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SPORTS ANTHROPOLOGICAL STUDIES OF ADOLESCENT KARATEKA AND JUDOKA IN COMPARISON

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ABSTRACT

The approach of the present study was to look for differences in body development in children practicing karate or judo. 50 children between the age of 7 and 16 years were measured for this study. Parnell's and Heath and Carter's somatotypes were used as well as the German constitution schools of Conrad as well and Knussmann. The influence on higher muscle development through practice of these martial arts cannot be denied, although no significant differences between the martial arts were found.

Only with a version of Conrad's checkerboard pattern graph specially tailored for children, we could work out impressive differences between the sports. Differentiated according to age groups, it is noticeable that the male judoka make the most significant development from the hypoplastic area towards hyperplastic with increasing age.

Keywords: *sports anthropometry; adolescents; somatotypes; judo; karate*

INTRODUCTION

While numerous studies have already been available for adult athletes from different martial arts from our working group [6, 13, 14, 22, 23] or other researchers [2, 3, 7, 15, 19, 25, 26], such data have so far been missing, especially for children and adolescents [16].

From the many years of training experience of both authors in various martial arts disciplines, the consideration arose to reduce this obvious gap with the present study.

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METHODOLOGY

For these reasons, 34 boys and 16 girls aged 7–16 years practising judo and 26 boys and 24 girls aged 7–16 years practising karate were measured in various clubs of the city of Frankfurt am Main. In all cases, the written consent of the clubs, coaches and parents was obtained after detailed information. In addition, a contact person of the children was always present as a guardian. The data collection took place during 2018–2019.

Anthropometric data and computed constitutional and somatotypical parameters in this paper correspond to international standards [16, 20, 21, 24, 28]. The analysis of differences was tested by ANOVA.

Somatotyping according to Parnell [17, 18] and Heath & Carter [8] as well as the constitution type determination according to Conrad [4, 5] and Knussmann [10–12] were performed.

Hebbelinck and Borms [9] have extended the table for the mesomorphism values and created a correction factor for the endomorphism of children to accommodate their increased body fat as Heath and Carter's system is based on adult persons.

The athletes examined in the present study were divided into two age groups (7–11 years and 12–16 years).

RESULTS

With regard to somatotyping according to Parnell [17, 18] and Heath & Carter [8], there were no statistically significant differences between the sports (Tables 1–3).

With regard to the influence of training parameters, only male judoka had a negative significant, albeit weak, relationship between endomorphism values according to Parnell [17, 18] and the number of training months ($r = -0.32$, $p \leq 0.32$) as well as the number of training sessions per week ($r = -0.37$, $p \leq 0.05$).

Only in male judoka, there were significant ($p \leq 0.05$) correlations between Heath and Carter endomorphism [8] and the number of training months ($r = -0.3$) and training sessions per week ($r = -0.35$).

Table 1. Age, gender and sport differentiation of endomorphism values according to Parnell [17, 18] and Heath and Carter [8].

Sports discipline and age group	n	Endomorphy boys		N	Endomorphy girls	
		Parnell	Heath/ Carter		Parnell	Heath/ Carter
Judo	34	2.7±1.2	2.6±1.7	16	3.3±1.2	3.3±1.6
Age 7–11 years	24	2.3±0.6	2.0±0.8	12	3.1±1.2	3.1±1.7
Age 12–16 years	10	3.8±1.7	4.0±2.5	4	4.0±0.9	4.1±1.4
Karate	26	2.8±1.3	2.7±1.6	24	3.6±1.0	3.7±1.3
Age 7–11 years	18	2.6±1.3	2.4±1.6	10	3.3±1.4	3.2±1.7
Age 12–16 years	8	3.3±1.1	3.3±1.4	14	3.8±0.6	4.1±0.9

Table 2. Age, gender and sport differentiation of mesomorphism values according to Parnell [17, 18] and Heath and Carter [8].

