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An Investigation into the Association between Anthropometric Measurements and Speed among Elite Kayakers in Khuzestan

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Abstract:

Characteristics of anthropometric are important in describing and analysis of athletes to understand the growth exercise performance and used body structure. The main purpose of the research was to study the relation of anthropometric size with speed in elite men kayak recers of 200 meters of Khozestan province. Sample of the research was 30 men kayak racers with average age (24/30) years old weight (78-96kg) height (178.67cm). The variables of the research were arm's length distance between two Acromion blister, age, mass, height, and pectoral and dorsal muscle. Their relation is measured by speed and power of the kayak racers. Pearson correlation coefficient was used to test the hypotheses of the research and inferential analysis of the results. By using spss software version 20, the significant level is calculated as $p<0.05$. The results shown that there was a significant relationship between speed record of 200 meters in elite kayak racers with physiological indices (Maximum strength of pectoral and adorsal muscle) and anthropometric indices (height of athletes in standing and sitting height, upper limb length and shoulder width). Combination of

physiological and biomechanical abilities of body in athletes could be effective in improving the athletes' performance.

Key words: Speed, Power, Elite men kayak racers, Anthropometric indices

Introduction

During the past half-century, coaches strived to empirically identify athletes' talents and their innate abilities. Since early 1970s, advanced countries have planned regular programs in this regard. One of such programs was to develop a plan correcting people's body types and states (1). Physical activities, movements and competition have always been an integral part of human activities (2). Human beings have been searching for the associations between physical characteristics and their performance and abilities to identify their physical features and characteristics and restrictions and benefits such qualities might create in their performance. Therefore, methods and tools were needed to reach more accurate and valid details on physical features. Such demand gradually resulted in a scientific genesis, called anthropometry. Anthropometry refers to measurements used for quantitatively understanding human physical variations (3). Anthropometry involves the systematic measurement of the physical properties of the human body, primarily dimensional descriptors of body size and shape. Measuring human body parts in different sports is a valuable concept to understand athletes' body combinations in different executive levels. Additionally, body members can clarify how physical structure and biomechanical and physiological parts are linked to genetic sections. Body measurements widely affect practice, execution, techniques, and the development of muscular power. These measurements biomechanically play a crucial role in producing effective capacity in different skills.

Research Methodology

This is a descriptive survey study (in non-laboratory conditions) examining the current conditions of variables using data gathered from 30 selected kayakers in Khuzestan. As data analysis helps reaching the research findings and results, it is considered a descriptive/analytic practical study.

Research Procedure

Subjects were first asked to complete the consent form of participation in test to gather the required information. The selected ones were checked and they then entered the study by their consent. There was a statistical population of 40 kayakers 30 of them were prepared as a convenience sample. In a given day, muscular endurance and strength in athletes were tested in a gym using the test of upper body maximum muscular power and paddling power test (explained in test stages). In another day, all paddlers performed a 200 m speed test. The results were recorded individually for each subject. The test was taken under conditions which were equally fair for all. Results were analyzed by SPSS 20.

Conducted Tests

Upper body maximum muscular power test
Materials: barbell, dumbbell, seated chest press machine
Methodology: individuals lay down over a bench with their knees bent and the barbell exactly over their chest. To fill the waist arch, soles are placed at a height above the floor or bench level. To have the maximum iterations, dumbbells are first considered for each individual about 40 to 60 percent of a maximum iteration in the acquaintance session so that all subjects are able to iterate the practice several times. Following a three-minute break, some weights are added to dumbbells.

After several iterations, the practice is paused, and again 5 to 10 percent is added to the dumbbell weights. It is continually repeated until the subject is able to do the work just for once. At this point, according to the weight changes, individuals' RM is recorded (4).

Maximum rear muscular power test
Materials: barbell, dumbbell, seated chest press machine
Methodology: Rowing Machine with adjustable resistance
Methodology: individuals lay down over a bench with their knees bent, pulling the handles, connected to the weight by cable, toward their central body as if paddling and stopping it when approaching to their chest. Dumbbells are determined based on subjects' power, from least so that they can relocate them to the highest by which subjects are tested and are recorded as their score.

To record subjects' speed, a distance of 200 meter inside water was considered. Subjects rode the distance and the rode area was measured by stopwatch. According to data, the kayakers' speed was calculated by dividing changed distances (relocation) by time changes.

$$Speed = \frac{\text{Changed Distances}}{\text{Time Chagnes}}$$

Measuring Upper Body Length
The distance between acromion process and the tip of middle finger that is measured by tape measure.

Measuring Shoulder Width
Shoulder widths were measured by tape measure when subjects were standing undressed with their feet beside each other and hands hanging in sides. The distance between the two acromion processes was marked and measured (5).

Measuring Standing Height

It is one of the most ordinary and useful anthropometric measurements. Individuals' height is measured by height measure when feet are bare, hands hanging sides and heels are close to each other.

Measuring Sitting Height

Individuals are asked to seat on their hips with both legs stretched. The distance between floor and over the head is then measured.

