

Combat Sports: judo, karate, taekwondo at the Deaflympic Games from 2009 – 2022

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Authors' Contribution:

- A Study Design
- B Data Collection
- C Statistical Analysis
- D Manuscript Preparation
- E Funds Collection

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Dictionary:

Deaflympic Games – International sport competition held for athletes who are deaf or hard-of-hearing. The Deaflympic Games are organized by the International Committee for Sport for the Deaf. The first Deaflympic Games were held in 1924 in Paris, France and the first Deaflympic winter games were held in 1949 in Seefeld, Austria. Each Deaflympic Games are held every four years, one year after the Olympics and Paralympic games.

Abstract:

Background and Study Aim: The Deaflympic Game are an international multi-sporting event held for athletes who are deaf or hard-of-hearing (D/HoH). In recent years, various combat sports such as karate, judo, and taekwondo have been added to the Deaflympics. Combat sports are significant for the D/HoH community as they promote fall prevention, physical fitness, discipline, and self-confidence while also supporting psychosocial development. Despite the inclusion of martial arts in the Deaflympics, no literature exists regarding the performance and results of combat sports in the Deaflympic Games. Therefore, the purpose of this review was to discuss judo, karate, and taekwondo performance and results from 2009, 2013, 2017, and 2022 during the Deaflympic summer games.

Material and Methods: All data utilized was publically available through the official website of the International Committee of Sport for the Deaf. Results by weight class, number of participating countries, year of birth, and country data were extracted. Several athletes had participated in more than one Deaflympic Games and in some cases, competed in different weight categories therefore, each athlete's competition performance was treated individually. Outcomes of interest included medal winning frequency (index M) and points winning frequency (index P).

Results: Regarding Judo competition, the review demonstrates that the most successful Deaflympic athletes are from Russia and Ukraine. Russia and Iran produced the most successful athletes for Deaflympic karate competition while Korea and Turkey yielded the most successful athletes in Taekwondo.

Conclusions: The countries with the most success in combat sports resulted likely from each countries strong national programs, high level of competition, and cultural emphasis on the respective combat sport. Future research should consider biomechanical analyses and mental health considerations for athletes who are D/HoH who participate in combat sports relative to athletes who are hearing.

Keywords: Injury prevention, Deaf, Hard-of-hearing, Disability, Judo, Karate, Taekwondo

1. Introduction

Participation in combat sports requires athletes to have skills in maintaining postural control in dynamic and static scenarios both with their opponent and environment. During competition or training, combat sport athletes are required to be able to quickly determine the position of their body in space. Combat sport athletes postural control skills may also have long-term health-promoting benefits of preventing or minimizing injuries resulting from falls [1-5]. These skills may be especially important for people with hearing loss because people with congenital or childhood deafness have a higher incidence of vestibular disorders [6-8].

The vestibular system provides sensory information to an individual regarding linear and rotational acceleration and deceleration as well as coordinating the reception and processing of stimuli from other sensory systems due to its anatomical relationships with the cerebellum, eye muscles, reticular formation, cochlea, cerebral cortex, and cervical musculature [9]. Previous authors have reported that adults who are deaf that self-reported their postural control to be "good" presented with deficits in both cervical vestibular-evoked myogenic potentials and the modified Clinical Test of Sensory Integration of Balance compared to the adults who are hearing that also self-reported "good" postural control [10]. Therefore, the inherent skills developed during combat competition and training may be beneficial for athletes who are deaf or hard-of-hearing (D/HoH).

In addition to postural control benefits, there are also other physical and mental benefits of participating in combat sports for the D/HoH community. Specifically, combat sports promote physical fitness [11], discipline [12, 13] and self-confidence [14] while also supporting psychosocial development [15]. Individuals who are D/HoH are less physically active [16] and therefore, often do not benefit physically and mentally from participating in activity such as combat sports. The lack of participation in physical activity often contributes to health-related issues in individuals who are D/HoH, such as obesity [17] and anxiety and depression [18]. The inclusive nature of combat sports ensures athletes who are D/HoH have the opportunity to grow physically and mentally as well as connect with others in a meaningful way.

