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Body Composition, Functionality, and Injuries in Football among Amateur Male University Players in Central Thailand

Hamengamon Kharsynniang[1]*
Asia Pacific International University[1], Thailand
***Corresponding Author: hamengamon@apiu.edu**

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Abstract
Aim/Purpose: This study examined Body Composition, level of Functionality, and Injury at a university in Central Thailand. It aimed to investigate the relationships among these variables within the context of non-athletic amateur football players in the selected geographical area, taking into account their relevant demographic characteristics.

Introduction/Background: Football is one of the most popular team sports, and many students, faculty, and staff are actively involved in it at the selected university in Central Thailand. A lack of comprehensive data exists on Body Composition and Injury risk among Thai university football players, particularly in comparison to professional athletes. Evaluating Injury becomes relevant to a relatively large population in the specific sport. The relationship between body composition and injuries among football players has been a topic of considerable research interest, particularly given the sport's physical demands. It has been found that body composition is linked to the likelihood of injury, with athletes having higher body fat percentages being more prone to injuries. Another variable of interest in this study was the level of Functionality, which is closely linked to body composition.

Methodology: A quantitative approach was employed, utilizing stratified random sampling for sample selection. This study had 113 respondents who were amateur male football players from the selected university. The data collected included general characteristics of the players, such as body composition, injury rates, and the level of functionality. Key leaders, including team captains and research assistants, administered the questionnaire to the players. Body composition was measured using the KARADA Scan Omron HBF-375, while injury and functionality were assessed via standardized questionnaires. Data were collected between April and June 2025. The statistical analysis included descriptive statistics, the Mann-Whitney comparative analysis test, the Chi-Square test, and the Kruskal-Wallis test. Jamovi Statistical Software Version 2.3.28.0 was used.

Findings: Among participants, 51% reported at least one injury during the season, with 55% of injuries occurring below the knee, and most resulting from contact mechanisms. The average body composition metrics were a Body Mass Index (BMI) of 22.98, body fat of 16.59%, and a Body Age of 28.95 years. The data showed no statistical significance (p-value > .05) between Body Composition, level of Functionality, and Injury groups. Mann-Whitney tests revealed no significant differences in Level of Functionality, BMI, Body Fat, and Body Age between Injury Groups (p-value > .05). Chi-square tests showed no association between Injury Groups and BMI across four levels (p-value > .05). Kruskal-Wallis tests revealed that there was no significance between Body Composition and Injury Groups. Although most variables did not show significant relationships, body fat demonstrated a statistically significant association with playing position (p = .003), and BMI was significantly related to the level of functionality (p = .037). The substantial correlation observed between body fat percentage and playing position implies that different positions within the team may necessitate varying body fat levels for optimal performance. The significance of this correlation between Body Mass Index and functionality suggests that as an individual's functional capacity changes, so does their BMI.

Contributions/Impact on Society: This study contributes to understanding injuries among amateur football players in non-athletic settings. The findings provided evidence that contrasted with studies linking body composition to injuries, indicating that other factors may also influence outcomes among the selected player profiles. This presented a need to investigate amateur football as a unique context with various factors that could impact Injury. It also highlights the need to enhance player awareness of training, screening, and holistic health education for student athletes in university settings. The findings of the study can be used as informative material to strengthen proposed awareness. In particular, these insights may guide coaches, health educators, and university sports administrators in developing evidence-based programs that promote injury prevention and overall athlete well-being.

Recommendations: Key recommendations can be drawn from the results of this study. First, amateur football is a unique context, and results may vary depending on the context. The ideal way to investigate them in any context would require pilot testing. Second, football organizers can establish a medical record system to document injuries (e.g., type of Injury, mechanism of injury, loss of playing days). Finally, players can reduce their risk of injury through proper pre-season training, screening, and holistic health education.

Research Limitations: Several limitations in this study are acknowledged. First, the study relied on self-reported injury data, which may be subject to recall bias. Recall bias can threaten a study's internal validity, potentially leading to erroneous conclusions about associations between variables. Second, the sample size may have been insufficient to detect meaningful effects.

