Comparisons of the isokinetic extension and flexion strength between light and heavy weight class Ssireum athletes

This study was conducted to compare the difference between left and right extension and flexion isokinetic muscular strength of the knee, shoulder, and trunk to compare absolute and relative strength in light- and heavy weight Ssireum athletes. Fourteen professional Ssireum athletes were divided into the light (Taebaek and Geumgang) and heavy (Halla and Baekdu) groups according to the body weight. Anthropometric measurements and isokinetic strength (knee: 60º/sec, shoulder: 30.2º/sec, and trunk: 30.2º/sec) were assessed for the absolute and relative peak torque values. Left (227.6±48.7 vs 247.0±23.1 Nm, p=0.05) and right knee (233.7±32.0 vs 266.1±20.5, p=0.05) extension strength in absolute values were significantly different between the groups. Trunk’s extension (318.7±37.9 vs 351.2±57.4 Nm, p=0.03) and flexion (249.8±33.0 vs 302.1±42.4 Nm, p=0.03) strength also showed significant difference between the groups. Significant differences were observed for all relative values except for the left knee and trunk flexion. As for the flexion and extension strength ratios, the shoulder extension to flexion ratios of the light group was 1.32 (p=0.02) times and the heavy group was 1.01–0.98 (p=0.34). The trunk extension strength was 3.6 times that of the body weight in the light group and 2.8 times that of the body weight in the heavy group. Heavy Ssireum athletes’ absolute flexor peak torques were higher in the knee and trunk than in the light athletes. Also, the weight per weight of light athletes had relatively higher strength than the heavy athletes. In addition, the muscle strength ratio was higher in the light athletes. This study suggests that isokinetic strength is different in heavy and light weight class Ssireum athletes.

Key words: Isokinetic Strength, Knee, Trunk, Shoulder, Ssireum

INTRODUCTION

Ssireum or Korean wrestling, a typical folk sport in Korea, is a sport won by throwing down the opponent onto the sand within four minutes 1). The competition which takes about 2 minutes on the average should win two out three or three out five game out of the total games requires significant amount of strength and endurance to win the game 2). It is vital for a Ssireum player to maintain their balance before breaking the opponent’s balance as well as maintain the proprioceptive sense and muscular balance to win the game 3). These physical conditions affect not only the performance but also prevent muscular joint damage. Sports competitions such as Ssireum are likely to lead to physiological injuries due to the close-contact competitive nature of the sport between the athletes. According to a study, 57% of college wrestling athletes reported of injuries, especially injuries related to the waist area 4). Comparatively higher Ssireum related injury rate has been reported through several epidemiological analysis.

First, the lower body should be maintained at low
center of gravity such as in squat motion and the waist should be remained as bent position. While the competition between the players with relatively high body weight and physique is continued, the major joints of the upper limbs, lumbar, and lower limbs constantly maintain dynamic state of tension. Such tension upon the joint is also maintained even during training, leading to one of major causes of overtraining syndrome. Regardless of the type of sport, injuries in profession athletes lead to increased risk of discontinuity in the athlete’s professional life as well as deterioration of the athlete’s performance. Due to such reasons, training programs for injury prevention are being implemented in various sports developed countries. Generally, abnormal ratio of the quadriceps femoris to the hamstring strength has been known to be related to the cause anterior cruciate ligament and meniscus injuries. Moreover, stable lumbar strength requires greater extension strength than the flexion strength of the femoral region. In a combat sport such as Ssireum or Judo, balanced muscular strength of the knee joint is strongly recommended. Adequate balance between the antagonistic and agonistic muscular strength should be obtained for injury prevention.

However, most of previous researches have been focused on popular sports such as soccer, basketball, volleyball, and very few studies have been conducted on speculative or weight-classified athletes. Despite the fact that a number of studies have been conducted on various athletes, studies on Ssireum with a small number of professional athletes have rarely been conducted. Furthermore, studies on Ssireum with analysis of the upper body, trunk, and lower body correlation analyses have rarely been conducted with the purpose of analyzing conditioning of profession athletes. In addition, although muscular strength seem to be proportional to muscle mass and body weight, muscle strength does not seem to increase proportionally with increased body weight at certain point. Therefore, it is necessary to compare and analyze competition performance between low-weight class athletes with high weight-class athletes. This study compared absolute values of the flexor/extensor muscular strength, relative strength values in function of body weight, and muscular ratios between flexor and extensor muscular strength of three different joints. By analyzing the differences between the low-weighted and high-weighted athletes and their characteristics, suitable training program for the Ssireum athletes could be developed accordingly. Therefore, the purpose of this study was to compare light- and heavy-weight Ssireum athletes for their muscular strength for appropriate training according to their physique level.

METHODS

Participants

This study was conducted with 28 Ssireum or Korean wrestling athletes. The athletes were divided into light group composed of Taebaek (≤80 kg) and Geumgang (80.1 – 90 kg) classes, and heavy group composed of Halla (90.1 – 105 kg) and Baekdu (≥105.1 kg) classes. Based on the purpose of the study, the athletes were divided into two body weight classes. The light group consisted of seven athletes of Taebaek and Kumkang body weight classes, and the heavy group consisted of seven athletes of Halla and Baekdu body weight classes. Before the assessments were conducted, medical and surgical histories of the participants were obtained. Athletes with medical or surgical history were excluded from the study. In order to minimize assessment error, questionnaire-based history assessment were conducted upon visit to the clinic. In addition, anthropometric measurements were performed prior to the isokinetic strength testing.

Anthropometric measurement and body composition

Only light meal was allowed prior to the assessment. Alcoholic and large amount of non-alcoholic beverage consumption was restricted due to influence of fluid to body fat and muscle mass. Height was measured using an extensometer and the results were recorded to one decimal point and in centimeter (cm). Body weight and body composition were measured using an impedance equipment (Inbody 7.0, Korea). Before measuring for body composition, hands and feet were wiped of any contamination with alcohol and electrolyte liquid damped tissue provided by the manufacturer to minimize any error caused by dried skin.

Isokinetic test

The isokinetic strength testing equipment Cybex 770 and Humac norm software (HUMAC NORM,