applied sciences

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Physical and Morphological Differences between Young Elite Taekwondo and Karate Players

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Abstract: The different nature of taekwondo and karate actions involves sport-specific actions with different physical demands and a typical morphological profile. The aims of the current investigation were to compare body composition and strength factors between young karate and taekwondo players and to investigate the body proportionality of each discipline. Twenty-five young taekwondo fighters (18 boys and 7 girls) and twenty-eight karate athletes (19 boys and 9 girls) volunteered for the study. A battery of anthropometric measurements were obtained for each individual (heights, weight, girths, lengths, and sum of skinfolds). Upper-body and lower-body strength were determined using the handgrip test and counter-movement jump test, respectively. In boys, significantly greater Σ 6 skinfold, wrist, and maximum thigh girth measurements were observed in taekwondo athletes ($p < 0.05$; $d > 0.59$), while karate competitors revealed larger muscle mass values ($p < 0.05$). Nevertheless, girls only showed significant differences with respect to anterior-posterior chest breadth, age at peak height velocity (APHV), and head girth ($p < 0.05$). Proportionality analysis revealed that both sexes presented lower skinfold thicknesses and breadths than the normal population. Therefore, in both disciplines, similar profiles were determined, but young karate athletes seemed to exhibit a tendency towards a more robust and compact profile with greater body strength.

Keywords: martial arts; body composition; strength; proportionality

Citation: Martínez-Rodríguez, A.; Alacid, F.; Cuestas-Calero, B.J.; Matłosz, P.; López-Plaza, D. Physical and Morphological Differences between Young Elite Taekwondo and Karate Players. *Appl. Sci.* **2023**, *13*, 10109. https://doi.org/10.3390/app131810109

Academic Editors: Wojciech J. Cynarski, Tadeusz Ambrozy, Łukasz Rydzik, Wojciech Czarny and Wiesław Błach

Received: 8 August 2023
Revised: 1 September 2023
Accepted: 5 September 2023
Published: 8 September 2023

1. Introduction

Body composition is an important determinant of athletes' performance, especially in individual sports such as taekwondo and karate [1–3]. Over the last decades, investigations regarding the relationship between certain anthropometry attributes and performance have increased [4–6]. In martial arts, individual anthropometric parameters and somatotype components can not only be used to identify the representative morphological profile of an athlete but also for talent identification purposes or the assessment of training programs' efficacy [7,8]. Taekwondo emphasizes lower body actions using kicks and dynamic footwork [1], while karate focuses on powerful strikes and upper body techniques [3,9]. Despite technical differences, common anthropometric attributes might be observed in athletes of both disciplines.

Typically, martial arts competitors exhibit higher values of body fat percentage, triceps, biceps, and abdominal skinfolds compared to individual sports athletes [7]. However, da Silva et al. [10] determined a negative association between total fat mass, body fat percentage, and karate-specific aerobic tests. Since martial arts players are often classified according to their body mass to minimize differences between competitors, maintaining a body weight relatively close to their fighting class via the control of body fat is paramount [8,11,12]. Furthermore, high lean body mass and arm circumference values have been identified as other determinants of optimal performance in mixed martial arts [8].

Previous studies have reported strong associations between fitness attributes and individual performance [13,14]. Although the level of overall physical fitness may be determined using field tests, specific assessments, especially with respect to power and strength, have allowed the identification of more accurate determinants for performance in martial arts [1,15]. The quick and powerful actions executed in taekwondo and karate require high muscular strength demands. Most successful martial arts players have typically exhibited greater force production in the upper and lower body and also greater anaerobic tolerance [9,12,16,17].

During puberty, the maximum development of physical attributes such as strength or aerobic power occurs around the age at peak height velocity (APHV). Furthermore, at this stage, physical fitness and morphological changes are highly dependent on biological maturity [18]. This process is usually very different from one individual to another in terms of tempo and timing, resulting in opponents of the same chronological age but uneven biological age. In recent years, the influence of age and developmental periods on performance has become a central topic in sports research [14,18]. Particularly in martial arts, where young athletes undergo rapid physiological and morphological changes, understanding these changes is pivotal [1–3].