Future Research: Future research could employ larger, more diverse samples (e.g., female, older populations) and objective measures of injury (e.g., medical records) to enhance validity. Additionally, exploring interactions between body composition and other variables (e.g., fitness level, previous injury history, individual player characteristics, and environmental conditions) may provide deeper insights into injury risk factors in amateur football.

Keywords: *Body composition, injury, functionality, amateur male football players*

Introduction

Studies have shown that body composition significantly affects football players' physical performance. For example, higher body fat percentages have been linked to lower levels of physical fitness, especially in younger players 12–14 years old (Nikolaïdis, 2012). These studies demonstrate that body composition has a significant impact on the athletic performance of football (soccer) players. For example, thinner players typically show superior performance indicators, which are essential in football and include sprinting speed and agility (Romann & Fuchslocher, 2011). Body composition, encompassing the proportions of fat mass, muscle mass, bone mass, and water in the body, is a critical determinant of athletic performance and injury risk, particularly in physically demanding sports like amateur football. Football's intense physical requirements, characterized by high-impact collisions, rapid acceleration and deceleration, and sustained exertion, place immense stress on the musculoskeletal system, making players vulnerable to various injuries (Vasileiadis, 2020). The interplay between body composition and injury risk involves biomechanical, physiological, and metabolic mechanisms. A well-optimized body composition can enhance power output, agility, and endurance, while conversely, imbalances in body composition can compromise these attributes and increase the likelihood of injury (Collins et al., 2020). Anthropometric and physical performance measures are crucial in understanding injury risk among young football players (Caswell et al., 2016).

It is frequently observed that forwards are slimmer than goalkeepers, defenders, and midfielders, indicating that ideal body composition profiles may be determined by positional demands (Romann & Fuchslocher, 2011). Moreover, the position of players on the field can also influence the relationship between Body Mass Index (BMI) and injury incidence. Research has shown that players in positions requiring more physical contact are more susceptible to injuries when they have elevated BMIs. For example, Finstein et al. (2015) noted that tricep tendon ruptures, which are more prevalent among players with higher BMIs, often occur during defending, highlighting the role of body mass in injury mechanisms (Finstein et al., 2015). Similarly, Brophy et al. (2021) found that players with elevated BMIs were more likely to sustain Anterior Cruciate Ligament (ACL) injuries through direct contact, further emphasizing the interaction between body mass and injury mechanisms in football (Brophy et al., 2021).

Functionality in the context of amateur football refers to the ability of players to perform the specific movements and tasks required by the sport efficiently and effectively without undue risk of injury. It involves everyday tasks and activities, considering physiological, psychological, and mechanical adaptation (Pérez-Gómez et al., 2022). Functionality is closely linked to body composition, as the distribution and amount of muscle mass, fat mass, and other tissue types can significantly impact movement mechanics, joint stability, and overall physical capacity.

Ample evidence links body composition to the likelihood of injuries. According to studies, athletes with higher body fat percentages may be more prone to injuries, especially those involving the lower extremities, such as ACL tears (Brophy et al., 2010). Injury frequency has also been connected to asymmetry in body composition, namely, in muscular strength between limbs. Gribble et al. (2015) reported that BMI significantly influenced ankle function, suggesting that higher body mass could impair proprioceptive capabilities and balance, thereby increasing the likelihood of injuries such as lateral ankle sprains, particularly in football, where rapid directional changes and high-impact collisions are commonplace. Additionally, Jespersen et al. (2014) conducted a longitudinal study that demonstrated a relationship between total body fat percentage and lower extremity injuries, indicating that adiposity, as measured by BMI, is a predictive factor for injury risk in young athletes. This finding is crucial as it suggests that interventions to manage body composition could mitigate injury risks.

The prevalence of specific injuries also varies with BMI. A study by Yard and Comstock (2011) revealed that among high school athletes, obese football players had a higher incidence of knee injuries, with injuries more likely to result from contact. This finding aligns with the broader understanding that increased body mass can lead to greater mechanical stress on joints, particularly during high-impact activities like football. Furthermore, the relationship between BMI and injury risk extends beyond acute injuries to encompass chronic conditions, such as osteoarthritis, which can develop due to repeated stress on joints over time (Smith et al., 2017).

