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Anthropological and fitness status of Croatian judoists

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Authors' contributions:

A Study design
B Data collection
C Statistical analysis
D Data interpretation
E Literature search
F Manuscript preparation
G Funds collection

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Summary

Study aim:	To assess databases of anthropological and fitness characteristics of Croatian judoists available at the Croatian Judo Federation.
Material/methods:	Six male and 8 female elite judoists, and a group of 17 male junior judoists were subjected to anthropometric measurements and fitness (motor and functional) tests, the latter group being examined twice, at the age of 11 and 14 years.
Results:	Three databases were overviewed: the most informative, designed at the Sports Diagnostic Centre of Zagreb University, another one developed in a research project "Follow-up of the changes in anthropological status of children aged 11-14 years in wrestling sports", and a field tests set up by the Expert Coaching Committee of the Croatian Judo Association. So far, only few Croatian judoists pass all test procedures but effort is made to expand the programme and to include all age and weight groups of Croatian judoists.
Conclusions:	Regular examinations of athletes with the use of those databases should improve Croatian judo results thus reducing the gap between the Croatian and world judo achievements.
Key words:	Judo • Diagnostics • Anthropological status • Fitness status

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INTRODUCTION

Outstanding sport achievements are rare and require much effort and commitment. Many athletes strive to accomplish them, to break through various kinds of human limits, but only a few are successful. And their successes are ever more dependable on recent advances in sport training technologies and scientific findings. Due to them, mistakes or coincidences are minimised. Thus, behind every prominent sport achievement, either individual or team, there is a team of experts and a thoroughly elaborated training programme. Individualisation of a training programme depends on an insight the coach can get into an athletes' actual state of physical and sport fitness and on the data obtained from regular monitoring during the process of sport preparation. A proper choice of tests should provide diagnostic insights into the morphological, motor and functional components of athletic fitness. The same or a modified battery of tests can be used at various points in time, thus enabling a follow-up of changes in the anthropological status of athletes. Such a way of monitoring can be applied either in sport clubs (in that case modified field tests, adjusted to working conditions are needed) or in well equipped diagnostic centres. In both instances the measurements should be conducted by well trained persons.

Such an approach to planning and striving for sport achievements has not yet been fully adopted in Croatia. A lack of personnel trained and motivated for assessing fitness and preparedness of judoists, is obvious due to insufficient financial input to sport diagnostic procedures in laboratories. Thus, there is no opportunity to test a wide range of judoists and modern diagnostic procedures are rarely applied to Croatian judo.

The aim of this study was to assess the status of basic motor abilities considered important in the hierarchical structure of performance in judo. The results of the study might be used as a basis for a better planning of sport training and strategic development of judo in Croatia.

MATERIAL AND METHODS

Two groups of judoists participated in the study: male ($n = 6$) and female ($n = 8$) elite judoists, and 17 male junior judoists. The elite judoists aged 18 – 26 and 14 – 24 years, respectively, the juniors aged 11 years at the beginning and were re-examined 3 years later.

Three groups of tests were applied, the majority of which measured maximal strength and strength endurance, the most important features for achieving success in a judo contest [1].

