Anthropometric Profile and Vertical Jump Score in Kuwaiti Male Swimmers: a comparative study

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Introduction:

Swimming is one of the most loved physical activities in the world. It is performed by people of all ages who need to exercise their muscles without pressure. Studies have shown that regular swimming strengthens the muscles and improves the cardiovascular fitness of an individual (1). In Kuwait, swimming is done as a general activity, sporting event, and for occupational reasons. Before participating in swimming, it is imperative to consider some factors that improve its efficiency. One of the elements that swimmers need to consider while participating in the activity is body composition (2). It is regarded as a significant factor, especially when swimming is done as a sporting event (3).

Another factor is the anthropometry (3). It refers to the scientific study of the physical measurements of the human body, especially shape, size, weight, and height. This component provides the difference between swimmers competing at different levels (4). Research has found that anthropometric measurements are directly related to swimming potentials. For instance, height determines the swimming performance of a person (5). Likewise, long limbs help in the development of propulsive forces (6).

Vertical jump test refers to an examination of lower body power (7). It is used in some sport disciplines to evaluate lower extremity power such as leg power or leg strength and muscle strength of an individual (8). This test is a significant component of fitness testing in athletes and sedentary population (8). To improve leg strength and vertical jump performance, one must attend plyometric exercise training (9). These are exercises that exert maximum force to the muscles in short intervals to increase power (9). They are common among volleyball players who perform vertical jumping and lower extremity power to achieve success (10). A higher value of the vertical jump test has been associated with the improved performance of explosive strength and appropriate use of arms during jumping exercises (11).

In the same context, swimming requires a high value of vertical jump test to

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increase performance. In fact, swimming depends on muscular strength (12), muscular endurance (13), anthropometric features, and body composition, which are based on a vertical jump test scores. Swimmers require high muscle power in lower limbs to be successful. The beginning of swimming is often viewed as an explosive event because swimmers must jump. This process needs excessive force for a short time (14).

As noted above, the muscular strength and anthropometric profile are very important components for swimmers. Vertical jump test data is unavailable in Kuwaiti Swimmers as we as anthropometric parameters. Thus, the present study aimed to evaluate vertical jump test and anthropometric profile in male Kuwaiti swimmers and compare them with college age students as a control group. We formulated the hypothesis that Kuwaiti swimmers have superior anthropometric and vertical jump score.

Methods:

The sample size of this study was 45 Kuwaiti male swimmers with an average of four years training experience and total of 42 male participants (age 18-24 years) were randomly selected from college students in the Department of Physical Education & Sports at the Public Authority for Applied Education and Training. To ensure that the study complied with ethical considerations, researchers obtained written informed consent from the participants according to the policy of the College of Basic Education Board. The human Ethics Committee of the Public Authority for Applied Education and Training in Kuwait approved the study. The study took place at room temperature between 20-23 ^{o}C and relative humidity of between 40-45 %. Body height and the body mass were measured with the participant standing barefoot with±0.50 cm accuracy and ±0.1kg accuracy, respectively. body mass index (BMI, kg/m^2) was calculated.

Measures

Anthropometrists certified by the International Society of the Advancement of Anthropometry (ISAK) obtained the measurements using protocols such as six girths consisting of arm relaxed and flexed, thigh, waist, forearm, and calf. The researchers used sitting stretched height, Arm span, and torso to compare the physical characteristics of the study groups (15).

Vertical Jump Test Score Determination

Before the test, the participants were subjected to an 8-10 minute rigorous warm-up consisting of lunges, squats, quad stretches, and progressive

jogging. After the warm-up, the end of the participants' fingertips was marked while standing on the wall side with both feet remaining on the ground (M1). The participant from a static position was asked to jump as high as possible and mark the wall using chalk (M2). The distance between M1 and M2 was then measured and recorded. The test was repeated three times. Each time the test was measured and recorded, and the best measurement determined to evaluate the performance of the participant (16).

Statistical Analysis

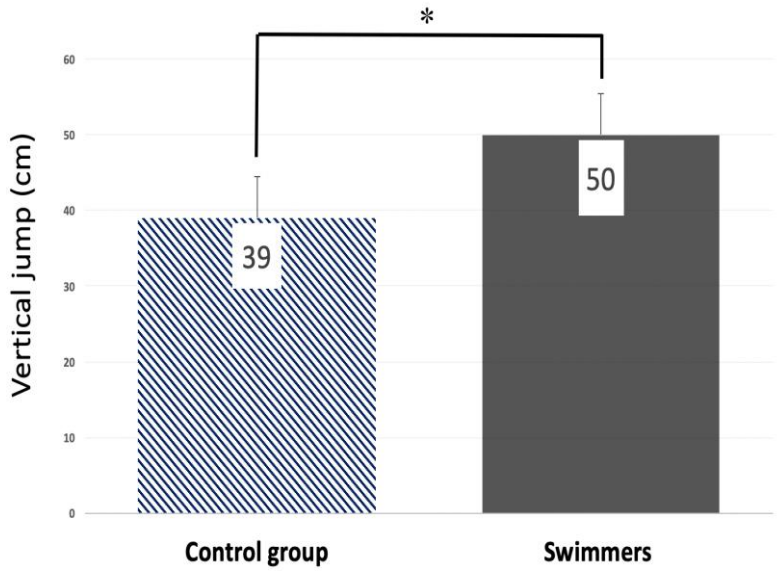
All measurements were calculated using descriptive statistics. A paired two-way sample *t*-test was used to detect any significant differences between the mean values of Kuwaiti swimmers and male college age students as a control group. Normality checks and Levene's test were carried out and the assumptions met. The level of significance was set at $p < 0.05$ for all analyses. All statistical analyses were carried out using Statistical Package for the Social Sciences (SPSS) version 22.0.

