

# Comparison of 'Atd' Angle between Physical Education and Non Physical Education Students

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## Research Article

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**Background:** Dermatoglyphics is the study of the pattern of the ridges present on the fingers, toes and soles of the humans. It gives an indication about the intrinsic qualities of an individual. The 'atd' angle is formed by the lines drawn from the digital tri-radius "a" to the axial tri-radius "t" and from this tri-radius to the digital tri-radius "d". It has been shown that smaller 'atd' angle corresponds to a higher athletic potential of an individual.

**Method:** A comparative study was undertaken on 50 participants, who were divided into physical education students (n=25) and non-physical education students (n=25) groups. The 'atd' angle was measured and compared in both the groups. Analysis of data between the groups was done using pair 't' test.

**Result:** The mean 'atd' angle in physical education students was 39.68 and in non-physical education students 41.04. There was no statistical significant difference between the two groups i.e. p>0.5.

**Conclusion:** The 'atd' angle is smaller in physical education students as compared to non-physical education students, suggesting preferable measurement of 'atd' angle in individuals prior to selection in sports.

## INTRODUCTION

The aim of recent sport competition is to notice associated human ability at an early stage of life and channelize it within the right direction to appreciate the achievements aimed toward in an exceedingly explicit sports or game. The aim of modern sport competition is to detect and develop human ability at an early stage of life and channelize it in the right direction to realize the achievements aimed at in a particular sports or game.

The word dermatoglyphics refers to the branch of science studying the pattern of the skin's (dermal) ridges present on the fingers, toes and soles of the human. The word dermatoglyphics is derived from the Greek word 'Derma' meaning skin and 'Glyphae' meaning carving. The term was given by Cummins and Midlow in 1926<sup>[1]</sup>. The ridge pattern first appear at about 6th week of interauterine life and once established, do not change during lifespan. It shows the congenital lines on fingers and one's intrinsic qualities<sup>[2]</sup>.

The 'atd' angle is the most commonly used methodology in dermatoglyphics. The axial tri-radius is present in proximal part of the palm in alignment to the fourth meta-carpal bone (Figure 1). The 'atd' angle is formed drawing lines from the digital tri-radius "a" to the axial tri-radius "t" and from this tri-radius to the digital tri-radius "d"<sup>[3]</sup>.

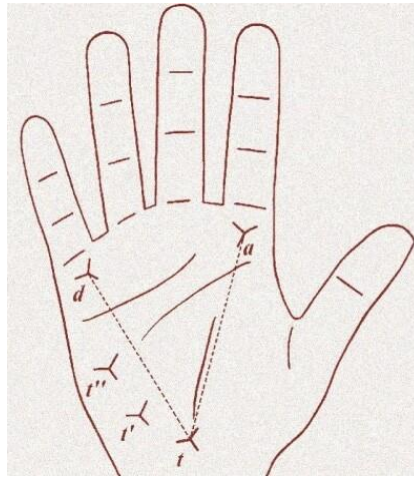


Figure 1. Landmarks Used To Measure 'Atd' Angle.

Researchers have described 'atd' angle as 'intellectual angle' or 'wisdom corner'. It is generally accepted that the smaller the value of 'atd' angle, the higher the level of intelligence. Lower the 'atd' angle, more the athletic an individual is. Researches have shown that an angle of <35 degrees reflects that an individual is a born athlete, an angle of 35-40 degrees shows that the individual is smart, the normal range of the angle is 41-45 degrees. While an angle of 46-50 degrees shows that the individual is a step by step learner & an angle of >50 degrees suggests that the individual is mentally retarded<sup>[3]</sup>. The 'atd' angle reflects the efficiency of co-ordination between the neuromuscular systems, determining one's agility<sup>[3]</sup>.

Since early 70's many countries had been applying 'atd' angle in selecting athletes. The 'atd' angle has been a one of the tools in selecting participants for Olympics in the countries like China, Australia, Japan, etc. This is one of the key reasons of China winning the maximum number of gold medals in Olympics<sup>[3]</sup>.

The 'atd' angle has a good inter as well as intra rater reliability. Its reliability may be improved by reading digitized prints with the help of a software program such as Adobe Photoshop as it helps in magnifying prints, better than a magnifying glass, and has the ability to enhance the lines of the palms when necessary<sup>[4]</sup>.