1. A battery of 16 tests designed at the Sports Diagnostic Centre of Zagreb University which included tests for motor and functional abilities. Motor abilities: sit-ups in 60 s (SUP; assessing the dynamic strength endurance of abdominal muscles), back extension hold (BEH; static muscular strength endurance of the back), squats in 60 s (S60; dynamic strength endurance of legs), bench press with 70% (male) or 50% (female) of body mass (BP70/50; dynamic strength endurance of chest and arm muscles), 300 yard run (300Y; speed endurance), side steps (SIS; agility), 20 m sprint (20MS; speed), squat jump (SQJ; power, jumping ability), maximal countermovement jump (CMJ; power, jumping ability), medicine ball throwing from a lying position (MBL; power, throwing ability), hand tapping (PLT; speed of alternate hand movements), cutting (CUT; speed of alternate leg movements), sit-and-reach (SAR; flexibility of the back and thighs, shoulder circumduction with a bar (SCB; shoulder flexibility) and one functional ability – relative oxygen uptake (VO_2).
2. Another battery of 16 items contained anthropometric measurements, and motor and functional tests. That battery included 11 standardised tests used school system of physical education and was applied to junior judoists*. The following variables were measured: body height (BH), body mass (BM), forearm circumference (CFA), upper arm skinfold (SFA), relative body fat content (F%; elite judoists only) and fitness tests: obstacle course backwards (OCB; co-ordination), straddle sit-and-reach (SAR; flexibility), hand tapping (PLT; speed of alternate hand movements), standing broad jump (SBJ; strength, jumping ability), sit-ups in 60 seconds (SUP; dynamic strength endurance), pull-up hang (PHT; static strength endurance), 6-min run (R6) and 5 more variables aimed at assessing the basic and the specific motor status: agility on the floor (AOF; co-ordination of the whole body), side steps (SIS; agility), push-ups in 60 s (PU60; dynamic arm strength endurance), squats in 60 s (SQ60; dynamic leg strength endurance) and a specific judo test assessing general endurance – as many series of various throws + two push-ups in 90 s (T2PU90).

* The data were obtained within the research project "Follow-up of the changes in anthropological status of children aged 11-14 years in wrestling sports"

Table 1. Motor and functional abilities and anthropometric characteristics of male and female elite judoists.

Variable	Men (n = 6)	Women (n = 8)
Age (years)	20.7 ± 3.2 (18 – 26)	18.1 ± 3.8 (14 – 24)
F%	12.0 ± 1.2 (10.4 – 13.9)	16.6 ± 4.3 (9.5 – 21.5)
VO ₂ (ml/min/kg)	58.7 ± 2.6 (55.5 – 61.7)	47.7 ± 5.3 (41.6 – 56.9)
SUP	58.0 ± 5.9 (51 – 65)	54.5 ± 4.2 (51 – 64)
BEH	82.0 ± 13.6 (68 – 98)	106.9 ± 30.6 (61 – 157)
SQ60	54.5 ± 5.4 (46 – 60)	49.1 ± 3.2 (43 – 53)
BP70/50	26.7 ± 5.5 (20 – 35)	15.3 ± 5.3 (5 – 23)
300Y	59.4 ± 2.4 (56.8 – 63.1)	69.0 ± 4.7 (62.5 – 77.8)
SIS	7.8 ± 0.4 (7.2 – 8.2)	9.4 ± 0.9 (8.4 – 11.1)
20MS	3.5 ± 0.1 (3.3 – 3.6)	4.0 ± 0.2 (3.8 – 4.4)
SQJ	44.3 ± 5.0 (38.9 – 51.5)	32.4 ± 4.4 (26.6 – 38.9)
CMJ	58.3 ± 5.4 (51.0 – 66.2)	40.8 ± 4.3 (34.2 – 48.0)
MBL	94.3 ± 7.6 (83.7 – 104.0)	54.0 ± 9.1 (41.3 – 63.7)
PLT	40.1 ± 2.1 (37.3 – 42.7)	34.0 ± 4.4 (30.3 – 42.0)
CUT	30.7 ± 1.5 (28.3 – 32.3)	27.9 ± 3.4 (23.3 – 33.7)
SAR	14.4 ± 9.0 (2.0 – 24.9)	15.2 ± 4.2 (11.8 – 24.6)
SCB	82.5 ± 24.3 (47.7 – 115.8)	76.3 ± 13.4 (60.7 – 94.3)

Legend: VO₂ – Relative oxygen uptake; SUP – Sit-ups in 60 s; BEH – Back extension hold; SQ60 – Squats in 60 s; BP70/50 – Bench press with 70 or 50% of body weight for male and female judoists, respectively; 300Y – 300 yards running; SIS – Side steps; 20MS – 20 m sprint; SQJ – Squat jump; CMJ – Maximal counter-movement jump; MBL – Medicine ball throwing from lying position; PLT – Hand tapping; CUT – Cutting; SAR – Sit-and-reach; SCB – Shoulder circumduction with a bar; F% – Body fat percentage.

