

# Measuring the Degree of Feet Arches Curvature for Male and Female Physical Education Students as a Function of Sitting and Standing Positions

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## Abstract

The study aimed to identify the degree of curvature of the feet arches for male and female Physical Education students at Al-Quds University (AQU) and Palestine Technical University – Kadoorie (PTUK), as a function of sitting and standing positions, as well as to identify the difference in the degree of curvature of the right and left feet due to sitting and standing positions attributed to the variables of university type, subjects' gender and weight. Both measurement and analysis methods were used; the study sample consisted of (151) male and female students from both Physical Education Departments distributed as follows: (58) male and (45) female students from AQU and (48) female students from PTUK-Ramallah selected randomly. To answer the study questions, the scientific and statistical coefficients have been used. Our results showed that the differences in the left foot arch curvature for AQU students are at an average rate of (44.71%) compared to that of female students at PTUK by (49.78%) which is very close to the level before and in the absence of statistically significant differences at the level of significance ( $0.05 \geq \alpha$ ) in difference of degree of curvature of the right and the left feet from the two positions between students at Physical Education Departments attributed to the institution, gender and weight. The researchers recommend conducting a footprint examination for all students as a requirement to join the physical education departments and not to rely on the naked eye as an evaluation tool, since the height of the feet arches does not mean that student is fit to join the physical education program. It is possible that the height of the arches exceeds the normal limit and therefore will be a disorder similar to flat foot. Keyword: feet arches, physical education, flat foot, position

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## **roduction:**

Lower limbs in human body are considered the base or the essential foundation upon which the human body and its movement are based. So the lower limb bones have been developed stronger and longer than the bones of the upper limb due to its function in carrying the body and the fact that it is based upon during movement. The upper limb is distinguished in its communicative function with the outside world. The skeletal structure of lower limb is distinguished by abundant of dense or ivory bones. Also, the muscles of the lower limb are characterized by its big size, length and strength and it has a broad and strong contact with its bone contact. It is also characterized by the presence of many great bony protrusions for muscle origins and connections. The joints of the lower limb are of a particular anatomical structure which gives it this distinctive ability to maintain the integrity of the body, the stability of these joints, their capacity and precision in engineering with the bone where the human body can resist weight and a person can walk or run. (Farris, et al, 2019; Ali 2013) Longitudinal arch of the foot is low and is based on two pillars front and rear, two rear sections of the heel bone and the front section of the two combs (IV and V) with the phalanges of gravity and moves weight through the heel. (Farris, et al, 2019)

The medial longitudinal arch of the foot is higher than the lateral bow and a pillar Fibula from behind the heads of the three combs medial (I, II and III) from the front, moves the weight of the body

through the tibial bone and heel. Strong ligaments are attached between the arches and short muscles to the toes with the support of the leg muscles and the tendons that pass to the plantar aspect of the foot from side to side, and the weak and stretched ligaments that compress the arches and make the plantar aspect of the foot come into contact with the ground and this condition is called (flat foot). Foot bones are linked to the bones of the foot joints (under-heel, bronchial navicular, bronchial heel, heel navicular, navicular wedge). (Samea, 2004)

The foot performs walking, running and jumping movements assisted by the strength of lower leg muscles. The precise movement of the foot and toes are by the foot muscles themselves. Foot injuries as a result of anatomical deformities occur due to additional pressures from the surrounding structures. When doing daily activities, one does not feel anything except when exposed to repetitive stress, as when doing sports activities, one can start to complain of pain and dysfunction as a result of injuries. (Samea, 2006)

The habit of walking on the little toe from the outside can lead to a fall of the feet arches and a lack of balance in standing. Wearing open shoes such as sandals can cause an increase in the flatness of the feet. Therefore it is important to strengthen the legs muscles and get used wake with forward toes direction and not to strain the muscles of the legs. (Rao 1992)

The great attention paid by sports and military colleges is an important reason to consider the criteria for students' admission or rejection, where there is a large percentage of students have weakness and stretching of the ligaments, which causes the disappearance of these arches during plantar contact with the ground, which is called flat feet. The same is the case with the high arch of the foot, where this distortion causes deformity of the footballer. ) Sabri 1982(. It is important to emphasize the vital role of the foot in all activities, including team and individual sports, as the foot is responsible for the direction of force, the path of motion, and the distribution of body weight on the ground. The difference in arch height and inflexibility also has a significant impact on the ability to distribute body weight, absorb shock and lose thrust forward. (Shabib 2011)