Only a few studies have investigated the differences in morphology, strength, and power between taekwondo and karate players [9]. In addition, the influence of biological maturation on performance determinants in young martial arts competitors has never been taken into consideration. All these determinants might provide a more complete athlete profile for talent identification purposes from young ages in both disciplines. The current investigation might help bridge the literature's gap by investigating the differences in body composition and upper and lower body strength between young elite karate and taekwondo competitors. By focusing on this age group, the findings of the present research study might contribute valuable insights into their specific training needs and developmental trajectories. It is hypothesized that karate athletes could reveal greater upper body strength, dimensions, and muscle mass compared to taekwondo competitors. Therefore, the aims of the current investigation were to analyze the morphological and strength differences between young karate and taekwondo players and to compare their body proportionality to the normal population.

2. Materials and Methods

2.1. Participants

A total of 53 participants volunteered for the present investigation: 37 boys (18 taekwondo and 19 karate competitors) and 16 girls (7 taekwondo players and 9 karate players). The participant inclusion criteria for this study required the following: (a) training on a regular basis between 3 and 5 days per week; (b) training at least 1.5 h per day; (c) having training experience of more than 2 years; and (d) competing at the national level in the last year. Before the beginning of the investigation, a signed written informed consent form was required from the participants and their parents or legal guardians. In addition, any participant under pharmacological treatment or injury recovery was excluded from any assessment. Written informed consent was obtained from parents/guardians and participants according to the Helsinki Declaration, and the study's procedures were approved by the University Ethical Committee before the beginning of the test (No. UA-2019-04-09).

2.2. Procedures

A battery of anthropometric and physical fitness tests were performed on two separate days. Participants were required to maintain their normal pre-training diet and avoid caffeine ingestion and intense training sessions 24 h before testing. Anthropometric assessments were completed early in the morning to avoid any potential changes in body composition. Before the beginning of the physical fitness test, clear instructions with respect to proper tests procedures and a supervised warm-up were provided for all participants. Warm-up comprised 5 min of multidirectional running and joint mobility activities followed by 5 min familiarization with the materials and procedures of each test.

2.3. Anthropometric Measurement

All measurements were performed by a certified level 2 anthropometrist following the procedures and methods described by the International Society for the Advancement of Kinanthropometry (ISAK). Before the beginning of each testing session, all instruments were calibrated to prevent any potential measurement error. For the determination of heights (cm) and direct lengths (cm), a GPM anthropometer (Siber-Hegner, Zürich, Switzerland) was used, girths (cm) were measured using Lufkin W606PM (Lufkin, TX, USA), a metallic non-extensible tape, and the sum of 6 and 8 skinfolds (mm) was obtained using a Harpenden calliper (British Indicators, Surrey, UK). Each parameter was measured two or three times depending on whether the difference between the first two measurements was larger than 5% for the skinfolds and 1% for the other parameters. Fat mass percentages were estimated following the procedures defined by Slaughter et al. [19], whereas muscle mass percentages were determined using the equation of Poortmans et al. [20] for adolescents. To obtain the Z-scores of each parameter, the equation of the Phantom Stratagem defined by Ross and Marfell-Jones [21] was used. Test–retest reliability was examined using the intra-class correlation coefficient (ICC) and the coefficient of variation (CV), with values of 0.88 and 3.8%, respectively.

2.4. Maturity

Biological maturity was obtained using the procedures described by Mirwald et al. [18] and the age at peak height velocity (APHV) of the athletes relative to their current chronological age. Since APHV was considered a maturational benchmark reference (0 value) that is representative of the maximum stature development, the difference between APHV and chronological age was considered the maturity offset value. Thus, negative values indicated the years remaining until APHV, whereas positive values denoted the years past after APHV.

