



Anthropometric characteristics with fielding skill among softball players

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Abstract

The present investigation is a study that correlates many anthropometric, fitness, and mental health measures with the outcomes of male softball players. The research required collecting information on a variety of topics, including anthropometrics, physical fitness, psychological variables, and softball performance, among others the sport of softball is very popular and is played all around the globe. In the realm of softball, only a very small number of research have been conducted to investigate the many aspects that continue to contribute to good performance. In the sport of softball, there is a dearth of written material, and study and analysis are needed in a number of different areas. The study's primary objective is to analyze the correlation between softball players' anthropometric profiles and physiological characteristics and their throwing performances. It is concluded that the Playing sports was formerly considered a leisure pursuit. Throughout history, sports have been deeply ingrained in many cultures. Sports have evolved into a highly serious profession in recent years.

Keywords: Anthropometric, skill, softball, sports and players

Introduction

The game of softball was first conceived as a more kid-friendly version of baseball. The development of softball was significantly influenced by the evolution of a number of other well-known sports, including sailing, boxing, and football. In addition, there was a rowing club, a boxing gloves club, and a football club engaged in the development of the game that we now know as softball. By grabbing the batter's glove with the handle of a broom, a Harvard fan proved to be a resourceful participant in the game. As a direct result of this, an indoor version of baseball was created. George Hancock, a graduate of Harvard and Yale, was at the Farragut Boat Club in Chicago on that particular day. He tied a boxing glove to produce a large and pliable ball. Players did not require to wear gloves while playing with soft balls, therefore they may do so while competing. On the deck of the yacht club, he started the game by drawing a little baseball field with chalk so that everyone could play. The end result was a score of 41-40. As soon as Hancock was informed of the rules, he made a beeline to the sporting goods store to get a big rubber ball and a bat with a rubber tip. This very intelligent youngster was responsible for drawing permanent foul lines on the floor of the Boat Club. During that particularly severe winter, the sport of baseball played inside saw a surge in popularity in the Chicago region.

Ten players from each team take turns being on the field at any one time during a game of softball, which is played between two teams on a large field. The field will typically include a grass infield and an infield made of dirt or brick dust. The infield will be the part that has the running areas and the quadrilateral form. On the other hand, the field could be made entirely of soil, grass, artificial turf, or even asphalt in some locations, like New York City. The infield of a baseball field consists of the first base line, the second base line, third base line, and home plate. The standard spacing for the bases is 45–65 feet, and they are set out in a square arrangement. The rubber is a little, flat, rectangular piece of rubber that is about a foot and a half long, and it can be found within the pitcher's circle, which is at the center of the square.

In order to get insight into sporting performance, it is crucial to assess not only sport-specific abilities, but also anthropometric and physiological features, since it has been shown that greater levels of physical fitness and vigour on the field lead to better overall results. These morphological and anthropometric measures are excellent indicators of athletes' development and nutrition, both of which are crucial for peak performance. The factors of age, gender, heredity, ethnicity, altitude, socioeconomic position, dietary status, personal cleanliness, and exercise practise are the most important in predicting future sports performance. Accurately assessing these elements displays the measurement of anthropometric parameters of top athletes, which may be particularly essential in linking body shape and performance in sports. Athletes are selected and trained with a focus on their performances and talents, physical measurements and proportions, and exercise physiology. Besides a player's natural talent and training, their physical make-up also plays a significant role in determining how well they perform. Numerous research on players' morphological evaluation and performance-related morphological concerns have been documented. Conversely, body composition describes how fat and muscle are distributed throughout the body.

Literature Review

Lear, Aaron & Patel, Niraj (2016) [7]: When the player executes the windmill softball pitch, significant stresses are created all around the shoulder and elbow. Overuse injuries seem to be the most prevalent kind of injury seen by softball pitchers, and softball pitchers do not appear to sustain as many injuries overall as baseball pitchers do. This article will address various causes of softball pitching injuries, as well as softball pitching tactics, the kinetics and kinematics of the windmill pitch, epidemiology of softball pitchers, and the kinetics and kinematics of the windmill pitch.