Though athletes who are D/HoH participate in combat sports at all levels of competition, the Deaflympics are considered the pinnacle of sports participation for the deaf population. The Deaflympic Games are the world's most important sport competition for individuals who are D/HoH [19]. This competition was established by the International Committee for Sport for the Deaf and were first held in Paris, France in 1924 [19]. Due to their longevity, the Deaflympic Games are the second longest multi-sporting event in the world [19]. In order to qualify for the Deaflympic Games, athletes must have a hearing loss of at least 55 dB pre-tone average in their better ear [20]. Additionally, hearing assistance devices such as hearing aids and cochlear implants are not permitted during competition [20]. The Deaflympic Games have seen significant growth since their inauguration in 1924, growing from 148 athletes from 9 different countries to the most recent Deaflympic summer games in Caxias do Sul, Brazil where 2412 athletes competed from 73 different countries [19, 21].

Not only has the amount of athletes and countries increased since the first Deaflympic Games but the amount of sports included has also increased. The Summer Deaflympic Games originally had 7 different sports and has evolved to include 18 sports during the most recent Summer Deaflympic Games 2022 in Caxias do Sul, Brazil [22]. Of these sports, combat sports including freestyle wrestling, Greco-Roman wrestling,

judo, karate, and taekwondo have evolved since the Deaflympic Games originated. Combat sports were first introduced to the Deaflympic Games in 1961 with freestyle and Greco-Roman wrestling [23, 24] while judo, karate, and taekwondo competitions were not introduced until 2009 [25-27].

Despite the physical and mental benefits for athletes who are D/HoH who participate in combat sports as well as the longevity of combat sport competitions at Deaflympic Games, there is a paucity in literature analyzing performance and results of combat sport in Summer Deaflympic Games. Therefore, the purpose of this review was to discuss judo, karate, and taekwondo performance and results from 2009, 2013, 2017, and 2022 Summer Deaflympic Games.

2. Materials and Methods

Data Collection

Deaflympic judo, karate, and taekwondo results were collected through the publicly available official website of the International Committee of Sport for the Deaf [28]. Data regarding freestyle and Greco-Roman wrestling were omitted and will be included in a separate article.

Specifically, results by weight class, number of participating countries, year of birth, and country data were extracted. Several athletes had participated in more than one Deaflympic Games and in some cases, competed in different weight categories therefore, each athlete's competition performance was treated individually.

Statistical analysis

Descriptive statistics were calculated for age and medals won by sex, countries, continents, and weight class. Additionally, three outcomes were calculated [29]:

- The Deaflympic games medal winning frequency index
 - o (Index M) = total medals won by country / number of Deaflympic Games when the given competition was held.
 - The Deaflympic games points winning frequency index
 - o (Index P) = (number of gold medals x 5 points + number of silver medals x 3 points + number of bronze medals x 1 point) / number of Deaflympics Games when the given competition was held.
 - Efficiency = number of total medals x 100% / number of record in database for a given country.

Statistical analyses was completed using TIBCO Software Inc. (2017) and STATISTICA 13.0 (Statsoft, USA). Turkey was assigned to the group of Asian countries because only 3% of Turkey's total area is located on the European continent.

3. Results

Archives of judo records of the Deaflympics summer games between the years of 2009 to 2022, yielded 219 records of male (mean age: 27.81 ± 6.35 years, age range: 17-60 years) and 139 records of female (mean age: 27.16 ± 6.59 years, age range: 15-47 years). Archives of karate records yielded 112 male records (mean age: 26.11 ± 7.64 years, age range: 14-49 years) and 73 records of female (mean age: 23.18 ± 6.44 years, age range: 14-45 years). Lastly, archives of taekwondo records yielded 149 male records (mean age: 26.27 ± 6.87 years, age range: 16-55 years) and 116 female records (mean age:

23.22±5.10 years, age range: 15-40 years). Table 1 and 2 provides an overview of combat sport by age and weight class.