Conceptual Framework

The variables in this study were Body Composition, Functionality, and Injuries. The independent variable was Body Composition, the mediating variable was Injuries, and the dependent variable was Functionality. The diagram in Figure 1 below illustrates the relationship. It was proposed that there is a direct relationship between Body Composition and Injury, which creates an indirect relationship between Body Composition and Functionality.

Figure 1 *Conceptual Framework*

To support the proposed conceptual framework, the biomechanical perspective and intrinsic risk factor model are stated as follows. From a biomechanical perspective, the distribution of mechanical stresses and forces on the musculoskeletal system is influenced by body composition. Higher fat mass, for instance, raises mechanical stress, which may result in increased fatigue, decreased stability, and more pressure on muscles and joints, all of which increase the risk of injury (Domaradzki, 2024). According to the intrinsic risk factor model, a person's body size, muscle mass, and fat distribution are important biological traits that influence their risk of injury (Domaradzki & Koźlenia, 2022).

Research Problem

Football, being the most widely played sport globally, inherently carries a significant risk of injuries among its participants (Pérez-Gómez et al., 2022). This applies to both professional and amateur players, with injuries leading to substantial time loss from play and considerable socioeconomic burdens (Pérez-Gómez et al., 2022; Asgari et al., 2022). Various factors contribute to injury. This study aimed to investigate the relationship between body composition, injury, and functionality. There is a limited understanding of how body composition directly affects the occurrence of injuries and how such injuries subsequently influence functionality among amateur male university football players, particularly regarding the location and mechanism of lower extremity injuries.

Research Objectives

1. To study the rate of Injuries (location and mechanism) among amateur university football players.
2. To study the levels of Body Composition (BMI, body age, and body fat) among amateur football players.
3. To study the association and variance between Body Composition, Functionality, and the incidence of football Injuries.

Hypothesis

There were two sets of hypotheses in this study; the null (H_0) and alternative (H_1) hypotheses for each set are presented below.

Injury Proneness and Body Composition

H_0: There is no significant difference in injury proneness between amateur football players with higher body composition and those with lower body composition.

H_1: Amateur football players with higher body composition are more prone to injuries than players with lower body composition.

Functionality Limitations and Body Composition

H_0: There is no significant association between body composition and the severity of functionality limitations in amateur football players.

H_1: Amateur football players with higher body composition have more severe functionality limitations than those with lower body composition.

Methodology

Population and Sample

The population consisted of students, faculty, and staff who play amateur football at a selected university in central Thailand. The league had eight teams participating; however, one team was excluded because they were a high school team. There were approximately 18 to 26 players registered for each team. The total population for the study consisted of 159 individuals; stratified random sampling was employed. A sample size of 113 was calculated from the population of 159 using the SurveyMonkey sample size calculator with a 95% confidence level and a 5% margin of error. A cross-sectional study design was used, considering the feasibility and practicality of the population being studied. Amateur male university football players have limited and irregular participation (one amateur football league for the academic year 2024-25), often tied to academic schedules and other extracurricular activities.

Research Instruments

A digital body composition monitor, the KARADA Scan Omron Model HBF 375 machine, was used to measure participants' BMI, body fat, and body age. Items from the Questionnaire of Recording Injuries in Soccer for a Season (European Union, n.d.), and the Lower Extremity Functional Scale

(Binkley et al., 1999) were used for collecting injury and functionality data. Demographic profile questions were added to the questionnaire to facilitate various descriptive analyses.

Data Collection

The KARADA Scan was administered by skilled personnel to each player participant. Data collected using the KARADA Scan and the survey questionnaire were recorded in an Excel worksheet and a Word file. Key leaders, such as team captains and research assistants, helped distribute and collect questionnaires from the players. The Injury and Functionality data were described retrospectively in the questionnaire mentioned above, and the body composition was collected prospectively. Data collection was completed between April and June 2025.

Data Analysis

Data were analyzed using Jamovi Statistical Software Version 2.3.28.0. Descriptive statistics and comparative analysis using the Mann-Whitney test were employed to compare the means of body composition metrics between the injured and non-injured groups. A Chi-Square test for associations and a Kruskal-Wallis test (Analysis of Variance) were used to compare body composition metrics across multiple groups.