Table (1)
Anthropometric characteristic of groups of swimmers and college age students

Variables	Control group (n=42)	Swimmers (n=45)
Age (years)	21±3	22±4
Weight (Kg)	80±7	82±6
Height (cm)	175±2	178±3*
BMI ($Kg.m^2$)	26.1±0.4	25.9±0.3
Sitting height (cm)	86±5	90±4
Arm span (cm)	159±6	170±7*
Torso (cm)	112±4	118±7
Waist (cm)	80±6	81±6
Thigh (cm)	44±6	48±3*
Calf relaxed (cm)	33±2	35±2
Arm relaxed (cm)	26±3	29±2
Arm flexed (cm)	30±3	32±6*
Forearm (cm)	22±3	24±1

Data are mean ± SD and range, BMI (kg/m^2) = Body Mass Index.
*Statistical significant differences between groups, $p<0.05$.

Figure 1: Values of vertical jump score in swimmers and control group.



*Statistical significant differences between groups, p<0.05.
Data are mean ± SD and range.

Results

Table 1 represented the mean, standard deviation and level of significance of various anthropometric profile of Kuwaiti male swimmers and the control group. there were no group differences between the swimmers and the control group in age, BMI, sitting height, torso, waist, calf relaxed, arm relaxed, and forearm. There was a significant difference in mean height, arm span, thigh, and arm flexed (P<0.05) between the swimming and the control group. As illustrated in Figure 1, the paired two-way sample *t*-test revealed that swimmers had higher vertical jump score than control group (p<0.05).

Discussion

It is important to have a specific anthropometry to be able to compete internationally. Many studies confirm that successfully competing in different sports has been associated with specific anthropometric characteristics and body composition. For example, Chaabene et al (18) reported the importance of anthropometry for the success of elite karate athletes; Dengel and Dengel (19) emphasized

the importance of anthropometry for the success of track and field athletes; Heymsfield et al (20) focused extensively on the relationship between high performance and body composition and supported a critical role those variables play in a majority of sports; and Mooses and Hackney (21) provided evidence to support the critical role anthropometrics and body composition has on the distance running success of East African athletes.

To the best of our knowledge, very few studies have investigated anthropometric characteristics and vertical jump score in the swimmers athletes in the State of Kuwait. Thus, in the present investigation, we compared anthropometric characteristics and vertical jump score between Kuwaiti male swimmers with male college age students.

Anthropometric Characteristics and vertical jump score

The present study examined which anthrpometric characteristics make swimmers superior to college age students. The average age, BMI, sitting height, torso, waist, calf relaxed, arm relaxed, and forearm showed no significant differences between groups, with the exception that only swimmers were significantly taller than the control group. Also, swimmers had an arm span that was significantly longer compared to the corresponding control group, had significantly higher circumference of the thigh and thicker arm flexed than the control group (Table 1). A study by Avlonitou showed significant correlations between performance and height in pre adolescent swimmers (22).

Overall, when we compared the Kuwaiti swimmers with different swimmers from different countries, it seems that the Indian swimmers demonstrated shorter body height compared to Kuwaiti swimmers (23). However, when comparing with Malaysian swimmers athletes, Kuwaiti swimmers exhibited higher circumference of the arm flexed. On other hand, Malaysian swimmers were taller than Kuwaiti swimmers (24).

In the present study VJT score of the swimmers was significantly ($P<0.001$) higher than the control group. The results of the present study were almost similar in

comparison to the results in a study conducted by Roy (23) where 40 swimmers from Kolkata of India were studied. When comparing the vertical jump score, they found that the swimmers scored higher value than boxer and the control group. Compering the present study with their finding, the Kuwaiti male scored higher value than Indian swimmers.

Additionally, measuring the vertical jump performance in American football players and volleyball players, Papadopoulos et al and iiuiu et all (25, 26) reported higher values of vertical jumps performance compared to Kuwaiti simmers in the present study and this variances of the results in jumping performance in these two studies might be due to possibly to the special type of movements with higher specific requirements for power performance of the American football and volleyball players, compared to swimmers.

Conclusion

The present study was conducted to determine and compare the specific anthropometric parameters and vertical jump score of Kuwaiti male swimmers. In this study, the results show that there were no significant differences in in age, BMI, sitting height, torso, waist, calf relaxed, arm relaxed, and forearm variables between any of the groups with the exception that swimmers were found to have significantly higher circumference of the thigh, thicker arm flexed, and scored higher in vertical jump test in comparison with the control groups. Furthermore, the present data can be used as a reference standard for the anthropometry and vertical jump score of Kuwaiti male simmers and used to help coaches plan and develop training programs, tactical emphasis, and talent identification.

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