Varnell, Michelle & Keenan (2016) [12]: The throwing motions of baseball and softball players are quite similar, as are the injuries they experience at the shoulder. However, it is not yet known if baseball and softball athletes have

comparable morphological features of the shoulder complex. The purpose of this study was to classify baseball and softball players according to their position and examine the musculoskeletal characteristics of their dominant shoulder complex. Forty healthy athletes who competed at the Division 1 level of the National Collegiate Athletic Association were evaluated for their posture, flexibility, range of motion, and strength. Muscular strength in the pectoralis major and upper trapezius was significantly higher among position players than among pitchers. According to the results of this research, baseball and softball position players have distinct as well as equivalent musculoskeletal features in their dominant shoulders. This conclusion suggests that there are differences between the two sports. In healthy softball and baseball athletes, these statistics will give important information on baseline musculoskeletal features of the dominant shoulder complex.

Nimphius, Sophia (2005) [13]: Games of Baseball and Softball Over the last decade, there has been a dramatic increase in the level of competition in fastpitch softball. Part of the reason for this is because in 1996, gymnastics was included as an Olympic sport, bringing it to the attention of the world. Softball players at the highest levels need to devote more time and effort to strength training and fitness if they want to compete with the best in the world. Softball and baseball are very similar games, although softball is played on a much smaller field. The throwing distance has been shortened from 60 feet to between 40 and 43 feet, while the distance between the bases has been reduced from 90 feet to 60 feet. Therefore, a softball player must train specifically to build speed and power over relatively short distances. Strength training might be the key to victory in a sport where the level of competition is always rising.

Francis, Niji & Kumar, Satish & Raveendran, Ankit. (2023) [14]: We set out to find out how cohesive softball teams are at the national level, both in terms of gender and age. We set out to examine the cohesiveness of national/university and professional softball teams from a male and female perspective. Team cohesiveness was supposed to be significantly different for male and female athletes, according to the research. Research Approach: Thirty male and thirty female softball players from different national teams, ranging in age from 18 to 32 years old, participated in the research. The degree of team cohesiveness was evaluated using the Group Environment Questionnaire (GEQ), which was created by Carron, Widmeyer, and Brawley (1985). The survey was given in English, but participants who needed more clarification were given it in their native language. Findings: Male and female national-level softball players showed significantly different degrees of team cohesiveness. Team cohesiveness ratings were somewhat higher for male players than for female players. A statistically significant difference was shown by the t-test results of 25.656 for female players and 27.143 for male players, lending credence to this discovery.

Lockie, Robert & Patron, Jacob & Dawes, Jay & Viramontes, Erika. (2024) [15]: Successful softball players need a wide range of physical abilities, including general fitness (strength, speed, power, etc.) and sport-specific talents (hitting, throwing, etc.). Little research has focused on high school female athletes' lower-body strength, which may underlie these traits. This study aimed to examine the relationships between age, linear speed, lower-body power, hitting and throwing velocity, and relative and absolute lower-body strength in softball players from high school. The analysis was based on historical data gathered from a private strength and conditioning facility from 34 female high school softball players with average age of 14.91±1.00 years, average height of 1.66±0.07 meters, and average body mass of 63.21±9.59 kg. Age, height, and body mass were among the variables recorded. Other relevant metrics included times for sprint intervals of 0-9.14 and 0-18.29 meters, distance covered by the standing broad jump (SBJ) (a measure of lower-body power), velocity of hitting and throwing, and the absolute and relative three-repetition maximums (RMs) for the front squat and hexagonal bar deadlift (HBD). The associations between absolute and relative strength and the fitness and sport-specific tests were determined by Pearson's correlations (p<0.05). The findings demonstrated that there were substantial correlations between the 3RM HBD and both striking velocity (r=0.418) and age (r=0.389). Both the SBJ (r=0.422) and the hitting velocity (r=0.457) were linked to the 3RM front squat. A correlation of -0.349 was found between relative 3RM HBD and the 0-18.29 m sprint interval. These findings provided evidence that high school female softball players may benefit from a conditioning program that targeted their lower bodies in order to increase their hitting velocity, horizontal leaps, and sprinting speed. This research lends credence to the idea that high school softball players might benefit from strength training and offers evidence that such programs should be available to young athletes.