Results and Findings

Demographic Profile of Respondents

Table 1 shows that most players (65%) were aged 20–24, indicating a relatively young participant group.

Table 1 *General Characteristics of the Players*

Variables	Number	Percentage
Age		
15-19	10	9%
20-24	73	65%
25-29	28	25%
30 & above	2	1%
Faculty		
English as a Second Language	6	5%
Faculty of Arts and Humanities	18	16%
Faculty of Business Administration	13	12%
Faculty of Education	19	17%
Faculty of Information Technology	24	21%
Faculty of Nursing	6	5%
Faculty of Religious Studies	15	5%
Faculty of Science	10	9%
Not Available	2	2%
Players Position		
Goalkeeper	11	10%
Defender	43	39%
Midfielder	31	28%
Forward	24	23%
Years of Playing		
1–5	39	36%
6–10	45	42%
11–15	14	13%
16–20	9	8%
21–25	1	1%

The Faculty of Information Technology (FIT) had the highest representation (21%), followed by the Faculty of Education (FOE) (17%), and the Faculty of Arts and Humanities (FAH) (16%). Defenders made up the largest group (39%), followed by Midfielders (28%) and Forwards (23%). Goalkeepers were the least common (10%), which is typical given team composition in football. Most players had 6–10 years (42%) or 1–5 years (36%) of playing experience, indicating a generally experienced group.

Injury Status

Table 2 shows that nearly half of the players (51%) reported being injured, indicating a relatively high injury rate.

Table 2 *Injury Status*

Injury Groups	Number	Percentage
Injured	58	51%
Uninjured	55	49%

Figure 2 shows that most injuries occurred below the knee (55%), common in sports involving running and sudden movements. Figure 3 shows that the most frequent causes were contact n = (30%) and sprinting (23%), while non-contact injuries were rare (3%). A significant portion (30%) was marked as "Not Applicable," likely referring to uninjured players.

Figure 2 *Location of Injury*

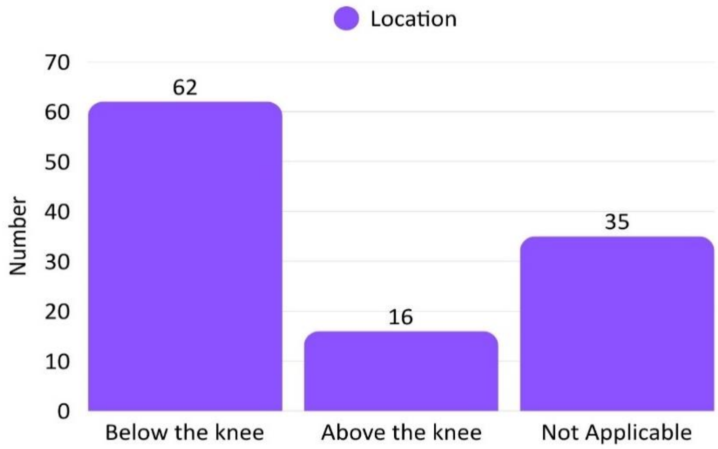
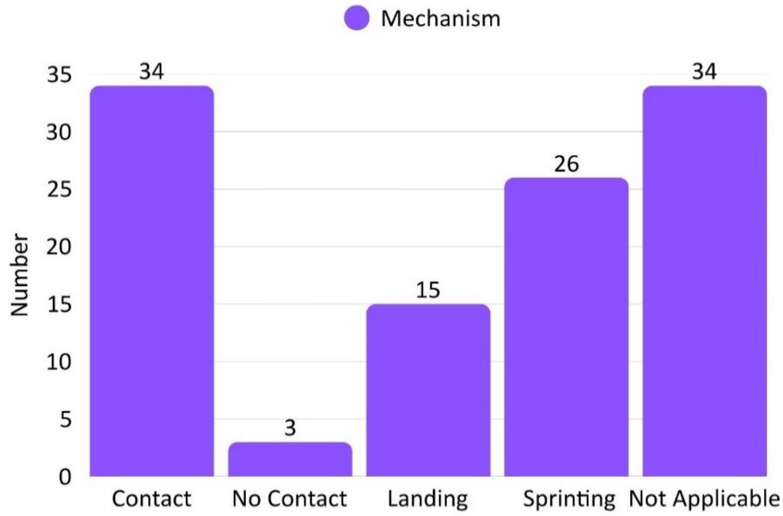