### **Previous studies:**

Madian (2005) studied the relationship between the distortions of lower skeleton for primary school pupils and some fitness components. The researcher used the descriptive approach with a sample of 540 pupils of primary school students. The most important results are that the defects are flat feet, chattering of the knees, tilt pelvis, and tilt of the heel. Shahid )1990) study results showed a correlation between the level of performance and the angle of foot arch (right and left) and that the angle

of curvature is better for outstanding female students with an average arch of the foot angle for both feet (right and left feet 46.74 cm (. Shata (1986) study summarized benefits of foot arches in that it helps to absorb shocks and vibrations located on the foot as a result of body weight on feet while jumping and running. It is also considered one of the sport elements, help mobility and flexibility. It also strengthens the structure of arch to be able to carry body weight. It also keeps the blood vessels and nerves in the feet soles from the pressure of body weight.

The causes of flat feet are summarized as follow: rare congenital causes; Achilles tendon tightness; idiopathic; extensor foot or muscle inherited in some families; flattening in the first years of childhood; Flattening of the foot skeleton due to an imbalance of the foot; Flattening as a result of bone injury in cases of accidents such as fracture of the foot bone or the neck of the navicular bone as a result of purulent inflammation of the bone; Flattening as a result of paralysis of the foot muscles, as in poliomyelitis. flattening due to disease or injury resulted for the loss of arches.

The researchers recommended the importance of choosing comfortable shoes, allowing children to play barefoot, and not forcing children to stand and walk early, taking into account their comfort as much as possible.

## Research problem:

The study seeks to identify situations of feet arches deformities, among a sample of male and female students of the Physical Education Departments at AQU and PTUK/Ramallah where students are admitted in physical education department without a thorough medical examination, which leads to a rise in sports injuries during practical lectures. A study entitled "common sports injuries among students in Physical Education Department carried out at AQU explained that the most body parts exposed to sports injuries are ankle joints which is the main support of the human body. This result raised the motivation to conduct this study

## Study objectives:

The present study aims to:

Find out the difference in the degree of curvature of right and left feet from both sitting and standing positions among Physical Education students at AQU and PTUK as a function of university type, gender, and weight..

## Study Hypotheses:

No statistically significant differences at the level of significance ( $0.05 \geq \alpha$ ) in difference degree of curvature of right and left feet arches for both sitting and standing positions among Physical Education Students at AQU and PTUK.

No statistically significant differences at the level of significance ( $0.05 \geq \alpha$ ) in a different degree of curvature of right and left feet arches for both sitting and standing positions among Physical Education Students in targeted institutions attributed to institution type.

No statistically significant differences at the level of significance ( $0.05 \geq \alpha$ ) in a different degree of curvature of the right foot and left arches for both sitting and standing positions among Physical Education Students in targeted institutions due to gender.

No statistically significant relationship at the significance level ( $0.05 \geq \alpha$ ) in a different degree of curvature of the right foot and left arches for both sitting and standing positions among Physical Education Students in targeted institutions due to weight .

## Importance of study:

The importance of the study lies in the detection of left and right feet curvatures from sitting and standing positions of physical education students at AQU and PTUK due to the high numbers of students exposed to sports injuries through practical lectures.

Study methodology and procedures: the researchers used the descriptive and analytical approach that suits the nature of the study. Study population: Male and female students of the Physical Education Departments at AQU and PTUK / Ramallah.

Study sample: Consisted of 151 male and female students distributed as follows: (58) male and (45) female students from the Department of Physical Education at AQU and (48) female students at Department of Physical Education / PTUK / Ramallah randomly chosen.

### **Study tools: The researchers used the following tools to achieve the objectives of the study:**

Alrstamitr device for measuring length, and standard Weight scale.

A local footprint design: A blank sheet with lines in millimeters on its left and right margins at the bottom of each sheet marked with a letter (R standing) indicating the right footprint of a standing position and (R sitting) the right foot of a sitting position, and the other sheet ( L Standing) indicating the left footprint of standing position and (L Sitting) the left footprint of the sitting position, as well as the student's code or number, height and weight on the same sheet. Easy-to-clean coloring material is poured into a bowl and a special sponge is placed under it on another bowl with clean water.

A chair has been prepared with the right and left sheets placed on the ground on a special wooden board. The participants sit on the chair and carefully place the right foot in the bowl of colors and then place their feet on the white striped sheet to take the right footprint of the sitting position and then measure the left footprint by the same mechanism. Then the participants footprints from a standing position were measured with the same mechanism, during these measurements, participants should stand in moderately balanced position without any tension. Finally the sheets were removed with great care. The Shtrater indicator that commensurate with the present study was used to measure the footprint.

