

## KNEE ALIGNMENT IN ADOLESCENT FOOTBALL TRAINEES

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<b>Article Info</b>	Abstract
<b>Article History:</b> <b>Submitted:</b> 06-07-2022 <b>Revised:</b> 07-07-2022 <b>Accepted:</b> 10-07-2022	Genu varum and valgum can trigger for osteoarthritis and happened between 16-18 years old. The study aimed to find out the relationship between knee joint alignment and foot ballers activities. This was a cross-sectional study, with 64 participants from two groups and only participants whom were meet all inclusion criteria were joined. It showed the knee joint angle in comparison to the norm was very significant with p- value 0.000 and there was a connection to practicing football against knee joint alignment, more specifically varum. In conclusion, there is a significant relationship between practicing football and the knee joint as measured by degree of genu varum as differences were found in year and duration of training.
<b>Keywords:</b> knee, alignment, adolescent, football	
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## Introduction

Based on the results of a survey from the International Football Association (FIFA) Federation in 2012, about 7 million Indonesians actively playing football. At the age of 16 years is the age of cessation of bone growth in men, while 18-year-old male football players have a very significant genu varum level if compared to the control group (Asadi et al., 2015). To say that football players have a great chance to experience misaligned knee joint and further injury, has become concern. In addition, it is widely known that in general football players experience genu varum, even when the German national (1990) athletes experienced genu varum. This study stated that incidents of genu varum are pronounced to be found in those who are football players rather than teenage control groups (teenagers who do not practice football).

Genu Varum is one of the coronal plane deformities of the knee. Misalignment on the lower extremity, especially the knee joint will have an impact to its stability and creating pain (Severino NR et al., 1998) Genu varum is the most common deformity and case handled by orthopedic surgeons (Gautam et al., 2013).

Genu varum can be identified through femoral condyles measurement. Measurements can be done with or without using X-rays, the knee and thighs are extended, hip in maximal adduction, then the distance between the femoral condyle of both legs will be measured. Genu varum will be classified into 4 levels based on its severity based on femoral condyles gap, the farther the distance from the more severe the genu varum experienced by a person.

Several studies on pathomechanics that could cause genu varum have been carried out. The compressive and tensile forces in the knee joint caused by regular exercise in adolescence May lead to occurrence of the deformity (Chantraine, 1985).

Practicing and kicking and especially the technique of ball dribbling on the foot may result to strengthening and shortening of the adduction muscle and would cause genu varum however, the mechanisms and negative effects are not yet clear and need to be studied further (Willson et al., 2010).

Compressive force and tensile forces are one of the unknown intrinsic and extrinsic factors which in the long run can cause deformities to athletes' body and some are susceptible to injuries that are not noticed by the athletes. This phenomenon is called "poor adaptation syndrome", this is an important subject to be acknowledged (Hreljac, 2004).

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## Methods

### A. Participants and Participants Size

The population of this study was boys aged 16-18 years in the Widuri Family High School in South Jakarta and boys aged 16-18 at the SPARTA Cinere Football School, Depok.

The participants are part of the population of the research object that was studied and considered to represent the entire population. Sampling is done based on purposive sampling. The participants are those who meet the inclusion criteria. There are 64 numbers of Respondents which was divided into two groups (Football group and non-football group), teenagers that were included were those who have the following criteria. The inclusion criteria of the football group as follows: Male, age 16- 18 years old, practice football >3hour/week, at least 1 year of football practice. The inclusion of the non-football group as follows: Male, age 16-18 years old, not practice football. The exclusion for both groups is the same which is having a history of knee joint disease that can affect angulation and femoral condyles distance of knee joints such as Rickets, Blount's disease. (Majewski et al., 2006)

### B. Instrument

Using questionnaire served as a tool to find out the data needed by researchers in the form of questions that asked to respondents. Including age, how long they have been trained football, how long the duration of training football in a week, and do they train the other weight-bearing sport such as: running, marathon, basketball, volleyball, martial arts and, badminton.

Measuring tape served as a measuring device for length or distance. In this study, the measuring tape used as an instrument to measure the femoral condyles distance to determine the angulation of knee joint in a coronal plane (Astur et al., n.d.; BESIER et al., 2001; Gautam et al., 2013; Thaller et al., 2018).