Figure 3 *Mechanism of Injury*



Levels of Body Composition and Functionality

Table 3 shows the description of body composition and functionality among the players. The average BMI was 22.98, which falls within the normal weight range of 18.5–24.9 (World Health Organization, 2010). The mean body fat percentage was 16.59%, which falls in the fair category of 14.9-18.6 (Villines, 2025), which may indicate a need for health awareness or lifestyle changes. The average body age was 28.95, close to the median of 28, suggesting a relatively symmetric distribution. The Standard Deviation (SD) of 9.59 showed considerable variation, with some individuals having body ages much younger or older than their actual ages. The **mean (64.64)** and **median (67)** of functionality both fell within the minimal to no limitation range, suggesting that most individuals in the sample were functioning well.

Table 3 *Body Composition and Functionality*

	N	Missing	Mean	Median	*SD*	Minimum	Maximum
BMI	113	0	22.98	22.70	3.43	15.90	37.20
Body Fat	109	4	16.59	16.50	5.65	5.00	33.20
Body Age	109	4	28.95	28.00	9.59	12.00	57.00
Functionality	113	0	64.64	67.00	14.56	9.00	80.00

Normality Shapiro-Wilk Test

The results showed that normality of data could not be assumed, as $p < .05$ on the Shapiro-Wilk test. Therefore, the following non-parametric tests were conducted.

Mann-Whitney Comparative Analysis

A Mann-Whitney *t*-test revealed no significant differences in the Level of Functionality, BMI, Body Fat, and Body Age between Injury Groups, as seen in Table 4.

Table 4 *Comparative Analysis Between Body Composition, Functionality, and Injury Group*

		Statistic	*p*
BMI	Student's *t*	-.72	.471
	Mann-Whitney U	1469.00	.361
Body Fat	Student's *t*	-.21	.831
	Mann-Whitney U	1455.00	.854
Body Age	Student's *t*	-1.61	.111
	Mann-Whitney U	1218.50	.093
Functionality	Student's *t*	.73	.468
	Mann-Whitney U	1504.50	.520

The Rank-Biserial Correlation (r_rb) values (shown in Table 5) close to 0 suggested very small or negligible effects. The wide confidence intervals (spanning nearly −1 to +1) indicated low statistical precision, likely due to small sample sizes or minimal group differences. Body Age shows the largest effect size (r_rb = .237) but still with a wide confidence interval, so caution in interpretation was applied.

Table 5 *Effect Size Summary*

Variable	Rank-Biserial Correlation	95% Confidence Interval
BMI	.080	(−.947, .948)
Body Fat	.088	(−.954, .948)
Body Age	.237	(−.940, .951)
Functionality	.057	(−.952, .945)

Chi-Square Analysis

Chi-square tests were conducted to examine the association between Injury Groups and BMI across four weight levels (Obese, Overweight, Underweight, and Normal Weight). There was no statistically significant association between BMI and Injury Groups, $X^2 = 2.02$, df = 3, $p = .56$, as shown in Table 6. This suggested that BMI distribution did not differ meaningfully across Injury Groups in the sample analyzed.

Table 6 *Association Between Body Mass Index and Injury Groups*

		BMI				
Injury Groups		**Obese**	**Overweight**	**Underweight**	**Normal Weight**	**Total**
Uninjured	Observed	2	9	4	40	55
	% within row	4%	16%	7%	73%	100%
Injured	Observed	1	14	2	41	58
	% within row	2%	24%	3%	71%	100%
Total	Observed	3	23	6	81	113
	% within row	3%	20%	5%	72%	100%

Note. $X^2 = 2.02$, df = 3, $p = .56$

Analysis of Variance (Kruskal-Wallis)

Table 7 shows the variance between BMI, body fat, body Age, and playing position. BMI ($\chi^2 = 7.37$, $p = .061$) suggested that, although not significant, BMI may vary slightly across playing positions. Body Fat ($\chi^2 = 13.89$, $p = .003$) levels clearly differ across positions. Midfielders often have the lowest body fat, possibly due to the high aerobic demands of their position. Goalkeepers may have higher body fat as their role is less endurance-based. Forwards and defenders may fall in between, depending on tactical roles. Body Age ($\chi^2 = 5.60$, $p = .133$) revealed no substantial evidence that body age differed by position.