2.5. Physical Fitness Tests

For the determination of hand grip strength, a dynamometer, TKK 5105 (Takei Scientific Instruments Co., Ltd., Tokyo, Japan), was used. At maximum effort, participants performed a hand grip for at least 3 s while sitting in a chair with the elbow angled at 90° [22] under the supervision and encouragement of an instructor. The best of three attempts with each hand was considered for subsequent analysis. Three minutes of rest was provided to all competitors between efforts.

The countermovement jump test (CMJ) was used to examine lower body power according to the recommendations described by Temfemo et al. [23]. Before the jump, a countermovement until approximately 90° of knee flexion was permitted for participants. The athlete's contact time (s) and jump height (m) were registered using a Bosco platform (Bosco System, Barcelona, Spain). Only the best of three attempts with 3 min rest in between was taken into consideration for posterior analysis.

2.6. Statistical Analysis

All statistical analyses were performed using the Statistical Package for the Social Sciences v24.0 (SPSS Inc., Chicago, IL, USA). Measures of homogeneity and spread were described as mean ± SD. The Kolmogorov–Smirnov test and the Levene's test were used to investigate the hypotheses of normality and the homogeneity of variance, respectively. The difference between the mean values of different groups was examined using a *t*-test for independent samples, or the Mann–Whitney nonparametric test was used when the normality assumption of the data was rejected. The level of statistical significance was set up at $p < 0.05$. The effect size of the observed differences was analyzed using Cohen's d, and it was considered small when values ranged between 0.2 and 0.5, moderate when values ranged between 0.5 and 0.8, and large when the effect was >0.8 [24]. The calculation of statistical power ranged from 0.03 to 0.81 and from 0.04 to 0.94 for boys and girls, respectively.

3. Results

Table 1 summarizes the differences in anthropometric parameters, maturity status, and upper and lower body strength between male taekwondo and karate players. Significantly higher morphological values were identified in taekwondo players in terms of Σ 6 skinfold, wrist and maximum thigh girth measurements and also with respect to femur breadth and leg length ($p < 0.05$; $d > 0.59$). Conversely, the karatekas revealed superior MM% and anterior-posterior chest breadth than taekwondo players, with moderate effect sizes ($d > 0.7$).

Table 1. Differences in anthropometric parameters, maturity status, and upper and lower body strength between male taekwondo and karate players.

