et al., 2011; Hines M., 2010).

“Relative finger length can predict a person's gender or their hand preference” say Nicholls et al. (2008) whereas Gillam et al. (2008) conclude that “age, lateral asymmetry and hand preference are potential confounding factors and that future study designs should take account of these as well as other known confounders such as ethnicity, birth order, menstrual cycle phase and sexual preference”.

There are authors who try to refute the idea that finger length can reveal personality and health because the sex difference in 2D:4D is present before birth in humans (Malas et al., 2006) or that these differences are attributable to hormones that affect early fetal development (Manning et al., 2000; Fink et al., 2003; McIntyre et al., 2005; Martin et al., 2008; Kyriakidis & Papaioannidou, 2008).

Barrett with colleagues (2021) in their study observed no sex difference in digit ratio in both sexes and they have come to the conclusion that the observed no evidence that early childhood digit ratio was associated with child sex or hormone-sensitive measures in their cohort, whereas Walder et al. (2006) reported that gender differences in 2D:4D ratios are absent in adolescents with schizophrenic personality disorders.

It is reported that males tending to have a 2D:4D ratio of less than 1 and females a higher ratio which may be greater than 1 (Peters et al., 2002; Trivers et al., 2006).

Also, there are data that mean ratios varied between the English, Scottish, Uygur, Han and Jamaican children (Manning et al., 2004; Knickmeyer et al., 2011).

Studies in South Indian Population (Jeevanandam & Prathibha, 2018) and in Greek population (Kyriakidis & Papaioannidou, 2008) have also identified the sexual dimorphism in 2D:4D ratios.

Hines (2010) suggests that perhaps 2D:4D digit ratio may to be a possible indicator for a number of traits, including athletic success and visuospatial abilities, whereas Manning and Taylor (2001) suggest the second to fourth ratio and masculine ability in sports.

In many studies in psychology the 2D:4D ratio is related to many different issues, including personality, but the correlation between numerical ratios and various human traits is controversial, whereas very little has been studied about the 2D:4D ratio and its implications in medicine (Jeevanandam & Muthu, 2016), so the 2D:4D ratio is related to many different health disorders and the results of several studies on autism (Schieve et al., 2018; Manning et al., 2001), infertility schizophrenia (Zhu et al., 2014) and some variation in the expression of different dimensions of psychopathy (Perez et al, 2022; Blanchard & Centifanti, 2017; Forouzan & Nicholls, 2015; Hönekopp, 2011) have already been published.

In contrast to the above research, as far as I know, until now, in my country, in the Republic of North Macedonia, there has been no measurement of finger length in healthy people, which means that I am a pioneer in this field. For this reason, in this research project discussed the ratio of fingers in healthy subjects, especially in those that had no past or present history of physical or mental illnesses or subjects who do not have problems in the field of motor skills and behavior in daily activities.

2. Research Methodology

2.1. Design: This pilot research project was a qualitative study that aimed to investigate the similarity or differences in the length of fingers 2 and 4 in two groups of students from different study programs to see if the selection of study program is influenced by the length of certain fingers.

The research implementation took place over three days in October 2023 and focused on measurements from the ventral side of the hand (right/left).

All measurements were completely anonymous for all students who verbally accepted individual finger measurements from the teacher of the Medical basis of invalidity and Neuropsychology course.

2.2. Participants: The students were informed of the study and subsequently invited to participate. The study sample included a total of 30 students grouped by study program into two groups: (A) special education and rehabilitation students and (B) psychology students from Tetova University in Tetovo who participated voluntarily and without any compensation in the pilot research project. Their age was in range from 19 to 21 years while the number of female students in this study reflects the actual male-to-female ratio of special and rehabilitation education and psychology students at the university.

2.3. Procedure: Single measures of the lengths (L in mm) of the 2nd and 4th digits from the fingertip to the ventral proximal crease of the left and right hand were collected using a ruler calibrated to 0.05 cm and recorded in the SPSS data sheet.

2.4. Statistical analyses: Statistical analyses were performed using the SPSS. Means and standard deviations of the parameters with respect to group differences were calculated. At the same time, the data analysis was done statistically using the paired samples test.

In order to present the obtained results of the research in a more effective way, tables were used. Group means were compared for finger length relationship for right 2D:4D, left 2D:4D and right-left 2D:4D.

3. Results:

The main measurements were the length of the 2D and 4D digits in each individual's left and right hand; from the middle of each proximal crease to the tip of the fingers. Means and standard deviations (SD) of the parameters with respect to first (A) and second (B) groups were calculated.

Although there were individual differences, the paired samples T test did not investigate significant differences in the length of fingers 2 and 4 of the two hands (right/left).in the first (A) group of female students for the right hand ($t=0.780$; $p=0.448$) and for the left hand ($t=-1.048$ $p=0.312$). These data are presented in Table 1.