**Aim of the study:** To determine any difference in 'atd' angle of Physical Education students and Non Physical Education students in a University.

**Null hypothesis:** No significant difference exists in 'atd' angle of Physical Education and Non Physical Education students.

**Alternate hypothesis:** A significant difference exists in 'atd' angle of Physical Education and Non Physical Education students.

## LITERATURE REVIEW

Del Vecchio et al. attempted to verify the relationship between biological markers of performance of elite judo athletes and performance in different physical fitness tests. The study concluded that there is interdependence between biological markers of performance & physical fitness, with an increased Total Ridge Count, in higher level judo athletes<sup>[5]</sup>.

Borin et al. conducted a study in order to understand the distribution of quantitative dermatoglyphic indicators in basketball players with different levels of performance compared to non-players. They found that Total Ridge Count have a different compartment when players are compared to non-players<sup>[6]</sup>.

Rishi et al. tried to study the relationship between performance of students in their annual senior secondary school exam and 'atd' angle. They concluded that the usefulness of atd angle in applied sciences remains unclear as there is no direct relationship between the angle and the academic performance and further research, with different sample groups, needs to be carried out<sup>[7]</sup>.

Dorjee et al. discussed the applications of dermatoglyphic traits in population variation studies, personal identification, inheritance studies, disputed paternity and association of dermatoglyphics with certain diseases in humans. Each aspect of the study has greatly contributed to the understanding of human population variation. Dermatoglyphic traits are now being used as an indicator for selection in sports<sup>[8]</sup>.

Brunson et al based on his study suggested that the 'atd'angle can be measured reliably whether it be inter rater or intra rater reliability. They further suggested that the reliability may be improved by reading digitized prints with the help of a software program such as Adobe Photoshop<sup>[4]</sup>.

W. R. Mir et al. concluded that the middle distance runners have better 'atd' angle when compared with sprinters and long distance runners. The 'atd' angle showed similar findings between right and left hand irrespectively of different pace runners. The selection of runners based on 'atd' between 35 degrees to 45 degrees was said to be suitable for track events<sup>[9]</sup>.

There is a need to identify the potential or aptitude for sports or sports related activities so that it can serve as a stepping stone in pursuing the education or career in this field. As there is a lack of studies of this nature in India we attempt to study the relationship of the 'atd' angle with the different groups of students in a University.

### METHODOLOGY

The present study is of descriptive research design. This study includes a total number of 50 participants, irrespective of the gender, by convenient sampling from Teerthanker Mahaveer University (TMU), Moradabad. The inclusion criteria consisted of students studying in TMU, between age group of 17-30 years, both male & female, and those who were willing to participate in the study. The participants who had any injury or any bony deformity or any neurological insufficiency of the hand and palm were excluded from the study. A total of 86 participants were approached out of which only 50 students who met the inclusion criteria preceded for further study procedure. The two groups of 25 participants each, of physical education students and non-physical education students were made to compare and evaluate the difference in 'atd' angle (Figure 2).

### MATERIALS USED

1. Magnifying glass
2. Ball point pen
3. Ruler
4. Protractor
5. High quality digital camera

#### Procedure for data collection

The following study was conducted involving the Physical Education and Non-Physical Education students studying in TMU, Moradabad. All the participants were explained about the nature and purpose of the study. Informed consent was taken from the participants who fulfilled the inclusion criteria.

The following steps were followed for measuring 'atd' angle in both the groups:

1. It was ensured that all the required materials were available at the time of measurement.
2. It was ensured that all the participant's hands were washed properly before the commencement of data collection.

**Note:** It is important to remove any kind of impurities or marks on the hand that could interfere with the data collection.

3. It was ensured that every participant was seated comfortably and all the queries were answered.
4. A picture of the participant's dominant hand was clicked with the aid of a high quality digital camera.
5. It was ensured that the fingers are set as apart from each other as possible.

**Note:** A variation in the angle measurement would be observed in the same person if the reading is taken with fingers apart as compared to when together<sup>[10]</sup>.