	Taekwondo		Karate			
	Mean ± SD	**95% CI**	**Mean ± SD**	**95% CI**	***p* Value**	**Cohen's *d***
Age (years)	14.02 ± 1.58	13.23–14.80	13.62 ± 1.86	12.72–14.51	0.48	0.23
APHV (years)	13.85 ± 0.56	13.57–14.13	13.77 ± 0.81	13.38–14.16	0.74	0.11
Maturity	0.14 ± 1.47	−0.59–0.87	−0.17 ± 1.67	−0.98–0.63	0.55	0.2
Weight (Kg)	57.52 ± 13.70	50.70–64.33	50.41 ± 9.25	45.95–54.87	0.07	0.61
Height cm)	164.77 ± 10.85	159.38–170.17	159.94 ± 9.90	155.17–164.71	0.17	0.47
Sitting height (cm)	84.81 ± 5.80	81.93–87.70	84.33 ± 7.44	80.75–87.92	0.83	0.07
Arm span (cm)	162.31 ± 21.46	151.64–172.98	162.24 ± 11.07	156.90–167.57	0.99	0
Σ 6 skinfolds (mm)	80.00 ± 36.02	62.09–97.91	61.08 ± 27.58	47.79–74.37	**0.04**	0.59
Σ 8 skinfolds (mm)	101.44 ± 48.94	77.10–125.78	77.33 ± 35.51	60.22–94.45	0.09	0.56
FM percentage (%)	19.87 ± 8.74	15.52–24.21	15.95 ± 6.98	12.59–19.32	0.14	0.49
MM percentage (%)	46.34 ± 2.33	45.18–47.50	47.74 ± 1.51	47.01–48.47	**0.04**	0.71
Right hand grip (kg)	21.74 ± 10.94	16.30–27.18	26.22 ± 10.89	20.80–31.63	0.23	0.41
Left hand grip (kg)	19.62 ± 10.84	14.23–25.01	23.03 ± 9.58	18.27–27.80	0.32	0.33
CMJ (cm)	28.80 ± 7.28	24.60–33.00	31.55 ± 7.04	28.16–34.94	0.28	0.38
Medial calf skinfold (mm)	14.15 ± 6.53	10.91–17.40	10.61 ± 5.13	8.13–13.08	0.07	0.6
Head girth (cm)	55.27 ± 1.43	54.56–55.98	54.56 ± 1.25	53.96–55.16	0.12	0.53
Relaxed arm girth (cm)	26.02 ± 4.23	23.92–28.13	24.58 ± 2.44	23.41–25.76	0.21	0.42
Flexed and tensed arm girth (cm)	28.59 ± 4.41	26.40–30.79	26.47 ± 2.58	25.23–27.71	0.08	0.59
Corrected arm girth (cm)	24.98 ± 4.28	22.85–27.11	23.41 ± 3.06	21.93–24.89	0.21	0.42
Forearm girth (cm)	24.02 ± 2.48	22.79–25.26	23.43 ± 1.93	22.50–24.35	0.42	0.27
Wrist girth (cm)	16.18 ± 1.48	15.44–16.92	15.19 ± 1.13	14.64–15.73	**0.03**	0.75
Chest girth (cm)	81.40 ± 9.21	76.82–85.98	79.99 ± 7.45	76.40–83.58	0.61	0.17
Waist girth (cm)	71.17 ± 7.77	67.31–75.03	67.95 ± 5.26	65.42–70.49	0.15	0.48
Hip girth (cm)	87.02 ± 9.84	82.12–91.91	83.46 ± 5.68	80.73–86.20	0.18	0.44
Max thigh girth (cm)	55.05 ± 7.26	51.44–58.66	49.52 ± 4.23	47.48–51.55	**0.01**	0.93
Thigh girth (cm)	47.56 ± 6.87	44.15–50.98	45.82 ± 3.38	44.19–47.44	0.33	0.32
Medial calf girth (cm)	34.02 ± 3.37	32.35–35.70	33.83 ± 6.19	30.85–36.82	0.91	0.04
Corrected thigh girth (cm)	29.58 ± 2.99	28.09–31.06	30.50 ± 5.69	27.76–33.25	0.54	0.2
Ankle girth (cm)	22.76 ± 2.18	21.67–23.84	21.73 ± 1.38	21.07–22.40	0.1	0.56
Leg length (cm)	79.96 ± 6.35	76.80–83.11	75.61 ± 5.99	72.72–78.49	**0.04**	0.71
Anterior-posterior chest breadth (cm)	14.52 ± 1.59	13.73–15.31	16.32 ± 3.11	14.82–17.82	**0.03**	0.73
Humerus breadth (cm)	6.69 ± 0.55	6.42–6.96	6.47 ± 0.38	6.29–6.66	0.17	0.46
Wrist breadth (cm)	5.29 ± 0.40	5.09–5.49	5.15 ± 0.36	4.98–5.33	0.29	0.36
Femur breadth (cm)	9.83 ± 0.71	9.48–10.18	9.26 ± 0.45	9.04–9.48	**0.01**	0.97
Ankle breadth (cm)	7.05 ± 0.63	6.74–7.36	6.98 ± 0.38	6.80–7.16	0.66	0.14
Hand breadth (cm)	7.43 ± 0.75	7.05–7.80	7.04 ± 0.57	6.77–7.31	0.08	0.58

CI: Confidence interval. Bold—significant difference ($p < 0.05$).