Table 1: Paired sample statistics and paired sample T-test on the measurements in the A group of students*

	right hand				left hand				
Finger	Mean	SD	Min	Max	Finger	Mean	SD	Min	Max
D2	6,587	0,3461	6,20	7,30	D2	6,513	0,4501	6,00	7,70
D4	6,520	0,3256	6,20	7,30	D4	6,593	0,3217	6,20	7,20

*The paired samples T test for the right hand ($t = 0.780$; $p = 0.448$) and for the left hand ($t = -1,048$ $p = 0.312$) to special education and rehabilitation students

The results from the data of paired sample statistics and paired sample T-test on the measurements in the B group of students are presented in Table 2.

Table 2: Paired sample statistics and paired sample T-test on the measurements in the B group of students*

	right hand				left hand				
Finger	Mean	SD	Min	Max	Finger	Mean	SD	Min	Max
D2	6,633	0,4203	6,00	7,20	D2	6,527	0,3918	5,90	7,20
D4	6,600	0,4766	6,00	7,60	D4	6,533	0,4304	5,90	7,60

*The paired samples T test for the right hand ($t = 0.580$; $p = 0.625$) and for the left hand ($t = -0,83$ $p = 0.935$) to psychology students

Also shown in Table 2, although there were individual differences, the paired samples T test did not investigate significant differences in the length of fingers 2 and 4 of the two hands (right/left).in the second (B) group of female students for the right hand ($t = 0.580$; $p = 0.625$) and for the left hand ($t = -0,83$ $p = 0.935$).

Means and standard deviations of right and left 2D:4D in both groups (A and B) are given in Table 3.

Table 3: Paired sample statistics and paired sample T-test on the measurements in the two group of students*

	right/left hand			
N	Mean	Std.Deviation	Min	Max
30	6,6167	0,44185	6,00	7,60
30	6,5300	0,40442	5,90	7,60

*The paired samples T test for the right/left hand ($t = 2,024$; $p = 0.52$) to special education and rehabilitation students/psychology students

As seen in Table 3, the averages of the parameters related to the first and second groups were compared. Although there were group differences in means of the length of fingers 2 and 4, the paired samples T test did not investigate significant differences in the length of fingers 2 and 4 for the right/left hand ($t = 2,024$; $p = 0.52$).

4. Discussion

In the present study, all of the participants were right handed hand and according to the t test results in the independent groups, statistically no significant differences were found between students of psychology and special education and rehabilitation left and right handed 2D:4D averages. This may be associated with female students' rates of right-hand preference being higher than the normal population.

Critical assessment as a measuring and motivating tool for improvement and change should serve as motivation for internalizing critical, creative thinking and promoting changes for the success of individual and group competencies, which also correspond to the development of 21st-century competencies: curiosity, critical thinking, creativity, non-violent communication, constructive and peaceful interaction, and collaboration.

With all this in mind, this pilot study project was undertaken to see if finger length could be related to the selection preference of students in which study program, they study. In the right and left hand, there was no statistically significant difference between the 2D:4D averages of the right and left hand in both independent groups (students of psychology and special education and rehabilitation) ($p < 0.05$), this means that the 2D:4D ratios cannot influence the choice of study program, but 2D:4D ratios can be said to have an effect on strength and grip strength.

As for the ratio of the fingers, in the literature there are studies related to human 2D (index) and 4D (ring) digit lengths and their variation and relationships with a surprising variety of different traits like personality (Fusar-Poli et al., 2021; Zhu et al., 2014), measured the length of fingers in academic disciplines (Lehan & Smith, 2015; Brosnan, 2006), sport performance (Bescos et al., 2009), sexual orientation (Martin et al., 2008), during the menstrual cycle (Mayhew et al., 2007), maternal smoking during pregnancy and possible effects of in utero testosterone (Rizwan et al., 2007), acute exercise in men and possible change in salivary testosterone (Kowal et al., 2020) and others, meanwhile “scientists try to debunk idea that finger length can reveal personality and health” Leslie (2019) concluded.

According to Ciumas et al. (2009) one of the motivations for measuring fingers length comes from the presence of masculine or lower digit ratios in children with congenital adrenal hyperplasia who have higher androgen exposure and females suffering from congenital adrenal hyperplasia.

The results from this study show that in both student samples, the difference in the 2D:4D fingers length between the hands (left 2D:4D-right 2D:4D) showed strong similarity.

Blanchard & Centifanti (2017) found that callous and unemotional traits moderated the association between prenatal testosterone (2D:4D) and externalizing behaviors in children.

According to some authors psychological personality characteristics are described by a genetic marker of index finger dermatoglyphics (Venurkar et al., 2022), while and according to other authors the sex difference in 2D:4D is present before birth in humans (Malas et al., 2006).