## Mechanism of calculating the difference according to the method of index:

1. With four imprints on both feet, a foot-length line was drawn from the medial cuneiform aspect connecting the most prominent point on the metatarsal below the big toe, the researchers labeled with the symbol (A) to the most prominent point on the back of the heel. It was designated by the symbol (B). Using the ruler, a point in the middle of the line A and B was marked with the symbol (C).

2. Using a protractor, a line was drawn from point (C) horizontally at right angles to the line (A\_B) from point (C) toward the plantar of the foot that passes through the medial arch of the foot indicated by point (D) and on the same horizontal line to the end of the space from the side edge which points to point (E).

3. Shtraetr index to measure the footprint for Kashuba V.A. (2002)

$$I = (DE(\text{cm})) / CE \text{ cm}$$

Table (1): represents:

No	Degree of curvature	percentage
1	High curvature(high)	From 0-36
2	Slight high curvature	From 36.1-43
3	Normal curvature	From 43.1-50
4	Arch before flattening	From 50.1-60
5	Flattened foot	From 60.1-70 or more

## Statistical analysis:

Statistical analysis of the data has been made by extracting numbers, percentages, standard deviations, t-test, and Pearson correlation coefficient. Using statistical packages SPSS V-21 program.

## Results and discussion:

Table (2) the demographic characteristics of the sample:

Variables		number	percentage
Higher education institute	AQU	103	68.2
	PTUK	48	31.8
Gender	male	58	38.4
	female	93	61.6

Table (2): refers to study samples students of Physical Education Department at AQU, where the total sample was 58 students (45 female students) while the total (103) male and female students. The total number of female students at Department of Physical Education at PTUK (48) female Students, where the total of study sample was (151) male and female students. The percentages of the total members of the study have been calculated.

Table (3) shows that the mean weight of male subjects was (70.74) kg, and for female subjects was (57.89) kg.

Average highest of male subjects was (171.21 cm) and for female subjects was (162.16 cm).

Age average for male subjects was (20.31) years, and for female subjects was (19.47) years.

Table (3): the distribution of the study sample depending on weight, height, age and sex.

gender		weight	height	Age
male	mean	70.74	171.21	20.31
	Standard deviation	19.04	15.08	1.49
female	mean	57.89	162.16	19.47
	Standard deviation	7.94	6.11	1.26

Table (4) shows a comparison between AQU students and PTUK students according to the degree of curvature of the right foot arches from a sitting position.

university	Degree of curvature of feet archs from sitting position					Total
	High curvature	Slight high curvature	Normal curvature	Arch before flattening	Flattened foot	
AQU	47	17	25	11	3	103
	45.60%	16.50%	24.30%	10.70%	2.90%	100.00%
PTUK	23	11	7	5	2	48
	47.90%	22.90%	14.60%	10.40%	4.20%	100.00%
total	70	28	32	16	5	151
	46.40%	18.50%	21.20%	10.60%	3.30%	100.0%

Table (4) Shows that AQU students have high curvature in the right foot arches in sitting position by percentage (45.6%), followed by the normal curvature by (24.3%), then high curvature with a percentage (16.5%), then slight high curvature with a percentage (10.7%), and finally flattened foot with a percentage (2.9%).

Moreover; PTUK female students have high curvature at the right foot arches (47.9%), followed by arching a bit high rate (22.9%), followed by female normal curvature rate (14.6%), followed by arch pre-flattening by (10.4%), Finally female foot flattened by (4.2%).

Researchers believe that the results of right foot arches for students at both AQU and PTUK from the sitting position was not satisfactory by (46.4%), high arches by (18.5%) slightly high arches by (21.2%), normal arches by (10.6%). High arches are a serious deformity no less than flat feet, because both are caused by a serious deformity of the foot plus the high rate of arches in the foot is supposed to be one of the reasons for rejecting the admission to physical education program.

The study showed that students with normal foot arches height reached (21.2%), which is a low percentage and a serious problem.