The comparison of anthropometric parameters, biological maturity, and the upper and lower body strength of female karate and taekwondo competitors is presented in Table 2. No significant differences were identified between disciplines except for maturity and head girth, observing significantly higher values and large effect sizes in taekwondo competitors ($p < 0.05$; $d > 1$). In addition, greater anterior-posterior chest breadth (cm) was determined in karate players ($p < 0.001$; $d = 1.87$).

Table 2. Differences in anthropometric parameters, maturity status, and upper and lower body strength between female taekwondo and karate players.

	Taekwondo		**Karate**			
	Mean ± SD	**95% CI**	**Mean ± SD**	**95% CI**	***p* Value**	**Cohen's *d***
Age (years)	13.40 ± 1.48	12.03–14.77	12.20 ± 1.09	11.36–13.04	0.08	0.92
APHV (years)	12.13 ± 0.31	11.84–12.42	11.78 ± 0.32	11.54–12.02	**0.04**	1.11
Maturity	1.24 ± 1.52	−0.16–2.65	0.39 ± 1.02	−0.40–1.18	0.2	0.66
Weight (Kg)	53.34 ± 11.63	42.59–64.10	46.42 ± 10.12	38.65–54.20	0.22	0.63
Height cm)	159.93 ± 12.80	148.09–171.77	153.57 ± 7.15	148.07–159.06	0.23	0.61
Sitting height (cm)	83.26 ± 6.29	77.44–89.08	84.10 ± 6.68	78.96–89.24	0.8	0.13
Arm span (cm)	162.34 ± 12.87	150.44–174.25	154.97 ± 7.77	148.99–160.94	0.18	0.69
Σ 6 skinfolds (mm)	85.43 ± 25.58	77.60–139.83	76.89 ± 27.62	55.65–98.12	0.54	0.32
Σ 8 skinfolds (mm)	108.71 ± 33.65	15.95–27.81	98.39 ± 38.40	68.87–127.91	0.58	0.29
FM percentage (%)	21.88 ± 6.42	37.57–41.04	21.13 ± 5.48	16.92–25.34	0.8	0.13
MM percentage (%)	39.30 ± 1.88	16.74–32.49	40.52 ± 3.44	37.87–43.16	0.42	0.44
Right hand grip (kg)	24.61 ± 8.52	15.40–28.12	18.91 ± 5.43	14.74–23.09	0.12	0.8
Left hand grip (kg)	21.76 ± 6.88	19.60–40.21	16.99 ± 6.35	12.10–21.87	0.17	0.72
CMJ (cm)	29.91 ± 9.82	24.60–33.00	26.08 ± 3.99	21.12–31.04	0.44	0.51
Head girth (cm)	55.21 ± 1.27	21.94–27.72	53.17 ± 1.59	51.94–54.39	**0.01**	1.42
Relaxed arm girth (cm)	24.83 ± 3.13	23.62–28.73	23.96 ± 3.77	21.06–26.86	0.63	0.25
Flexed and tensed arm girth (cm)	26.17 ± 2.76	20.15–24.43	24.64 ± 3.54	21.92–27.37	0.36	0.48
Corrected arm girth (cm)	22.29 ± 2.31	20.48–24.12	20.70 ± 2.53	18.75–22.65	0.22	0.66
Forearm girth (cm)	22.30 ± 1.97	13.66–15.74	21.99 ± 2.37	20.16–23.81	0.78	0.14
Wrist girth (cm)	14.70 ± 1.13	73.08–85.75	14.86 ± 0.87	14.19–15.52	0.76	0.15
Chest girth (cm)	79.41 ± 6.85	61.29–69.85	77.41 ± 8.07	71.21–83.61	0.61	0.27
Waist girth (cm)	65.57 ± 4.63	78.15–94.48	65.52 ± 6.96	60.17–70.87	0.99	0.01
Hip girth (cm)	86.31 ± 8.83	48.65–63.35	85.30 ± 8.46	78.79–91.81	0.82	0.12
Max thigh girth (cm)	56.00 ± 7.94	42.11–51.41	50.19 ± 6.78	44.98–55.40	0.14	0.79
Thigh girth (cm)	46.76 ± 5.03	30.45–35.66	44.52 ± 5.73	40.12–48.93	0.43	0.41
Medial calf girth (cm)	33.06 ± 2.82	25.98–30.62	34.22 ± 7.33	28.58–39.85	0.7	0.21
Corrected thigh girth (cm)	28.30 ± 2.51	19.89–23.06	29.91 ± 7.22	24.35–35.46	0.59	0.3
Ankle girth (cm)	21.47 ± 1.72	11.64–14.28	21.26 ± 1.26	20.29–22.22	0.78	0.14
Leg length (cm)	76.67 ± 7.20	70.01–83.33	69.47 ± 6.92	64.15–74.79	0.06	1.02
Anterior-posterior chest breadth (cm)	12.96 ± 1.43	5.65–6.35	15.93 ± 1.74	14.60–17.27	**<0.001**	1.87
Humerus breadth (cm)	6.00 ± 0.38	4.61–5.59	6.04 ± 0.29	5.82–6.27	0.79	0.13
Wrist breadth (cm)	5.10 ± 0.53	8.33–9.52	4.93 ± 0.50	4.55–5.32	0.53	0.32
Femur breadth (cm)	8.93 ± 0.64	5.60–6.80	8.64 ± 0.66	8.14–9.15	0.4	0.44
Ankle breadth (cm)	6.20 ± 0.65	12.78–16.36	6.53 ± 0.43	6.20–6.86	0.24	0.61
Hand breadth (cm)	6.86 ± 0.41	61.77–109.09	7.09 ± 0.39	6.79–7.39	0.27	0.58