Table 7 *Kruskal-Wallis Variance between Body Composition and Playing Position*

	χ^2	df	*p*
BMI	7.37	3	.061
Body Fat	13.89	3	.003*
Body Age	5.60	3	.133

Figure 4 shows the distribution of the mean scores of body fat percentage by playing positions. Goalkeepers have the highest mean body fat (21%), likely due to less continuous running and more explosive movements. Defenders follow with 18%, balancing physicality and mobility. Midfielders

(16%) and forwards (14%) had the lowest body fat, reflecting their high aerobic demands and the agility requirements of their positions.

Figure 4 *Body Fat by Playing Positions*

Table 8 shows the variance between BMI, body fat, body Age, and injury groups. Since all *p*-values were greater than .05, the null hypothesis was accepted for all three variables. The analysis revealed no significant differences in BMI, Body Fat, or Body Age between injured and uninjured players, suggesting that these body composition indicators were not strongly associated with injury status. However, Body Age might be a possible area for further exploration due to its borderline *p*-value of .093.

Table 8 *Kruskal-Wallis Variance between Body Composition and Injury Groups*

	χ^2	df	*p*
BMI	.84	1	.359
Body Fat	.03	1	.852
Body Age	2.83	1	.093

Table 9 shows the variance between BMI, body fat, body Age, and level of functionality. Since the *p*-values were greater than .05 for body fat (p = .204) and body age (p = .207), the null hypotheses were accepted. However, the null hypothesis was rejected for the variable BMI (p = .037). BMI appeared to influence the level of functionality among the participants.

Table 9 *Kruskal-Wallis Variance between Body Composition and Functionality*

	χ^2	df	p
BMI	8.51	3	.037*
Body Fat	4.60	3	.204
Body Age	4.56	3	.207

Discussion

A Mann-Whitney *t*-test revealed no significant differences in the Level of Functionality, BMI, Body Fat, and Body Age between Injury Groups. Similar studies have shown that motor function, including strength and stability, does not significantly differ between injured and non-injured players, suggesting that baseline motor function may not be a reliable predictor of injury risk (Sieland et al., 2020).

The Chi-Square test assessed whether there was an association between BMI categories (underweight, normal weight, overweight, and obese) and the injury groups. The non-significant result ($p > .05$) indicated that the BMI category did not significantly influence the likelihood of sustaining an injury among amateur football players. This finding contrasts with previous research suggesting that higher BMI may increase injury risk due to factors such as musculoskeletal conditions (Anandacoomarasamy et al., 2008). However, our results aligned with studies that found no clear link between BMI and injury rates in non-elite athletes (Richmond et al., 2013). Possible explanations for this discrepancy include differences in sample characteristics (e.g., playing intensity) or the fact that amateur players may not experience the same biomechanical demands as professional athletes.

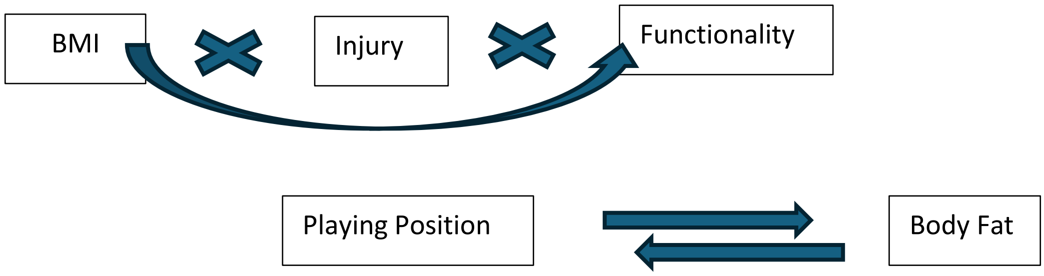
This study did not find a significant relationship between body composition and injury, which may suggest that unique injury factors exist within this amateur context. However, there was a significant difference between the level of functionality and BMI, as well as between body fat and playing position. Identifying a significant relationship between the level of functionality and Body Mass Index suggests that as an individual's functional capacity changes, their BMI also changes (Hammami et al., 2019). This could be indicative of several underlying physiological mechanisms, such as the influence of body weight on agility, speed, or overall physical performance in the sport (Caswell et al., 2016). An exploration into understanding whether the functional capability impacts BMI, or vice versa, could be further investigated. Furthermore, the significant result observed between body fat percentage and playing position implies that different positions within the team may necessitate varying body fat levels for optimal performance. This observation aligns with the understanding that certain positions may require greater bursts of power, while others require more endurance (Hermassi et al., 2020).