Table (5): Comparison between students at AQU and PTUK according to the degree of the right foot curvature from a standing position:

university	Degree of curvature of right foot arch from standing position					total
	High curvature	Slightly High curvature	normal curvature	Arch before flattening e	Flattened foot	
Al-Quds	24	16	26	26	11	103
	23.30%	15.50%	25.20%	25.20%	10.70%	100.00%
PTUK	6	8	14	14	6	48
	12.50%	16.70%	29.20%	29.20%	12.50%	100.00%
total	30	24	40	40	17	151
	19.90%	15.90%	26.50%	26.50%	11.30%	100.0%



Table (5) shows that AQU students are showing normal curvature, and arches before flattening in the right foot in standing position with the same proportion (25.2%) for each of them, then the high curvature rate is (23.3%), then the slight high curvature rate is (15.5%), and finally the flattened people by a rate of (10.7%) only.

Moreover; the PTUK students have normal curvature, and the arc pre-flattening rate (29.2%) with the same proportion for each, female with little high curvature rate is (16.7%), and finally female with high curvature, the females with flattened foot with the same proportion is (12.5%) for each

The researchers believe that the results of the right foot curvature for AQU and PTUK students from a standing position was also not satisfactory (19.9%) high arches and the reason for the low percentage is a standing position and (15.9%) slight high arches and (26.5%) normal arches and (26.5%) pre-flattening arches with the same proportion of normal foot. This is also an indicator and an alarm which means that feet arches may return to flattening stage and (11.3%) flattened feet and the rise in rates was due to the weight in a standing position.

Table (6): Comparison between AQU students and PTUK female students according to left foot degree of curvature from the sitting position:

University	Degree of left foot curvature due to sitting position					Total
	Normal curvature	Slight high curvature	Normal curvature	Pre-flattening arch	Flattened foot	
AQU	46	25	19	9	4	103
	44.70%	24.30%	18.40%	8.70%	3.90%	100.00%
PTUK	26	13	5	3	1	48
	54.20%	27.10%	10.40%	6.30%	2.10%	100.00%
total	72	38	24	12	5	151
	47.70%	25.20%	15.90%	7.90%	3.30%	100.0%

Table (6) shows that AQU students show high curvature in their left foot in sitting position (44.7%), followed by a little high arch (24.3%), then the normal curvature rate (18.4%), then pre-flattening by (8.7%), and finally the flattened people by (3.9%).

Female students at PTUK, have high left feet curvature in sitting position (54.2%), followed by slight high by a rate of (27.1%), also female subjects with normal curvature rate (10.4%), then pre-flattening curvature by ( 6.3%), and finally with flattened feet by (2.1%).

The researchers believe that result of the left feet from the sitting position was also not satisfactory and disturbing for AQU and PTUK Students which is similar to the right feet situation. The researchers found a difference in measurements rates between both right and left feet from

the sitting position which is a bad indicator. The results showed that the development of the left foot arches from the sitting position was as follows: AQU students better results of (44.7%), while female students at PTUK (54.2%), and normal arches for students at AQU (18.4%) whereas PTUK students (10.4%).

In addition, the results of arches before high arch and pre-flattening came close and unsatisfactory also. However; flattened feet were (3.9%) for AQU students and (2.1%) for PTUK students and the result was in favor of students at PTUK.

Table (7) shows the comparison between students at AQU and PTUK according to the degree of curvature in the left foot in arches of left foot from a standing position:

University	Degree of curvature of left foot arches from a standing position					total
	High curvature	Slight high curvature	Normal curvature	Arch pre-flattening	Flattened foot	
AQU	25	16	29	22	11	103
	24.30%	15.50%	28.20%	21.40%	10.70%	100.00%
PTUK	2	9	21	9	7	48
	4.20%	18.80%	43.80%	18.80%	14.60%	100.00%
Total	27	25	50	31	18	151
	17.90%	16.60%	33.10%	20.50%	11.90%	100.0%

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Female students at PTUK, have high left feet curvature in sitting position (54.2%), followed by slight high by a rate of (27.1%), also female subjects with normal curvature rate (10.4%), then pre-flattening curvature by ( 6.3%), and finally with flattened feet by (2.1%).

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In addition, the results of arches before high arch and pre-flattening came close and unsatisfactory also. However; flattened feet were (3.9%) for AQU students and (2.1%) for PTUK students and the result was in favor of students at PTUK.

Table (7) shows the comparison between students at AQU and PTUK according to the degree of curvature in the left foot in arches of left foot from a standing position:

Table (7) shows that AQU students show normal curvature in left foot when in a standing position (28.2%), followed by a high-arching (24.3%), then pre-flattening curvature by rate of (21.4%), then slightly higher rate curvature (15.5%), and finally flattened feet by (10.7%).