Sports discipline and age group	n	Mesomorphy boys		n	Mesomorphy girls	
		Parnell	Heath/ Carter		Parnell	Heath/ Carter
Judo	34	4.8±0.7	4.9±1.0	16	4.0±0.9	4.5±0.6
Age 7–11 years	24	4.8±0.6	4.6±0.7	12	4.1±0.8	4.5±0.6
Age 12–16 years	10	4.7±0.9	5.6±1.2	4	3.6±1.3	4.5±0.7
Karate	26	4.9±0.8	5.2±0.8	24	3.6±1.3	4.3±1.3
Age 7–11 years	18	4.9±0.9	5.1±1.0	10	3.7±0.9	4.2±0.7
Age 12–16 years	8	5.1±0.7	5.4±0.5	14	3.6±1.5	4.3±1.6

Table 3. Age, gender and sport differentiation of ectomorphism values according to Parnell [17, 18] and Heath and Carter [8].

Sports discipline and age group	n	Ectomorphy boys		n	Ectomorphy girls	
		Parnell	Heath/ Carter		Parnell	Heath/ Carter
Judo	34	3.7±1.3	3.3±1.2	16	3.3±1.3	2.8±1.2
Age 7–11 years	24	4.1±1.2	3.7±1.0	12	3.3±1.5	2.9±1.4
Age 12–16 years	10	2.9±1.4	2.6±1.5	4	3.3±0.5	2.8±0.5
Karate	26	3.8±1.3	3.3±1.3	24	3.6±1.3	3.2±1.3
Age 7–11 years	18	3.8±1.3	3.4±1.3	10	3.7±1.6	3.2±1.6
Age 12–16 years	8	3.7±1.5	3.2±1.5	14	3.5±1.1	3.1±1.0

Table 4. Age, gender and sport differentiation of plastic and metric values according to Conrad [4, 5].

Sports discipline and age group	♂ n	Plastic index		♀ n	Metric index	
		Boys	Girls		Boys	Girls
Judo	34	–1.1±3.7	–0.3±2.4	16	7.7±1.2	7.3±1.0
Age 7–11 years	24	–3.0±1.6	–1.3±1.6	12	7.9±0.9	7.4±1.1
Age 12–16 years	10	3.4±3.3	2.8±1.7	4	7.2±1.6	7.0±0.8
Karate	26	–0.8±2.8	2.0±2.3	24	7.8±1.2	7.5±1.6
Age 7–11 years	18	–2.2±1.5	–0.4±1.0	10	7.7±1.0	7.5±1.9
Age 12–16 years	8	2.4±2.4	3.6±1.2	14	8.1±1.6	7.6±1.4

Table 5. Age, gender and sport differentiation of microsomia-macrosomia and pykno-leptomorphism values according to Knussmann [10–12].

Sports discipline and age group	♂ n	Pykno-leptomorphy		♀ n	Micro-macrosomia	
		Boys	Girls		Boys	Girls
Judo	34	–2.9±1.2	–1.4±1.2	16	4.3±1.9	3.4±1.6
Age 7–11 years	24	–2.6±0.9	–1.2±1.1	12	4.1±1.8	3.5±1.7
Age 12–16 years	10	–3.8±1.3	–2.1±1.4	4	4.7±2.3	3.4±1.3
Karate	26	–3.4±2.3	–1.9±1.6	24	3.9±1.3	4.0±1.3
Age 7–11 years	18	–3.2±2.1	–1.5±1.7	10	3.9±1.4	3.7±1.6
Age 12–16 years	8	–3.7±2.8	–2.3±1.5	14	4.0±1.3	4.2±1.1

The distribution of the examined athletes (Table 4) in Conrad's checkerboard pattern graphic [4, 5] can be found in Fig. 1 and 2.