### C. Procedures

Respondents divided into two groups (Football group and non-football group). The femoral condyles distance measured while the respondent stands with the maximum extension of knee and hip and maximum adduction of the hip. genu varum identified if there is a distance between both leg on the medial part of the tibio-femoral joint.

Duration of practicing football on football

group divided into two categories as follows: <6hour/week and >6hour/week. The experience of practicing football on football group divided into two categories as follows: 1-4 years and >4 years of practicing football

#### D. Data Analysis

Training football affecting in femoral condyles distance was tested analytically to find the association between the training soccer with femoral condyles distance. It tested using independent t-test with 95% confidence interval. A P value of  $\leq 0.05$  considered as statistically significant association with football training. The compared mean of femoral condyles distance between two groups was applied will be tested by independent t-test. A P value of  $\leq 0.05$  considered as statistically significant. Chi Square were also applied to find the association and risk value between football training and femoral condyles distance.

## Results

#### A. Descriptive Analysis

From table 1, obtained the characteristics of participants from both groups displaying the age, weight, height, and body mass index. From these data, it is known that the average age of football groups is 16.59 years, and the non- football group has an average of 16.97 years. The average value of the football participant' height is 166.13 Cm while the non- football group is 164.78 Cm. The average value of the football group bodyweight is 59.25 Kg while for the non-football group the average body weight is 64.66 Kg. for the average value of the football body mass index of 21.39 Kg / m<sup>2</sup> greater than the body mass index of the non- football group which has a value of 23.66 Kg / m<sup>2</sup>.

Table 1. Participants' Characteristics

Variable	Subjects (football groups)	Subjects (Non-football groups)
Age, year		
16	17 (53.1%)	12 (37.5%)
17	11 (34.4%)	9 (28.1%)
18	4 (12.5%)	11(34.3%)
Bodyweight	59.25	64.66
Height	166.13	164.78
Body Mass Index	21.397	23.66

Data are presented number (%) or mean

#### B. The difference in Football and Non-Football

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#### Groups Against Femoral Condyle Distance of Genu Varum Knee Joints

From the statistical tests' result showed in the table 2. p-value = 0,000 (p-value 0,000 <0.05) is obtained, indicating a significant statistical test. in conclusion, that there is a significant difference of genu varum femoral condyles distance at the knee joint between the football group and the non- football group. From the statistical test's results showed in table 3 p-value = 0,000 (p-value 0,000 <0.05) is obtained, it shows significant results of statistical test, meaning that there is a significant relationship between football group and non- football group in terms of the condition of knee joint genu varum.

From the results of a statistical test in the table 3, it is indicated that the odds ratio is 9,000, which mean that practicing football could be at 9 times risk of causing a genu varum in the knee joint if compared to those who are not practicing football.

Table 2. Table of Difference in Football and Non-Football Groups Against Femoral Condyle Distance of Genu Varum Knee Joints

Groups	Frequen c. (n)	FCG (mean)	Std. Deviation	P-value
Football Groups	32 (50%)	3,00	1,849	0,000
Non-Football Groups	32 (50%)	0,75	1,344	

Table 3. Table of Relationships Practicing Football Against the Conditions of Genu Varum

Group	Genu Varum	Not Genu Varum	Odds Ratio	P-Value
Football Group	84,4%	15,6%		
Non-Football Group	37,5%	62,5%	9,000	0,000

#### C. Table of Differences in the Distance of Femoral condyles Genu Varum to the experience, duration of Football Practice, and practicing other weight-bearing sports

From statistical tests showed in table 4, p-value = 0.003 (p- value 0.003<0.05) is obtained in which

showing its significance. In conclusion, there is a significant difference between the length of football practice to the genu varum femoral condyles distance. The statistical tests result showed in table 4, obtained  $p$ -value = 0,000 ( $p$ -value  $0,000 < 0.05$ ), showing a significant, difference between the duration of football practice with genu varum Femoral condyles distance at the knee joint.