Research Findings

To reach the research objectives, several hypotheses were developed and tests. Results are as follows:

1. There is a significant inverse association between Khuzestan kayakers' age and fast 200 m riding (p=0.003, r=-0.520).
2. There is a significant association between Khuzestan kayakers' weight and fast 200 m riding (p=0.468, r=-0.138).
3. There is a significant association between Khuzestan kayakers' body mass index and fast 200 m riding (p=0.536, r=-0.118).
4. There is a significant inverse association between Khuzestan kayakers' height mass index and fast 200 m riding (p=0.048, r=-0.365).
5. There is a significant inverse association between Khuzestan kayakers' upper body length and fast 200 m riding (p=0.007, r=-0.484).
6. There is a significant inverse association between Khuzestan kayakers' shoulder width and fast 200 m riding (p=0.009, r=-0.470).

7. There is a significant inverse association between Khuzestan kayakers' sitting height and fast 200 m riding ($p=0.004$, $r=-0.506$).
8. There is a significant inverse association between Khuzestan kayakers' chest muscles and fast 200 m riding ($p=0.003$, $r=-0.523$).
9. There is a significant inverse association between Khuzestan kayakers' maximum rear muscles and fast 200 m riding ($p<0.001$, $r=-0.709$).
10. There is a significant inverse association between Khuzestan kayakers' arm circumference and fast 200 m riding ($p=0.170$, $r=-0.257$).

Discussion and Conclusion

Research findings showed that chest muscle strengths were inversely associated with the speed of kayakers in 200 m riding. This indicates a better speed among those with higher maximum power.

Van Somron et al. (2008) [5] found a significant connection between isometric and isokinetic resistance and kayakers' records. This supports our research findings. Regarding the 200 m kayakers' records, the dominated system is anaerobic. Given the role of muscle resistance and relation between maximum power and muscle resistance, such association can be, thus, justified. Our findings also agree with what Misguj et al. (1992) found out. They studied high power of body extension among kayak/canoe athletes. These findings are supported by Mackin's et al. (2010) [7] results on a strong link found between shoulder muscles resistance and sustained power among kayak paddlers. Here, maximum chest muscle power was used; the alignment of these two studies can be though attributed to the similarity of involved muscles in both moves.

Our research findings revealed that rear muscles resistance was founded to be inversely associated with kayakers' speed in 200 m riding. This indicates a better speed among those with higher maximum power.

This supports Van Somron's et al. (2008) and Misguj's et al. (1992) [6] findings. These findings are supported by Mackin's et al. (2010) [7] results on a strong link found between extension to pressure ratio among kayak paddlers. Regarding the role of arm extensive muscles, especially underarm muscles involved in extension, the alignment of our research findings can be adjusted.

Our research findings revealed that arm circumference were not associated with the speed of kayakers in 200 m riding.

Misguj et al. (1992) studied kayak/canoe paddlers and reported that the circumference of upper body parts was greater among kayakers. Studying the circumference of arms when resting and bended, Van Somron et al. (2003) [8] found no significant correlation. However, the circumferences were greater for bended arms than resting which support our findings.

In recent years, researchers in the area of sport sciences have shown interest in how to reach athletes to their highest performance in international competitions. Optimal performance is the consequence of physiological, anthropometrical, and biomechanical factors. Therefore, to reach the highest performance, some bioenergetics features, biomotor abilities, and psychological features along with scientific training programs, and taking advantage of sport scientists and sufficient facilities are needed [1]. Beside optimal physical conditions, identifying a proper body type matching the field of sport is necessary to succeed in physical activities [3]. In terms of anthropometry and body combination, kayak/canoe peddlers were reported to have higher height, greater body mass index, less fat percentage, and higher fatless mass. Data also disclosed that kayaking gold medal winners

were heavier and taller than their unsuccessful competitors [1]. It was also observed that rear and chest maximum muscles power is an effective factor in the speed of kayakers in 200 m riding [8].

Muscle strength is a common effective factor in speed sports. As kayakers have to overcome water resistance and the explosive power and muscle resistance are calculated based on a percentage of maximum power, the maximum power can be considered as a key factor in finding talent in kayaking.

Research findings also showed that standing and sitting heights, shoulder width and hand lengths were significantly associated with the speed of kayakers in 200 m riding. This is another effective factor in finding talent in kayaking. Such link can be justified as to the fact that taller kayakers with longer body members have stronger ability to push forward and pull backward paddles and consequently pass longer distance.

By a simple estimation, in kayaking, speed results from the number of paddling in the extent of boat thrust per each stroke. Therefore, those with longer body parts and higher muscle strength can have better records.

Conclusion

In sum, the speed of elite kayakers in 200 m riding was found to be significantly related to physiological indexes (chest maximum muscle power) and anthropometric indexes (athletes' sitting and standing heights, length of upper body parts, and shoulder width). A combination of physiological and biomechanical abilities can improve athletes' performance.

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