From a 2009 study (Bescos et al., 2009), 2D:4D digit ratio explained as a possible indicator for a number of traits, including athletic success and visuospatial abilities, other 2015 study (Lehan & Smith, 2015) shows that the 2D:4D digit ratio is not a reliable marker for comparing different traits or later studies shows that the 2D:4D digit ratio is not a reliable marker for prenatal hormone environment (Barrett et al., 2021; Blanchard et al., 2017). However, according to Bescos et al. (2009) “findings extend related evidence suggestive of prenatal programming of aptitude across a variety of sports, especially running and soccer. Some known extragenital effects of prenatal testosterone that contribute to the development of efficient cardiovascular systems, good visuospatial abilities, physical endurance and speed, and to the propensity for rough-and-tumble play, apparently promote sporting success in adult life”.

How the brain (as matter) creates thought (an immaterial product) is an eternal question and in this view using data from three published studies (Fink et al., 2003; Martin et al., 2008; Barrett et al., 2021), they analyzed four handedness traits in adults and derived estimates of trait laterality (directional asymmetry) and developmental instability (fluctuating asymmetry). Fink et al. (2003) say that “prenatal sex steroids have been broadly discussed in terms of their possible effect on brain differentiation, whereas pubertal/adult sex hormones are thought to be the main regulators of sexually dimorphic physical features in males and females”.

Study of the Martin et al. (2008) is a retrospective analysis of hand growth patterns in relation to sex and sexual orientation, whereas study of the Barrett et al. (2021) show that digit ratio, a proposed marker of the prenatal hormone environment, is not associated with prenatal sex steroids, anogenital distance, or gender-typed play behavior in preschool age children.

Klimek et al. (2014) suggest the digital ratio (2D:4D) is an indicator of body size, testosterone concentration and number of children in human males, whereas Jägetoft et al. (2022) conclude

that “digit ratio showed sexual dimorphism at the age of seven and seems to represent a true sex difference rather than an artifact and bias from hand size, body size or body fat content.”.

Hines (2010) show that “the ratio of 2D:4D digits is not a reliable marker for trait competition, suggesting that exposure to different levels of testosterone in utero does not affect competition later in life however, the findings suggest that, in men, this numerical ratio can be useful as a sign of participation in sports and competitive games”.

According to Kowal et al. (2020) the relationship between 2D:4D change and testosterone during acute exercise in men showed no relationship between digit ratios (2D:4D) and change in salivary testosterone.

Manning et al. (2001) found that “the 2D:4D ratios of children with autism, their siblings, fathers, and mothers were lower than population normative values” and they “concluded that the 2D:4D ratio may be a potential marker for autism that may to implicate prenatal testosterone in its etiology”.

Overall, this study showed no left-right asymmetry and is associated with a similar morphological variety between the two study groups as shown by the results of a study of subjects aged 4 to 60 years (Gillam et al., 2008) or as it shows Brookes et al. (2007).

It should be noted that according to the authors of two studies (Manning et al., 2000 and McIntyre et al., 2005) that have analyzed the variation of finger length and their relationships as models of hand growth in relation to different issues, according to them the second-to-fourth digit ratio (2D:4D) is a biological marker, defined as the ratio of the length of the index (second digit) to the length of the ring finger (fourth digit) of the same hand while the difference in 2D:4D ratio between hands (left 2D:4D-right 2D:4D) showed the strongest asymmetry of hand performance and is constant throughout life. Also, Manning et al. (2000) and McIntyre et al. (2005), have come to the conclusion that the results of their study strongly encourage the further use of finger length ratios as markers of perinatal testosterone action.

A study done by Kyriakidis and Papaioannidou (2008) shows that in Greek population the 2D:4D ratio is not only a sexually dimorphic biometric marker, associated with prenatal levels of estrogen and testosterone in utero, and genetically determined by HOX genes, but is stronger in right than left hand.

A systematic review of case-control studies by Fusar-Poli and colleagues (2021), showed that, ratio of the second digit to the fourth (2D:4D) as an indirect, retrospective, non-invasive measure to correlate negatively with intrauterine exposure to testosterone and overall, psychiatric patients had lower 2D:4D than healthy controls, with more pronounced differences in the right hand, males, and children. And, the same systematic review of case-control studies considering psychiatric disorders individually, significant differences were found in the patients with autism spectrum disorder, schizophrenia, attention deficit-hyperactivity disorder, mood disorders, intellectual disability and addictions groups, in which 2D:4D was significantly lower than healthy controls (Fusar-Poli et al., 2021).

5. Conclusion

The results of our research in the field of finger measurements say that the opposite idea helps in a way to increase the motivation and desire to perform activities, which to some extent show an overlap

The volunteers belonged to the faculty of pedagogy and the faculty of Philosophy and they had no past or present history of physical or mental illnesses. Since the statistical results did not show statistical differences, this group of students as a control group is likely to be used in the next study in terms of neuropsychology. The participation of students in such pilot project has been beneficial to them, given the benefits in the development of their competencies for their future profession.

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