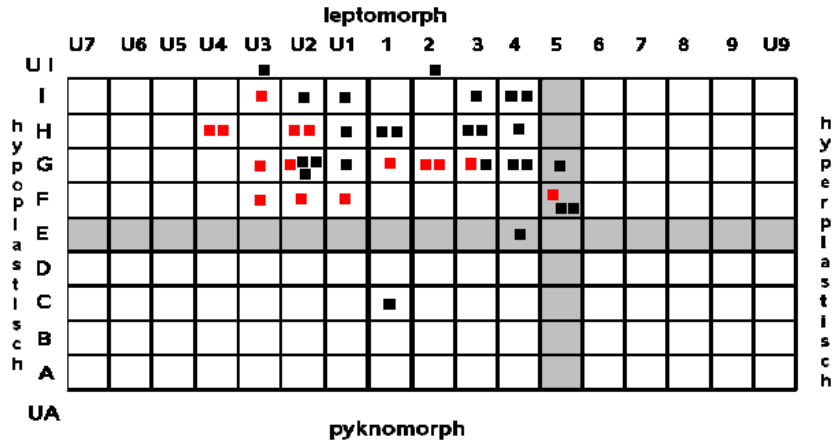

Figure 1. Extended checkerboard pattern graphic of the girls (red square 1 judoka each, black square 1 karateka each).

The female judoka (red) are more in the hypoplastic range than the female karateka (black). Both can primarily be categorized as leptomorphic. The sport has a highly significant influence on the metric index of girls ($p \leq 0.001$). There were no significant differences in the plastic index. None of the training variables correlated significantly with the metric index or the plastic index. It can be seen that the original classification according to Conrad [4, 5] would no longer have been sufficient for a detailed subdifferentiation, since all children to the left of column 1 would at best have been classified under column U1.

This also applies to the boys. A large part of the male judoka (red) is located in the leptomorph-hypoplastic area. Above all, the fields U2/G and U3/H with three judoka each and especially U2/I with six athletes must be highlighted.

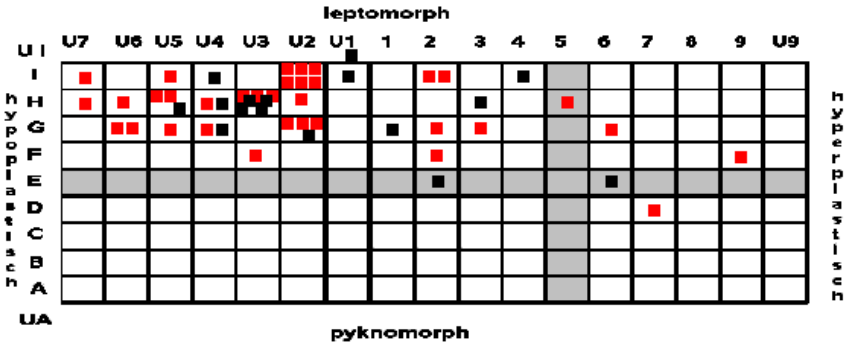

Figure 2. Extended checkerboard pattern graphic of the boys (red square 1 judoka each, black square 1 karateka each).

The majority of the karateka (black) also rank in the ultra-leptomorphic range (U5-U2, G-I) of the diagram, comparable to the judoka.

With regard to Knussmann's typognosis system [10–12], there were no significant differences according to the sport (Table 5). There was a significantly negative relationship only between pycnomorphy and the duration of the training sessions.

DISCUSSION

In principle, it must be noted that significant differences between the sports in all the four investigated type systems could only be detected in Conrad's system [4, 5].

On the one hand, the constitutional type system according to Conrad [4, 5] has the clear disadvantage that it only allows exact divisions. Values and thus

also constitution types cannot lie between two points, as it is possible in the somatochart at Heath and Carter [8].

Another problem is that Conrad's classification diagram [4, 5] was not created for children.

Although the constitutional index values can be determined exactly, there are problems for the differentiated representation in the classic checkerboard pattern diagram, since a large part of the children is located in the ultra-hypoplastic range.

However, this does not allow an exact constitutional picture, and the differences between the children cannot be clearly worked out in the original diagram, as the original diagram only extends to U1. For this reason, it makes sense to extend this diagram into the hypoplastic area in accordance with the distance determination of the individual classes made by Conrad [4, 5] himself. This is done at the same intervals as Conrad [4, 5] had specified in his classification for the plastic index.

With this modification, we were able to work out impressive differences between the sports.

Differentiated according to age groups, it is noticeable that the male judoka make the most significant development from the hypoplastic area towards hyperplastic with increasing age.

In Knussmann's system [10–12], there were no significant differences between the sports.

With regard to the positioning in the somatochart of Heath and Carter [8], it is noticeable that the male karateka and judoka are approximately in the area where high school wrestlers are also to be found [1].

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