Amateur Football Players' Injury

Amateur football, characterized by its broad participation base and varying levels of competition, presents a unique context for examining the factors influencing player injuries and functional capabilities (Vasileiadis, 2020). Studies have shown that various factors can influence lower extremity injuries and functionality in amateur football. Key variables include player posture, training routines, and footwear. Static posture has also been linked to injury risk (Snodgrass et al., 2021). Injuries resulting from running and sprinting highlight the need for tailored training regimens (Vassis et al., 2024). Footwear design, particularly in terms of stud placement and rigid soles, can adversely affect foot function and impair the foot's ability to absorb impact, thereby increasing the risk of injury during dynamic activities (Bruntzel, 2000). Other factors like individual player characteristics and environmental conditions (e.g., Football Field) may also exist. These factors could be explored further in the context of amateur football injuries.

Studies have shown that a higher BMI is associated with an increased risk of lower extremity and ankle injuries, particularly when combined with poor off-season training habits (Brumitt et al., 2020; Manoel et al., 2020). Compared to previous studies, the findings from this study showed that amateur football is a unique context. To gain a clearer understanding, the findings are presented within the conceptual framework shown in Figure 5. This implies that body composition does not directly affect injury, and injury does not affect functionality. However, the variable body composition, as measured by body mass index (BMI), influences functionality. There is also a clear relationship between playing position and body fat. The positions that require less running and movement tend to have higher body fat, while positions with greater physical demands, mobility, and aerobic requirements have lower body fat percentages. This is also reflected in Figure 5.

Figure 5 *Revised Conceptual Framework*



This study highlights the need to enhance player awareness of training, screening, and holistic health education for student athletes. Weight et al. (2016) found in their study that athletes knew more about nutrition, health, injuries, and body awareness than non-athletes. However, both groups still had low overall knowledge. Although non-athletes or amateur players are not as regularly engaged in playing, they are still vulnerable to serious risks that could be prevented. A systematic plan incorporating the suggested variables could mitigate injury risk, improve functionality, and enhance body composition levels among non-athletic amateur male football players in the selected geographical location.

Conclusion and Recommendations

This study examined the association and variance between body composition, functionality, and Injury. The two proposed research hypotheses stated that amateur players with higher body composition are more prone to injuries than players with lower body composition and would have severe functionality limitations. Player Position was added to determine the impact on the variables. This study showed that there were no significant differences in injury proneness between amateur football players with higher body composition and those with lower body composition. However, it was observed that there was a statistically significant association between the level of functionality and BMI, as well as between body fat and playing position. This shows that although BMI did not directly impact injury groups, it did impact the level of functionality. It also revealed that body fat had an impact on playing position. This contrasted with the results of some previous studies, which supported the findings of a relationship between body composition and injury rates. This study shows that amateur football players may be in a unique context that needs further investigation. A key takeaway from the study is the recommendation to develop team training, screening protocols, and holistic health education programs for students who are amateur football athletes.

Limitations and Future Directions

Several limitations should be considered when interpreting this study. First, the study relied on self-reported Injury and functionality data, which may be subject to recall bias. Recall bias can compromise the internal validity of studies, leading to incorrect conclusions about associations between variables (Hassan, 2005). Additionally, the sample size may have been insufficient to draw definitive conclusions. Future research could employ larger, more diverse samples (e.g., females, older populations) and objective measures of Injury (e.g., medical records) to enhance validity. Additionally, exploring interactions between Body Composition and other variables (e.g., fitness level, previous injury history, individual player characteristics, and environmental conditions) may provide deeper insights into injury risk factors in amateur football.

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