Research Methodology

The current research consists of a study that examines the relationship between a number of different anthropometric, physical fitness, and psychological variables and the performance of male softball players. One hundred twenty (N=25) male intercollegiate Softball players who participated in the inter-zone softball championship who represent respective colleges affiliated to Visvesvaraya Technological University in Karnataka state, during the 2017-18 academic year, were selected as subjects for the study. The investigator made the following selections for softball players based on these findings, supposing that these characteristics could be crucial for best performance when it comes to softball. The purpose of this research was to examine the correlation between the anthropometric, fitness, and psychological statistics of male softball players and their performance on the field.

Data Analysis

All the Anthropometric measurements equally predict the performance of the Softball players.

Table 1: The values of R, R2, and the corrected R2 from a stepwise multiple regression analysis (DV=Performance; IVs =Anthropometric Variables)

| Model | Variables entered | Variables removed | R | R Square | Adjusted R square | Std. Error of the Estimate |
|-------|-------------------|-------------------|-------------------|----------|-------------------|----------------------------|
| 1 | Weight | . | .412 ^a | .170 | .163 | 5.19148 |

Using hierarchical multiple regressions, we were able to identify height as a significant predictor of softball players' on-field success. Using height, width of shoulders, waist circumference, and length of legs as Independent Variables, we found the following. Only one of the five anthropometric factors, weight, was shown to have a significant effect on

softball performance. Coefficient of determination calculated as .412, squared R=.170, corrected R²=.163. That is to say that the 16.3% of overall performance may be attributed to weight. However, the other factors were not included in the model, and hence could not be used to predict the outcomes of the current sample.

Table 2: Results of regression ANOVA

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|-------|------------|----------------|-----|-------------|--------|------|
| 1 | Regression | 651.695 | 1 | 651.695 | 24.180 | .001 |
| | Residual | 3180.271 | 118 | 26.951 | | |
| | Total | 3831.967 | 119 | | | |

The result of 24.180 for the regression ANOVA was significant at the .001 level of significance. This further supports the conclusion that the softball players' weight as

an anthropometric measure was the most significant predictor of performance.

Table 3: T-values, standardised and unstandardized coefficients, and beta-values

| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|-------|------------|-----------------------------|------------|---------------------------|--------|------|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 60.580 | 3.068 | | 19.748 | .001 |
| | Weight | .221 | .045 | .412 | 4.917 | .001 |

In the first stage, the beta value for the predictor model was .412. When comparing the constant and the projected

model, the t values of 19.748 and 4.917, respectively, are statistically significant (p=.001).

Table 4: Regression Analysis Step-by-Step Exclusion of Variables

| Model | Beta In | T | Sig. | Partial Correlation | Collinearity Statistics | |
|-------|-------------|--------------------|--------|---------------------|-------------------------|------|
| | | | | | Tolerance | |
| 1 | Height | .108 ^b | 1.128 | .262 | .104 | .758 |
| | Arm length | .018 ^b | .193 | .847 | .018 | .784 |
| | Chest girth | -.209 ^b | -1.360 | .176 | -.125 | .296 |
| | Leg length | -.029 ^b | -.345 | .731 | -.032 | .972 |

Measurements of height, arms, chest, and legs were ruled out in the first phase. All the Anthropometric, Physical

Fitness and Psychological Variables together equally predict the performance of the Softball players.