In contrast PTUK students have a normal curvature in the left feet in standing position (43.8%), followed by a high-arching slightly higher rate at 18.8%, and pre- flattening the same percentage (18.8%) and foot flattening by (14.6%), and finally the female arched foot (4.2%).

Researchers believe that the results of comparison between students of AQU and PTUK in the left feet from standing position were unsatisfactory. Students with normal arches at AQU were at (28.2%) and female students at PTUK were at (43.8%) which is in favor of female students at PTUK .The same applies to high arches with a percentage for the same foot and the situation for AQU students (24.3%) and for PTUK by (4.2%) and in favor of PTUK.As for pre-high arches and pre-flattening were close and unsatisfactory for AQU and PTUK. However; flattened foot results were: (10.7%) for AQU students and (14.6%) for students of PTUK in favor of AQU students.

There were no statistically significant differences at the level of significance ( $0.05 \geq \alpha$ ) in a degree difference of curvature of the right and left feet in both sitting and standing positions among Students attributed to institution type.

Table (8): results of (t) test for the differences in difference of degree of curvature for the right and left foot arches attributed to the institution variable.

Domain	University	Number	Mean	Standard deviation	Freedom degree	Calculate value	Statistical significance
Right foot sitting	AQU	١٠٣	38.42	12.71	١٤٩	٠,٤٨	٠,٦٣٢
	PTUK	٤٨	37.29	14.91			
Right foot standing	AQU	١٠٣	46.14	14.25	١٤٩	-١,٤٥٩	٠,١٤٧
	PTUK	٤٨	49.69	13.18			
Left foot sitting	AQU	١٠٣	36.58	15.03	١٤٩	٠,٢٧٢	٠,٧٨٦
	PTUK	٤٨	35.91	11.83			
Left foot standing	AQU	١٠٣	44.71	15.88	١٤٩	-1.900	٠,٠٥٩
	PTUK	٤٨	49.78	13.81			

Table (8) shows the presence of statistically significant differences at the level of significance ( $0.05 \geq \alpha$ ) in difference of degree of right and left feet curvatures from both sitting and standing positions attributed to the university, where the statistical significance was ( $\leq 0.05$ ).

The differences were in the left feet for university students at a standing position and in favor of AQU students where their feet with a normal curvature by (44.71%) compared to female students at PTUK by (49.78%) which is very close to the level of pre-flattening.

Researchers believe that the difference in left foot degree of curvature of the arches indicates the nature of a man's posture, and due to the fact that culturally students in Palestinian society used to rely on the right side as we see that the anthropometric measurements differ greatly between the right and left side.

There were no statistically significant differences at the level of significance ( $0.05 \geq \alpha$ ) in a difference of degree of curvature of right and left feet arches from sitting position of AQU students and female students at PTUK attributed to the university.

Domain	University	Number	Mean	Standard deviation	Freedom degree	Calculate value	Statistical significance
Right foot sitting	AQU	١٠٣	38.42	12.71	١٤٩	٠,٤٨	٠,٦٣٢
	PTUK	٤٨	37.29	14.91			
Right foot standing	AQU	١٠٣	46.14	14.25	١٤٩	-١,٤٥٩	٠,١٤٧
	PTUK	٤٨	49.69	13.18			
Left foot sitting	AQU	١٠٣	36.58	15.03	١٤٩	٠,٢٧٢	٠,٧٨٦
	PTUK	٤٨	35.91	11.83			
Left foot standing	AQU	١٠٣	44.71	15.88	١٤٩	-1.900	٠,٠٥٩
	PTUK	٤٨	49.78	13.81			

Table (9): results of (t) test for differences in the difference of degree of curvature of the right foot and left foot in sit and stand situations for students at Physical Education Department and students of PTUK for Girls attributed to the university.

Field	University	Number	Mean	Standard deviation	Freedom degrees	(T) Calculated value	Statistical significance
Right foot sitting	AQU	44	36.85	14.64	٩٠	٠,١٤٤-	٠,٨٨٦
	PTUK	48	37.29	14.91			
Right foot standing	AQU	44	47.26	16.58	٩٠	٠,٧٨٣-	٠,٣٤٦
	PTUK	48	49.69	13.18			
left foot sitting	AQU	44	36.33	17.57	٩٠	٠,١٣٢	٠,٨٩٥
	PTUK	48	35.91	11.83			
left foot standing	AQU	44	45	20.5	٩٠	١,٣-	٠,١٩٨
	PTUK	48	49.78	13.81			

Table (9) shows a lack of statistically significant differences at the level of significance ( $0.05 \geq \alpha$ ) in difference degree of right and left feet arches in sitting and standing positions for students of Physical Education Departments of AQU and PTUK attributed to the university type, where the statistical significance was ( $< 0.05$ ), a non-statistically significant, and thus the null hypothesis is accepted.