Table 1: Analyses of male participants within combat sports and weight class at the Deaflympic Summer Game (2009-2022)

Combat sport	Weight category	Weight range	Number of Data Records	Age (years) (Mean, ± [Range])
Judo	Light	60-66 kg	64	26.64 ±4.85 [18-40]
Judo	Middle	73-81 kg	66	27.61 ±7.23 [18-60]
Judo	Heavy	≥90 kg	89	29.18 ±6.97 [17-46]
Karate	Light	60 kg	20	24.20 ±7.13 [15-47]
Karate	Middle	67-85 kg	92	28.01 ±8.15 [14-49]
Taekwondo	Light	58 kg	35	22.46 ±4.10 [17-33]
Taekwondo	Middle	67-81 kg	98	27.47 ±6.22 [16-41]
Taekwondo PI	N/a	N/a	16	28.88 ±10.29 [16-55]

Table 2: Analyses of female participants within combat sports and weight class at the Deaflympic Summer Games (2009-2022)

Combat sport	Weight category	Weight range	Number of Data Records	Age (years) (Mean, ± [Range])
Judo	Light	48-63 kg	88	25.32 ±5.64 [15-39]
Judo	Middle	≥70 kg	51	29.92 ±7.53 [15-47]
Karate	Light	50-61 kg	49	23.16 ±6.80 [14-45]
Karate	Middle	≥68 kg	24	24.46 ±6.07 [14-40]
Taekwondo	Light	49-57 kg	58	22.67 ±4.45 [15-32]
Taekwondo	Middle	≥67 kg	36	22.92 ±4.27 [16-33]
Taekwondo PI	N/a	N/a	24	24.08 ±6.59 [15-40]

Judo 2009-2022

Male and female judo results at the Deaflympic summer games by country are available in Tables 3 and 4, respectively. European countries had the most archived records (87 male; 60 female) followed by Asia (112 male; 54 female), South America (12 male; 15 female), North American (4 male; 5 female), and Australia and Oceania (0 male, 1 female). The most successful Deaflympic Games competitors are the (individual no team) winners of four Deaflympic medals: Samet Bulut (TUR, 2 gold medals, 1 silver medal, 1 bronze medal), Jungmu Yang (KOR, 1 gold medal, 2 silver medals, 1 bronze medal). Thirteen athletes won three Deaflympic medals including Zaur Bedankov (RUS,), Dmytro Sheretov (UKR, 2 gold medals, 1 bronze medal), Albert Westerhof (NED, 2 gold medals, 1 bronze medal), and sixteen athletes won an Deaflympic medal twice. Among the female multi-medalists, Eunmi Honh (MEX, 4 gold medals, 1 silver medal) has the largest number of medals. Four Deaflympic Games medals were won by five athletes, but three gold medals were won by Ukrainian athletes Anna Shostak and Kateryna Shepeliuk. The first of them also won a silver medal, and the second - a bronze medal. Three competitors won three medals

each - in this category, the most successful competitor was the representative of Poland, Natalia Brzykcy. Twelve athletes stood on the Deaflympic podium twice.

Table 3. Male Judo Deaflympic Summer Game Results (2009-2022)