Table 5: The values of R, R², and the corrected R² from a stepwise multiple regression analysis (DV=Performance; IVs = All)

| Model | Variables Entered | Variables Removed | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|---------------------------|-------------------|------|----------|-------------------|----------------------------|
| 1 | Reaction time | . | .578 | .334 | .329 | 4.64960 |
| 2 | Arm power | . | .709 | .503 | .494 | 4.03618 |
| 3 | Abdominal Endurance | . | .761 | .578 | .568 | 3.73169 |
| 4 | Depth Perception Approach | . | .782 | .612 | .598 | 3.59735 |
| 5 | Thoroughness | . | .803 | .645 | .629 | 3.45512 |
| 6 | Agility | . | .811 | .658 | .640 | 3.40309 |

Using Anthropometric, Physical fitness, and Psychological as Independent Variables, the following findings were obtained through stepwise multiple regression analyses aimed at identifying the primary determinants of athletic performance. Reaction time was the initial input into the equation, and it had a 0.578 correlation coefficient, a R squared value of 0.334, and an adjusted R² value of 0.329. That is to say that arm power accounted for 33.1% of overall efficiency. Correlation coefficient, squared R, and adjusted R² values for the whole model were .709, .503, and .494, respectively, when arm power was included with response time. In other words, arm strength and speed of response accounted for 49.4 percent of overall efficiency. In addition to arm power and response time, we also threw in a third variable, abdominal endurance, which had a correlation coefficient of .761, a R squared value of .578 and an adjusted R² value of .568. In other words, 56.8

percentage points of overall performance came from abdominal endurance, arm power, and response speed. Correlation coefficient of .782, squared R to value of .612, and adjusted R² value of .598 for the depth perception approach variable; the other three variables are response time, arm power, and abdominal endurance. As a result, depth perception strategy, together with response speed, arm power, and abdominal endurance, accounted for 59.8% of the overall performance. With a correlation coefficient of .803, a squared R value of .654, and an adjusted R² of .629, thoroughness is the sixth variable to enter the equation alongside response speed, arm power, abdominal endurance, and depth perception strategy. In other words, 62.9% of the overall performance was attributable to thoroughness coupled with response speed, arm power, abdominal endurance, and depth perception strategy. Agility was the last predictor included in the model, and its correlation

coefficient was .811, squared R value was .658 (after being corrected for other factors), and adjusted R² was .640. Agility, response time, arm power, abdominal endurance,

depth perception, strategy, and detail all accounted for 64.0% of overall performance. However, we did not factor in the remainder.

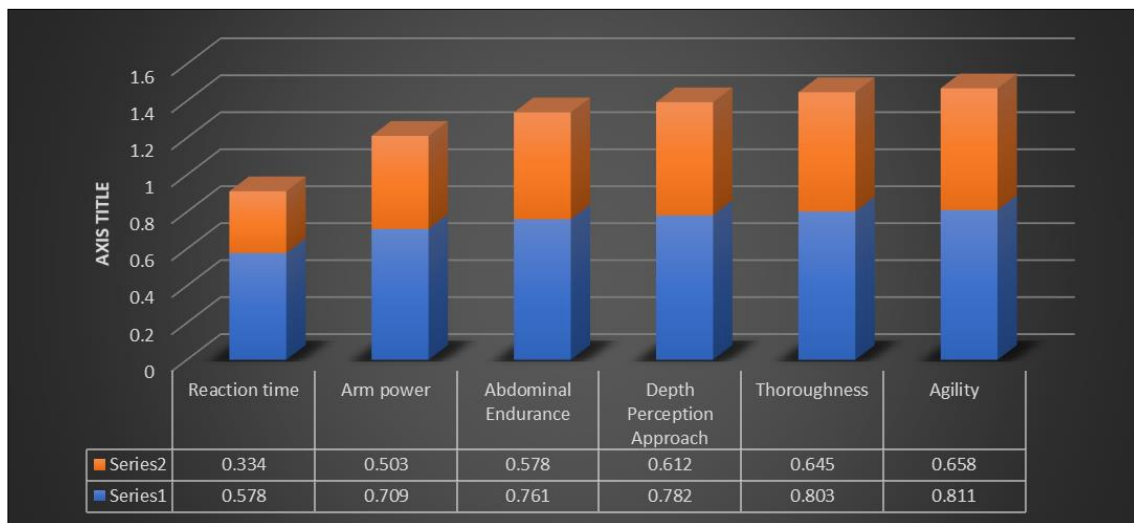


Fig 1: Impact of Body Composition, Cardiovascular Health, and Mental Attitude on Athletic Performance