The statistical tests showed in table 4, obtained  $p$ -value 0,386 ( $p$ -value  $0,386 > 0.05$ ), showing not significant, the difference between following other weight-bearing sports practice with genu varum Femoral condyles distance at the knee joint. are not significant.

Table 4. Table of Differences in the Distance of Femoral condyles Genu Varum to the experience, duration of Football Practice, and practicing other weight bearing sports.

	Frequency (n)	FCG (mean)	Std. Deviation	P- value
<b>Experience of football practice</b>				
<b>&gt;4 Year</b>	11 (65.6%)	4,27	1,272	0,003
<b>1-4 Year</b>	21 (34.4%)	2,33	1,770	
<b>Duration of Football Practice</b>				
<b>&lt;6 Hour/Week</b>	15 (46.9%)	1,60	1,454	0,000
<b>&gt;6 Hour/Week</b>	17 (53.1%)	4,24	1,147	
<b>Practicing Other Weight Bearing Sports</b>				
<b>Yes</b>	24 (75%)	3,17	1,880	0,386
<b>No</b>	8 (25%)	2,50	1,773	

## Discussion

Bivariate data analysis was performed to see frequency distribution based on football groups and non- football groups. There are 32 Respondents for each group. In this study, the statistical test of femoral condyles gap differences in football group and non-football groups was  $p = 0,000$ . Thus, one could conclude that there were significant differences

between femoral condyles gap and football practice. Chi-square test was conducted to see the relationship between practicing football and the genu varum condition with  $p$ -value = 0,000 and odds ratio = 9,000, it can be concluded that there is a significant relationship between practicing football against the condition of genu varum at the knee joint, practicing football also risking the football group to experience genu varum as much as 9 times. According to (Thaller et al., 2018), training football intensively at the age of children and adolescents has a significant influence on the distance of femoral condyles knee joint.

In bivariate results, it was concluded that the results of this study are in line with the hypothesis of this study. The results of this study are supported by (Asadi et al., 2015) who examined the differences in practicing intensive football with genu varum Femoral condyles distance of the knee joint. In his research stated that there were significant femoral condyles gap differences in football groups and non- football groups. (Asadi et al., 2015; Willson et al., 2010) states that the percentage of high genu varum is found in young people in the age of 16-18 years.

In this study showed that respondents who have practiced more than 4 years have wider femoral condyles distance compare to respondents who have practice 1-4 years. This is in line with the research which was conducted by (Asadi et al., 2015)

Based on the duration of football practice in a week for football groups on femoral condyles distance by grouping them into two categories. The first category is respondents who practice less than 6 hours/week, the second category is respondents who practice more than 6 hours/week. The highest number is shown in a group with respondents who practice football with the duration of training for more than 6 hours/week. This is in line with the research conducted by (Asadi et al., 2015; Brouwer et al., 2007). In this research, it was revealed that there was a significant relationship between the duration of football practice with femoral condyles distance.

Based on performing other load-bearing sports, such as running, marathon, martial arts, volleyball, basketball, and badminton on femoral condyles distance was done by grouping the football group into two categories. (Witvrouw et al., n.d.). The first category is respondents who practice other load-bearing sports, the second is respondents who do not practice any other load-bearing sports. The data shows the highest number on respondents who practice other load-bearing sports.

In this study the  $p$ -value = 0.386 for the

relationship between performing another load bearing sport against the femoral condyles distance. Thus, it was concluded that there was no significant difference between the practicing other weight bearing sports with femoral condyles distance. However, the average distance value shows that respondents who follow other load-bearing sports still show a greater value even though the results are not significant.

## Conclusion and Recommendation

This study investigated the football group has a larger femoral condyles gap compared to the non-football group and has a significant relationship in practicing football against genu varum in younger aged between 16-18 years. (Asadi et al., 2015; Thaller et al., 2018). There are significant femoral condyles distance differences in the experience of football practice within football groups. The respondents who have been practicing football for more than 4 years showed a greater average femoral condyles gap score of 4.27 compared to respondents who practiced for 1-4 years (2.33). In addition, the respondents who practice football > 6 hours/week significantly show a greater average femoral condyles gap score of 4.24 compared to respondents who practice football <6 hours/week.

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