6. With the aid of a magnifying glass, the 'a', 't', and 'd' points were identified and marked with a ball point pen.

**Note:** It was ensured that the pen mark does not spread and that it has covered the points exactly.

7. With the aid of a protractor and a pen, the 'a' and 'd' points were joined with the 't' point.

8. The angle forming between these lines was measured using a protractor.

**Note:** It was ensured that same base line for all the measurements was taken. In this study, the line near the little finger was taken as a base for all the participants and the results were rounded off to the nearest angle.

9. The 'atd' angle of the dominant hand of the participant was recorded in the data collection sheet.

10. The picture of the dominant hand was clicked as evidence of data collection & for future reference<sup>[11]</sup>.

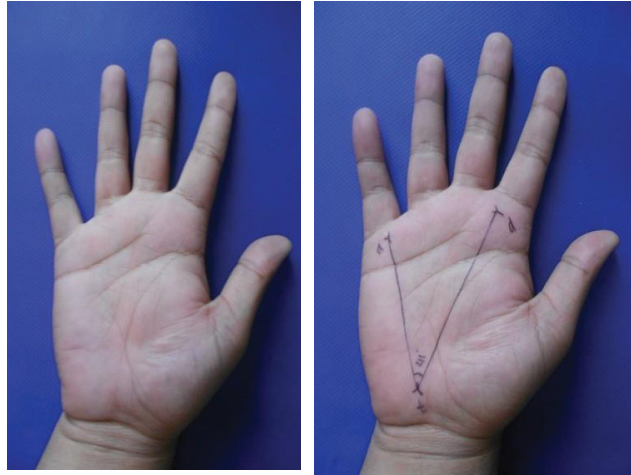


Figure 2. Measurement of 'atd' angle.

Data analysis

The collected data was analyzed statistically by SPSS software; statistical analysis for the group was performed to find out mean, standard deviation and statistical significant difference between 'atd' angles of the participants. Microsoft office excel was used to generate tables and graphs.

RESULTS

The total number of participants in the Physical Education Group was 25, out of which 19 were males & 6 females. In the Non Physical Education Group out of a total of 25 participants, 14 were males while 11 females. The mean age of participants in the Physical Education Group was 23.68 years while it was 19.84 years of the Non Physical Education Group (Table 1).

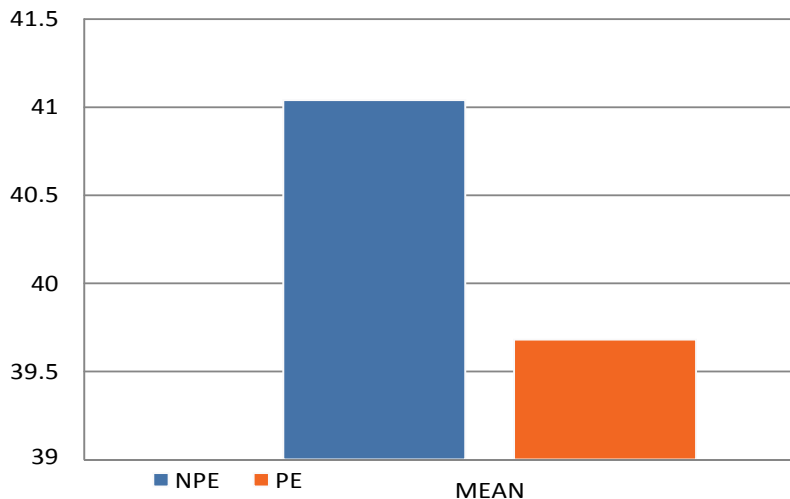
Table 1. Frequency distribution.

Characteristics	Physical education	Non physical education
No. of males	19	14
No. of females	6	11
Mean age (in years)	23.68	19.84

The result of analysis of 'atd' angle in physical education and non-physical education students has been depicted in the (Table 2) and (Graph 1), showing the difference between the mean values of 'atd' angle in both groups. It is clear from the findings that the mean 'atd' angle in the Physical Education Group was 39.68 while that in the Non Physical Education Group was 41.04.

Table 2. Descriptive statistics.

Atd	DEPT	N	Mean	Std. Deviation	Std. Error Mean
	NPE	25	41.04	4.8	0.96
	PE	25	39.68	4.05915	0.81183



Graph 1. Showing the difference between the mean value of 'atd' angle in physical education and non- physical education students.