Table 6: Results of Regressional ANOVA

| | Model | Sum of Squares | df | Mean Square | F | Sig. |
|---|------------|----------------|-----|-------------|--------|------|
| 1 | Regression | 1280.953 | 1 | 1280.953 | 59.252 | .001 |
| | Residual | 2551.014 | 118 | 21.619 | | |
| | Total | 3831.967 | 119 | | | |
| 2 | Regression | 1925.953 | 2 | 962.976 | 59.112 | .001 |
| | Residual | 1906.014 | 117 | 16.291 | | |
| | Total | 3831.967 | 119 | | | |
| 3 | Regression | 2216.607 | 3 | 738.869 | 53.059 | .001 |
| | Residual | 1615.360 | 116 | 13.926 | | |
| | Total | 3831.967 | 119 | | | |
| 4 | Regression | 2343.756 | 4 | 585.939 | 45.278 | .001 |
| | Residual | 1488.210 | 115 | 12.941 | | |
| | Total | 3831.967 | 119 | | | |
| 5 | Regression | 2471.055 | 5 | 494.211 | 41.399 | .001 |
| | Residual | 1360.912 | 114 | 11.938 | | |
| | Total | 3831.967 | 119 | | | |
| 6 | Regression | 2523.313 | 6 | 420.552 | 36.314 | .001 |
| | Residual | 1308.654 | 113 | 11.581 | | |
| | Total | 3831.967 | 119 | | | |

The result of 59.252 for the regression analysis of variance (ANOVA) on response time was determined to be statistically significant at the .001 level. This provides even more evidence that the current study's softball players' performance was most closely correlated with their response speed as a psychological component. To combine arm power and response time, a regression analysis of variance (ANOVA) value of 59.112 was determined to be statistically significant at the .001 level. This further validates the hypothesis that the psychological variables of arm power and response time were the most significant predictors of softball players' success in the current study. The regression analysis of variance (ANOVA) value of 53.059 for abdominal endurance, reaction time, and arm power was statistically significant at the .001 level of significance. This further validates the hypothesis that the physical fitness variable of abdominal endurance, in addition to reaction time and arm strength, was the most significant predictor of performance among the softball players tested here. For depth perception, response time,

abdominal endurance, and arm power, the regression ANOVA value was 45.278, which was statistically significant at the .001 level. This further validates that the Depth perception Approach, in addition to reaction speed, abdominal endurance, and arm power as a physical fitness variable, was the definitive predictor of performance of softball players evaluated in the current experiment. Exhaustiveness, together with reaction speed, abdominal endurance, and that Depth perception Approach arm power, had a significant Regression ANOVA value of 41.399 at the .001 level. In addition to reaction speed, abdominal endurance, and Depth perception Approach arm power as physical fitness variables, thoroughness was a significant predictor of performance in the current study of softball players. Agility, together with completeness, reaction speed, abdominal endurance, and that Depth perception Approach arm power, had a significant Regression ANOVA value of 36.314 at the .001 level. Agility, together with thoroughness, reaction time, abdominal endurance, that Depth perception

Approach arm power as a physical fitness characteristic, was the definitive predictor of performance of softball players evaluated in the current inquiry, as shown by the results.

Conclusion

Arm strength, leg strength, speed, agility, and abdominal endurance were positively correlated with and significantly impacted softball players' performances. Reaction speed, depth perception strategy, and decision-making completeness were determined to be the most significant psychological predictors of athletic performance in a multiple regression study. Completeness, speed of response, and an intuitive grasp of spatial relationships all played a role in the success. Positive correlations were found between other characteristics and softball players' success, including depth perception criticism, control, and overall decision-making aspects; however, these traits did not enter the model as predictors of success.

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