Table 2. Anthropological and fitness status of male judoists (n = 17) at the age of 11 and 14 years.

Variable	11 years	14 years
BH (cm)	155.5 ± 5.9 (146.8 – 169.2)	171.3 ± 6.4 (160.8 – 181.0)
BM (kg)	48.5 ± 10.4 (34.2 – 69.0)	62.0 ± 12.1 (42.0 – 87.0)
CFA	22.2 ± 2.6 (18.5 – 28.5)	25.1 ± 2.8 (20.5 – 30.2)
SFA	12.8 ± 5.0 (5 – 21)	10.4 ± 4.2 (6 – 24)
OCB	15.6 ± 3.3 (7.9 – 21.1)	11.8 ± 3.2 (7.1 – 18.5)
SAR	55.9 ± 7.8 (35 – 66)	63.7 ± 4.9 (53 – 74)
SBJ	167.1 ± 16.9 (132 – 206)	196.7 ± 27 (4 (157 – 240)
PLT	26.9 ± 2.9 (22 – 32)	30.3 ± 3.2 (27 – 37)
PHT	20.8 ± 11.3 (1.0 – 39.5)	43.6 ± 19.0 (12.0 – 81.0)
SUP	37.9 ± 6.0 (26 – 48)	47.3 ± 7.9 (30 – 57)
AOF	22.6 ± 3.7 (16.0 – 27.3)	17.9 ± 5.4 (12.0 – 27.5)
SIS	11.1 ± 0.9 (9.9 – 13.1)	10.0 ± 1.1 (7.9 – 12.0)
T2PU90	12.0 ± 2.1 (10 – 16)	14.1 ± 2.9 (10 – 20)
PU60	16.9 ± 10.9 (6 – 47)	32.4 ± 14.9 (10 – 61)
S60	42.5 ± 7.1 (28 – 52)	52.3 ± 5.2 (41 – 61)
R6	1072 ± 126 (790 – 1300)	1328 ± 134 (1029 – 1520)

Legend: BH – Body height; BM – Body mass; CFA – Forearm circumference; SFA – Upper arm skinfold; OCB – Obstacle course backwards; SAR – Straddle sit-and-reach; PLT – Hand tapping; SBJ – Standing broad jump; SUP – Sit-ups in 60 s; PHT – Pull-up hang; R6 – 6 min running; AOF – Agility on the floor; SIS – Side step; PU60 – Push-ups in 60 s; SQ60 – Squats in 60 s; T2PU90 – As many series of various throws + two push-ups in 90 s.



3. A group of standardised yet simple field tests for judo designed by the Expert Coaching Committee of the Croatian Judo Association in order to establish a reference database. That battery included the following tests: over-grip pull-ups and rope climbing for assessing relative strength of arms and the back, bench press for assessing absolute/maximal strength of arms, squat for assessing absolute/maximal strength of legs, dead lift for assessing power of the back and legs, sit-ups with weight for assessing muscular strength endurance and 1500-m run for assessing cardio-respiratory endurance.

RESULTS AND DISCUSSION

Table 1 shows fat content and physical fitness indices of Croatian male and female elite judoists. It should be emphasised that these data are the first entries in the National judo database and represent the current reference values i.e. "model characteristics" of Croatian judoists.

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Table 2 shows basic somatic features and a set of physical fitness indices recorded in a longitudinal study on young judoists aged 11 years at the beginning and re-examined 3 years later. A comparison of these results with those recorded for control subjects, either untrained or involved in sport activities other than judo, was reported elsewhere [2,3,4].

The National database of the anthropological field testing results of judoists, initiated by the Expert Coaching Committee of the Croatian Judo Association, is still under construction because such extensive measurements are a novelty in Croatian judo. That database, when consisting of a large number of young judoists, would facilitate the future guiding of judo sport development and sport preparation programming for judoists of various ages and quality levels. Such an approach should improve Croatian judo results thus making the gap between the Croatian and world judo achievements less pronounced.