

## Status of body symmetries of youth judokas in -73kg category

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### 1. Introduction

Conventional anthropometry is the most known and used method for assessing the dimensions of body segments (Heyward & Wagner, 2004), and it is also often used in judo (Franchini, Del Vecchio, Matsushigue, & Artioli, 2011; Katralli & Goudar, 2012). The progress of technology and application of 3D body scanners has taken anthropometry research to a new direction as those methods have become contactless, fast and above all, accurate (Simmons & Istook, 2003; Zhang, et al., 2014) and are increasingly widely used in judo (Šimenko & Vodičar, 2015; Šimenko, 2015a,b). Body dimensions play an important component in weight-sensitive sports (Clarys, Geelen, Aerenhouts, Deriemaeker, & Zinzen, 2011), therefore 3D analysis can also be useful in determining body asymmetries which can lead to occurrence of injuries (Šimenko & Vodičar, 2015). The present study seeks to examine the status of the body symmetries in youth judokas in the under 73kg category.

### 2. Methodology

Ten youth Slovenian judokas participated in this study, 5 with 1.Dan and 5 with 1.Kyu belt degree (age:  $17.28 \pm 1.46$  years; height:  $177.53 \pm 3.71$  cm; weight:  $73.86 \pm 3.01$  kg), that are competing in under 73 kg category in cadet and/or junior age category in domestic and international tournaments. Two of them were left hand dominant and eight of them were right hand dominant. 3D anthropometric measurement of judokas body was performed by the 3D body scanner NX-16 ([TC]<sup>2</sup>, Cary, North Carolina). The NX-16 utilizes a non-invasive scanning method to produce a true-to-scale 3D body model in 8 seconds, which uses photogrammetry technology (white light) with 32 cameras to produce raw photonic point cloud data 3D body image. That 3D cloud data image allows for automatic landmark recognition as well as electronic tape measurements. Before measurements full calibration of the NX-16 scanner was made, with the acceptable range of the accuracy of circumferences standard deviation of 0.577 mm. Subjects were instructed to remove all jewelry and clothes. They entered the scanner barefooted and in form-fitting bright color underwear. They stood in a standardized position, with their feet located on landmarks on the scanner's floor (feet set straight, not inwards or outwards), grabbing the handles inside of the scanner with a natural standing posture (shoulders not elevated, elbows stretched, upright position of the back, chin slightly lifted). A 3D Body Measurement System Version 7.4.1 software was used to create the initial point cloud that was then processed into a 3D body model from which customized measurements could be extracted. A multi-scan option with three consecutive scans was used to obtain the data which gave us one merged file with means of all three consecutive scans. Scanning of three consecutive scans lasted 24 s and subjects were instructed to be still as much as possible. With software we extracted values of 15 paired variables: left (L) and right (R) armscye girth, L-R straight arm length, L-R upper arm girth, L-R elbow girth, L-R forearm girth, L-R wrist girth, L-R side height waist to floor, L-R outside leg length, L-R thigh length, L-R thigh girth, L-R mid-thigh height, L-R mid-thigh girth, L-R knee height, L-R knee girth and L-R calf girth. Data were analyzed

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with the SPSS 22.0 software for Windows. For determination of differences in symmetries we used a two-paired t-Test with statistical significance set at  $p \leq 0.05$ .

### 3. Results

Statistically significant differences between right and left variables were elbow girth (EGR, EGL)  $t(9) = 4.08$ ,  $p = 0.003$ , forearm girth (FGR, FGL)  $t(9) = 2.84$ ,  $p = 0.019$ , thigh girth (TGR, TGL)  $t(9) = 3.88$ ,  $p = 0.004$ , mid-thigh girth (MTGR, MTGL)  $t(9) = 5.81$ ,  $p = 0.000$  and calf girth (CGR, CGL)  $t(9) = 2.45$ ,  $p = 0.037$ . Variables that are not statistically significant, but are closest to the  $p \leq 0.05$  limit were knee height (KHR, KHL)  $t(9) = 2.00$ ,  $p = 0.077$ , mid-thigh height (MTHR, MTHL)  $t(9) = 2.08$ ,  $p = 0.068$  and calf height (CHR, CHL)  $t(9) = 2.16$ ,  $p = 0.059$ . The rest of the variables were not statistically significant.

### 4. Discussion and conclusion

Results show that youth judokas in under 73kg category statistically differ in five of 15 selected variables and with three variables on the limit of significance. These results show that, in this weight category, some body asymmetries start to occur, which can significantly contribute to the occurrence of injuries if they develop excessively. Usually, asymmetries are consequences of extended lateral training that starts to occur in youth judokas, especially in those that start to compete internationally. Those judokas are starting to develop their *tokui-waza* (special technique), therefore, coaches should enforce the development of the bilateral execution of those techniques to increase the motor efficiency of judokas and consequently increase their technical-tactical solutions in fight and specially to reduce the possibilities of injuries occurring. All previously listed factors will help to reduce the dropout rate and contribute to a systematic development of youth athletes into senior judokas.

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