Table 3 depicts the results of paired 't' test and we can say that no significant difference was found between the 'atd' angle in the two groups with  $p < 0.5$ .

Table 3. Independent samples test.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
atd	Equal variances assumed	0.323	0.573	1.082	48	0.285	1.36	1.257	-1.16786	3.88786
	Equal variances not assumed			1.082	46.711	0.285	1.36	1.257	-1.16966	3.88966

## DISCUSSION

A total number of 50 students participated in this study out of which 25 were Physical Education students and 25 were Non-Physical Education students from TMU, Moradabad.

The result of our study shows that the atd angle is greater in Non-Physical Education students (Mean 41.04) as compared to Physical Education students (Mean 39.68) which suggest that measuring 'atd' angle in athletes prior to their selection is preferable in sports.

Studies suggest that the 'atd' angle once formed remains unchanged throughout the life which is decided genetically and determined in fetal life [12,13]. This is why the subjects taken in this study were of the same age group.

David has shown that great care must be taken in determining which angle to measure the 'atd' angle from same triradius. It is impossible to determine whether the 'atd' angle is smaller or larger because the 't' triradius is actually displaced or because the researchers were simply measuring the prints differently [14,15]. To overcome this problem the 'atd' angle was measured by keeping all the fingers abducted and same base was taken for all the measurements.

According to Empower Mind 2012, the 'atd' angle less than 35 degrees indicates excellence in sports activities, the 'atd' angle up to 40 degrees depicts smartness and normal range is from 41 to 45 degrees. Those who have 'atd' angle greater than 50 degrees are considered mentally retarded [16]. This supports our findings which show that the 'atd' angle of most of the Physical Education students lies from 35 degree to 40 degree. On the other hand, the study conducted by Y. Zhou, et al, shows that the 'atd' angle of exceptional athletes are significantly smaller and the general population are normally between 41 degree to 42 degree [17]. The results of our study are in accordance to this.

Various studies indicated that general population had 'atd' angle of 41 degree to 42 degree, and people suffering from various diseases have atd angle was significantly greater than general population, due to various hypoplasia of the brain. Smaller 'atd' angle is necessary to include athletes during the selection. These findings are also congruent with our findings.

The result of present study showed that there is no significant difference in 'atd' angle between physical education and non-physical education students. This finding can be attributed to the fact that some students in the physical education group may not have an innate potential for sports but have selected it as their career or the students in the non-physical education group may have an innate potential for sports but have not pursued it as a career option due to various intervening factors or may be participating in sports at a recreational level. Waseem Raja et al also found no significant difference among sprinters, middle distance runners & long distance runners on 'atd' angle [18].

Zhou Thong Chaodeng in a study on 29 students found that students in the class track and field training had 'atd' angle less than the general population, the 'atd' angle becomes smaller in individuals with athletic ability [19]. These findings support our study as according to our findings the physical education students have a smaller 'atd' angle as compared to non-physical education students.

Some studies have shown that the 'atd' angle had been linked with mental retardation and the selection of athletes [20]. Our study also gives results about 'atd' angle which can be used in selection of athletes.

In the field of sports, different factors in diverse type of sports influence the athlete in reaching in his best performance level. These range from physical dimensions, techniques, tactics and psychology, as well as structure, organization & controlled training planning. High performance in sports can only be attained by 6-10 years of planned & systematic preparation. Authors like Moskatova emphasize that, although it might be highly perfected, training technology does not modify what has been determined by the athlete's individual organic capacity. In order to have interaction between variables which assume different levels of influence according to the sport, it is important to know the real specifics like profile of the sport or team, characteristics of the group of players with determined functions or even in individual sport.

The present study concluded that 'atd' angle in Physical Education students are smaller than non-Physical Education students and there is no significant difference in 'atd' angle of Physical Education students and non-Physical Education students.

### LIMITATIONS & FUTURE SCOPE OF STUDY

The limitations of this study were that the sample size of male and female subjects was not equal, the study was done in a short duration, the difference in age group was small and study was done only on students from TMU. Therefore, the future recommendations would be that the study can be done on candidates above 35 years of age, the study can be done on selected sports and on other dermatoglyphic traits also. The study can be done by including both hands of the participants and the sportsmen of different levels of championship can be taken for future study.

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