Researchers believe that the similarities or conformity in the surrounding environment of AQU students and of PTUK female students in terms of floors of stadiums, practical lectures,

shoes worn are to a large extent identical as well as the results of the study showed that the weights and lengths of female students are very similar. Researchers attribute the reason in convergence of body and shape which should be the attributes of female students enrolled in Physical Education program.

There were no statistically significant differences at the level of significance ( $0.05 \geq \alpha$ ) in a different degree of curvature of right and left feet arches from of sitting and standing positions for students at AQU students and PTUK female students due to gender.

Table (10): results of (t) test shows differences in the degree of curvature of right and left feet in sitting and standing positions for AQU students and PTUK female students due to gender variable.

Domain	Gender	Number	Means	Standard deviation	Freedom degrees	(T) Calculated value	Statistical significance
Right foot sitting	Male	08	39.4	11.04	149	0,967	0,230
	Female	93	37.23	14.69			
Right foot standing	Male	08	45.08	12.29	149	1,026-	0,129
	Female	93	48.63	14.82			
Right foot sitting	Male	08	37.07	12.89	149	0,481	0,732
	Female	93	35.93	14.79			
Right foot standing	Male	08	44.69	11.47	149	1,027-	0,306
	female	93	47.34	17.37			

Table (10) shows the absence of statistically significant differences at the level of significance ( $0.05 \geq \alpha$ ) in a different degree of curvature of right and left feet arches in sitting and standing positions for AQU and PTUK students due to gender variable, where the statistical significance is  $> 0.05$  thus the null hypothesis is accepted.

The results of table 10 shows that students feet arches at AQU and PTUK of both postural sitting and standing was not statistically significant depending on the sex variable. The researchers does attribute this to physical ability, structural, morphological and interoperability between

the sexes. Males have sizes and weights commensurate with the force of muscle, stiffness and bone, as well as their feet arches. However; for females, the situation is relative as males completely, females enjoy weights, and sizes adapted to them and suited their feet arches.

There is no statistically significant relationship at the significance level ( $0.05 \geq \alpha$ ) between weight of males and females Physical Education students at AQU and PTUK students in the degree of curvature of right and the left feet at sitting and standing positions.

Table (11): Pearson correlation coefficient for the relationship between student's weight in both institutions and the degree of curvature of right and left feet arches as a function of sitting and standing position.

Variables	Number	R Value	Statistical significance
Right foot sitting	151	0.088	0.283
Right foot standing	151	-0.032	0.695
left foot sitting	151	0.082	0.314
left foot standing	151	-0.04	0.623

Table (11) shows that there is no statistically significant relationship at the significance level ( $0.05 \geq \alpha$ ) between the weight of AQU and PTUK students in the degree of curvature of right and left feet arches from sitting and standing positions,

The researchers believe that results are conclusive and confirm that there is no relationship between human body weight and the flatness of the feet, this correlates with (Daneshmandi, 2009) results where they Classified footprint based on the Denis method, and concluded that no significant relationship between obesity and flatfoot. Whereas (Ali 2013) found a statically significant relationship between body fat tissue composition and arches angles. Moreover, researchers believe that human feet and arches grow in balance and appropriateness with the physical mass they carry. The thickness of the bones, strength and ligament of the foot grows with the muscles covered such as the legs, thighs, pelvis as well as the upper torso, organs and even the head.

## Conclusions:

The current study concluded that Physical Education students at AQU and PTUK suffer from a noticeable rise in feet arches in sitting and standing positions. There is a difference in the degree of curvature of right and left feet arches for the same male student or female student in both sitting and standing positions.

Moreover, the left foot has more flexibility than the right foot due to the dominance feature as the majority of students use the right foot as a preferred foot which gives its muscle strength and durability in the ligaments.

There are variations on foot arches between setting and standing positions regarding student's weights or institution type.

## Recommendations:

**Conducting** a footprint test for all new students enrolled in physical education departments and not relying on the naked eye to make decisions.

**Wear** proper footwear appropriate for activities and floors where each field has its suitable shoes.

**Conduct** a larger study to measure feet arches utilizing footprints and radiography of physical education students' at all Palestinian universities.

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