CI: Confidence interval. Bold—significant difference ($p < 0.05$).

Figure 1 shows the anthropometric Z-Scores of males and females according to discipline. Boys exhibited lower skinfold thickness and breadths than the normal population in both karate and taekwondo. Similarly, the analysis of proportionality in girls revealed lower skinfolds and girths in the lower body, especially in karate players.

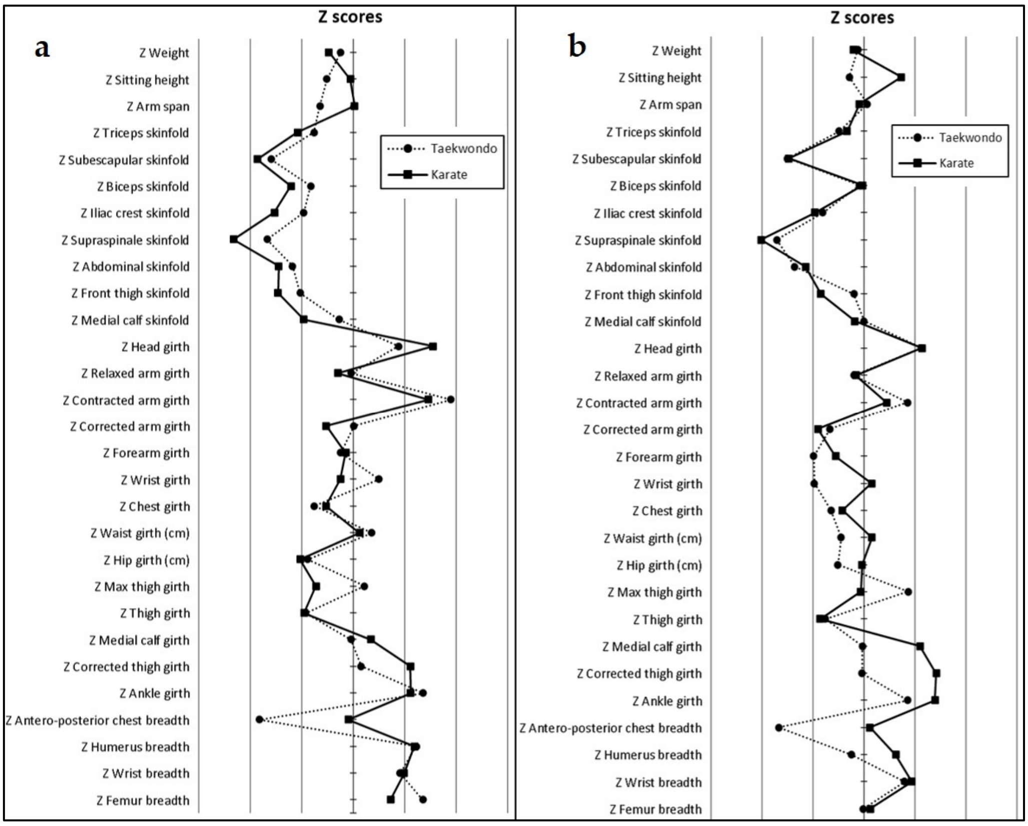

Figure 1. Anthropometric Z-Scores of males (**a**) and females (**b**).

4. Discussion

The purpose of the current study was to investigate the differences in body composition and in upper and lower body strength between young elite karate and taekwondo competitors. The main finding of this research was the significantly greater upper body dimensions of karatekas, especially with respect to muscle mass and chest girths in both boys and girls. Additionally, analyses of proportionality revealed leaner and more robust morphotypes as the typical anthropometric profile of karate and taekwondo players with respect to both sexes compared to the normal population. Since this is the first study to compare and analyze proportionality in successful mixed martial arts players, these data might provide normative data on morphological and strength determinants for talent identification purposes at young ages.

Before delving into comparisons, it is crucial to individually understand the morphological and physical characteristics of each type of fighter. Karatekas traditionally have exhibited greater muscle mass and chest girths, and this is attributed to the involvement of both upper and lower body sections in offensive and defensive actions. Drawing parallels with prior research studies, the findings of the current study further cement the theory posited by Kim and Nam [2] where morphological attributes heavily influence martial art styles. Taking into consideration that categories in martial arts are based on weight, maintaining a relatively low body mass via the minimization of fat mass is crucial to compete in the desired category [1]. However, performance can be affected if the power-to-weight ratio is altered by muscle mass reduction [25]. Previous research studies have reported significantly lower fat mass in international taekwondo players than in recreational taekwondo players [2,16,26], and greater muscularity in senior than junior athletes has been reported [1]. Similarly, more successful junior competitors also exhibited lower levels of adiposity than those obtained in the present study, ranging from 12% to 18% [27] using the anthropometric method [18]. However, further studies in young taekwondo players have reported contradictory results, perhaps as a result of the different methods used for estimations [1,2]. In boys, the determination of the physical profile of karate players obtained in the current research revealed a more compact and leaner morphotype than taekwondo competitors, while the comparison in girls only revealed a similar tendency. These findings are in agreement with prior investigations in young karate players, observing fat mass values of 10–12% and mesomorphic levels from 3.5 to 5 [3,17,28].

Strength and power assessments revealed no significant differences between the disciplines examined in the current study. Nevertheless, karate competitors showed a meaningful tendency towards greater hand grip values than taekwondo players. A possible explanation is related to the fact that the main technical actions in taekwondo are performed by the lower body, while upper body motion is limited to defensive and balance movements [1,15]. Conversely, in karate, both body sections are equally involved in the execution of offensive and defensive actions [3]. High demands of muscular power in the lower body are determinants in both disciplines but especially in taekwondo where powerful kicks and jumps are paramount in the pursuit of an optimal performance [1,9,12]. This fact might explain their higher morphological values in aspects such as leg length and femur breadth observed here. Previous research studies reported similar values that ranged between 22 and 50 cm in CMJ tests in junior categories [1,16]. Surprisingly, in the current investigation, CMJ analyses in boys revealed no significant differences between groups, while taekwondo girls exhibited a tendency towards larger values ($d = 0.55$). By understanding these particularities, the stark differences observed between these two groups and those reported in the present study might seem reasonable. However, the findings obtained here with respect to physical fitness and morphological development should be treated with caution when carrying out comparisons relative to other athletes of different ethnic origins or geographical conditions because they might influence the biological maturity process.

