Physiological Profiling of Competitive Handball-Players: Balance Assessment
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Physiological profiling, an important recent development in the field of exercise and sports science, has been utilized extensively with many athletic teams and was conducted on competitive handball players in conjunction with the University of Utah handball/smacquetball/racquetball comparison study. Assessing a battery of physiological parameters (aerobic and anaerobic power, flexibility, etc.) is useful to predict performance success, compare athletes, as a pathological screening tool, and to provide baseline measures to monitor rehabilitation following an injury.

Balance, the ability to control and maintain the body's position over its center of gravity, has recently received research attention with advances in equipment sophistication and the skill of athletes (especially in coordination-dominated sports such as gymnastics). Also called equilibrium, balance is crucial to success in competitive sports such as handball, which requires spot-and-go movements combined with quick changes in direction. Enhancing balance and coordination is also extremely important for injury prevention - recently leading several professional football lineman to take ballet classes. It has also been noted that injuries occur more often when athletes lose their balance due to muscular fatigue; and, that some athletes are somehow better able. to maintain balance than others when they are approaching exhaustion toward the end of a long competition.

Balance is achieved as the central nervous system integrates sensory information from the vestibular (receptors in. the inner ear which monitor rotational acceleration or deceleration), somatosensory (neural stimulation by touch or pain), visual, and auditory systems. The feedback of sensory information about movement and body position (termed proprioception) is a major focus within the rapidly growing field of kinesiology (the science of movement) and applied anatomy.

To assess balance in handballers, 10 top finishers in the Open and Class A divisions in the Utah State Handball Championships, held in Salt Lake City, were solicited as subjects. A state-of-the-art Lafayette Instruments sagittal balance stabilometer, linked to a computerized clock counter housed in the University of Utah Motor Control Laboratory, was used to measure the amount of time that the handballers spent in-balance, out-of-balance right, and out-of-balance left, during six, 20-second trials. Simply put, a sagittal reading measures the right and left deviation from a midline point, and a stablilometer is akin to a high-tech bongo board. The subjects were allowed 10 minutes of practice on the stabilometer prior to the six data collection trials. The score for each subject was computed as the average of six trials after warm-up. The clock counters, which determined time in-balance and out-of-balance, were engaged when the subject tilted the balance board 3 degrees or more out of the sagittal plane either to the right or to the left (see photo). Standard cues given to the subjects included:• (1) stand on the stabilometer board with feet shoulder width apart, (2) hands on hips, (3) knees slightly bent, and (4) eyes straight ahead. Eight of the subjects were right hand and right leg dominant (leg dominance determined by how they preferred to kick a soccer ball) whereas two subjects were left hand and left leg dominant. Six subjects were right eye dominant and four subjects were left eye dominant. The specific effect(s) of extreme one-side dominance vs. ambidexterity on balance is currently under investigation.

Descriptive and stabilometer balance data of the 10 competitive handball players are shown in Table 1. Time in-balance during the 20-second trials averaged 7.4 plus or minus 2.1 seconds. The highest time in-balance value for a subject was 10.5 seconds and the lowest value was 4.9 seconds. Time out-of-balance right-values averaged 7.1 plus or minus 1.5 seconds (range, 9.5 to 3.6 seconds). Time out-of-balance left-values averaged 5.4 plus or minus 1.2 seconds (range, 7.1 to 2.9 seconds). This study noted that the upper-level Open class players had better balance scores than the middle-level Open class and class A players. It was also noted that the shorter handball players had better balance scores than taller players. This is due to the often-referred-to biomechanical principle: the lower the center of gravity, the better the balance. Common sense dictates that bending your knees greatly assists rapid movements and that taller players generally take larger steps on the court, thus giving them a balance disadvantage.

Many questions regarding balance and performance remain unanswered such as: Is balance primarily an inherited trait or an attribute acquired through conditioning? Competitive gymnasts (who can stand on the stabilometer for an entire 20 second trial with essentially no out-of-balance deviation) are certainly born with good balance but how much of their coordination and balance is a product of training? Also, What is the best way to enhance balance (strength training, flexibility, etc.)?

This study concludes that handballers have comparable balance scores to athletes in other sports (with the notable exception of gymnasts) and that good balance is an advantage to competitive handball play. Other physiological profile parameters collected from handball players which will be reported in future issues of HANDBALL include: (1) maximal aerobic power and ventilatory threshold, (2) maximal anaerobic power, capacity, and power decline, (3) single and 60-second repeated vertical jump values, (4) reaction times, (5) upper and lower body flexibility measures, and (6) several blood chemistry indices (iron status, electrolytes, enzymes, cholesterol, red and white blood cell counts, etc.).

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TABLE 1. Descriptive and Sagittal Stabi/ometer Balance Data of 10 Open and class A handball players from the Utah Handball Association.

DESCRIPTIVE DATA

	MEAN	STD	MAX	MIN
Age (yr)	40.2	5.8	47.6	31.2
Height (in)	71.7	3.1	77.9	66.0

Height (em)	182.1	7.8	197.9	167.6
Weight (lb)	183.2	15.3	216.0	162.9
Weight (kg)	83.1	6.9	97.9	73.8
Body fat (%)	14.7	6.4	29.0	6.2
Fat Weight (I b)	27.51	14.5	62.7	12.1
Fat Weight (kg)	12.4	6.6	28.4	5.5
Fat-Free Weight (lb)	55.7	11.0	182.1	142.5
Fat-Free Weight (kg)	70.6	5.0	82.5	64.6

Sagittal Stabi/ometer Balance Data (error setting, three degrees) average of six 20-second trials from each subject

	MEAN	STD	MAX	MIN
Time in-balance (seconds)	7.4	2.1	10.5	4.9
Time out-of-balance-right (seconds)	7.1	1.5	9.5	3.6
Time out-of-balance-left (seconds)	5.4	1.2	7.1	2.9