Traditionally, there are certain morphological attributes that characterize typical athlete profiles relative to a sport, playing position, or even a specialist role within a discipline [6]. The examination of proportionality revealed similar predispositions in both sports and sexes. Values below 0 were identified in almost all evaluated skinfolds, resulting in body composition profiles with low levels of fat mass. These findings are in agreement with previous research studies that identified lean and robust athletes among the most successful competitors [2,7,8,28]. Additionally, the large corrected and contracted girths observed in this investigation also confirm the typical leaner profile associated with martial arts competitors [2,8,28]. In fact, athletes in both sports are typically classified as ‘ectomorphic mesomorph’ according to conventional descriptors [2,28]. The only noticeable difference observed between disciplines is the lower upper body girths exhibited by taekwondo players, especially with respect to girls. The secondary role of the upper body in taekwondo actions is possibly related to the lower dimensions of forearm, wrist, and chest girths not only in karate competitors but also in the normal population. Since proportionality allows the interpretation of body dimensions based on the normal population, these findings might provide normative data for talent identification purposes.

Regarding limitations, due to the restricted number of participants recruited in the current study, the final results were treated with some caution. Nevertheless, the high athletic and performance levels of athletes reduced the total number of potential candidates for the investigation. In addition, the Z-scores presented here were based on normal population data. The values of senior elite athletes are necessary to better understand the evolution of morphological characteristics from young ages and to monitor young athletes who exhibit body composition determinants that are associated with optimal successful performances later in senior categories. The implications of these results are profound, especially when formulating training regimens for young martial artists. The balance between muscle mass and agility, for instance, has always been a topic of debate, and our findings tilt the scales slightly towards the significance of discipline-specific training.

5. Conclusions

To the best of our knowledge, this is the first study to investigate not only body proportionality but also strength values of young elite male and female martial artists. Summarizing the critical insights, this study not only uncovers the distinct morphological profiles of young elite karate and taekwondo competitors but also underscores the impact of age and developmental periods on these attributes. These findings shed light on the importance of discipline-specific morphological characteristics, particularly the greater upper body dimensions in karatekas and the leg emphasis in taekwondo practitioners. From a practical standpoint, trainers and coaches can leverage this knowledge to tailor training programs, emphasizing areas of weakness and capitalizing on the inherent strengths of the athletes, thereby ensuring optimized performance in competitions.

Author Contributions: Conceptualization, A.M.-R. and D.L.-P.; methodology, F.A. and A.M.-R.; investigation, D.L.-P., B.J.C.-C. and P.M.; data curation, P.M., D.L.-P. and A.M.-R.; writing—original draft, A.M.-R. and D.L.-P.; writing—review and editing, P.M. and F.A.; supervision, A.M.-R., D.L.-P. and F.A.; project administration, F.A.; funding acquisition, F.A. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the ethics committee of the University of Alicante, with the reference UA-2019-04-09.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: All data presented in the current study are available upon request.

Acknowledgments: The participation of Daniel López-Plaza and Fernando Alacid was possible thanks to their stay at the University of Alicante, supported by the Mobility Programs of the Catholic University of Murcia and University of Almeria, respectively. The authors want to acknowledge the athletes who participated in this study, and their respective academies and coaches for their predisposition to provide support and facilities during the process.

Conflicts of Interest: The authors declare no conflict of interest.

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