Rank	Country	Age (years) (Mean, \pm)	No. of records	G	S	B	Total Medals	Index M	Index P	Efficiency
1	Russia*	26.70 \pm 5.79	23	8	4	5	17	4.25	14.25	73.91
2	Ukraine	28.65 \pm 6.12	20	4	3	6	13	3.25	8.75	65.00
3	France	28.81 \pm 8.01	16	3	2	8	13	3.25	7.25	81.25
4	Korea	27.32 \pm 4.67	19	2	6	4	12	3.00	8.00	63.16
5	Turkey	24.95 \pm 4.39	19	3	4	4	11	2.75	7.75	57.89
6	Ireland	24.56 \pm 3.47	18	2	2	5	9	2.25	5.25	50.00
7	Mongolia	32.20 \pm 6.60	20	1	1	6	8	2.00	3.50	40.00
8	Kazakhstan	28.00 \pm 5.91	10	1	2	2	5	1.25	3.25	50.00
9	Japan	33.40 \pm 9.80	10	1	1	2	4	1.00	2.5	40.00
10	Brazil	24.63 \pm 5.10	8	0	0	4	4	1.00	1.00	50.00
11	Bulgaria	26.00 \pm 6.24	7	0	2	2	4	1.00	2.00	57.14
12	Nederland	26.20 \pm 6.65	5	2	0	1	3	0.75	2.75	60.00
13	Kyrgyzstan	28.20 \pm 3.42	5	0	0	2	2	0.50	0.50	40.00
14	Taipei	37.33 \pm 8.50	3	0	0	2	2	0.50	0.50	66.67
15	Armenia	24.50 \pm 3.54	2	0	1	1	2	0.50	1.00	100.00
16	Hungary	21.50 \pm 2.12	2	0	0	2	2	0.50	0.50	100.00
17	Chile	29.00 \pm 0.00	2	1	0	0	1	0.25	1.25	50.00
18	Switzerland	26.00 \pm 2.83	2	0	0	1	1	0.25	0.25	50.00
19	Canada	32.00 \pm 2.83	2	0	1	0	1	0.25	0.75	50.00
20	Belgium	25.00 \pm 4.55	4	0	0	0	0	0.00	0.00	0.00
21	Azerbaijan	25.00 \pm 4.36	3	0	0	0	0	0.00	0.00	0.00
22	Poland	35.33 \pm 5.03	3	0	0	0	0	0.00	0.00	0.00
23	Algeria	30.33 \pm 9.29	3	0	0	0	0	0.00	0.00	0.00
24	India	23.00 \pm 4.24	2	0	0	0	0	0.00	0.00	0.00
25	Italy	20.00 \pm 0.00	2	0	0	0	0	0.00	0.00	0.00
26	Cuba	40.50 \pm 0.71	2	0	0	0	0	0.00	0.00	0.00
27	Greece	20.00 \pm 1.41	2	0	0	0	0	0.00	0.00	0.00
28	Argentina	40.50 \pm 4.95	2	0	0	0	0	0.00	0.00	0.00
29	Croatia	31.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
30	Hong Kong	32.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
31	Venezuela	31.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
32	RSA	17.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
33	Belarus	29.00 \pm 3.85	2	0	0	0	0	0.00	0.00	0.00
34	Cameroon	26.50 \pm 4.63	4	0	0	0	0	0.00	0.00	0.00
35	Georgia	20.00 \pm 3.52	2	0	0	0	0	0.00	0.00	0.00
36	Mali	34.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
37	Nepal	37.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00

38	Pakistan	20.00 ±0.00	1	0	0	0	0	0.00	0.00	0.00
39	Portugal	25.00 ±0.00	1	0	0	0	0	0.00	0.00	0.00

G= Gold medal; S= Silver medal; B= Bronze medal; * - RUSSIA did not participate in DG in 2022; RSA - Republic of South Africa

Table 4. Female Judo Deaflympic Summer Game Results (2009-2022)

Rank	Country	Age (years) (Mean, ±)	No. of records	G	S	B	Total Medals	Index M	Index P	Efficiency
1	Ukraine	30.41 ±6.38	21	8	5	8	21	5.25	15.75	100.00
2	Russia*	25.79 ±5.00	19	5	7	5	17	4.25	12.75	89.47
3	Korea	27.07 ±5.47	15	5	3	3	11	2.75	9.25	73.33
4	Venezuela	31.71 ±4.99	7	1	0	6	7	1.75	2.75	100.00
5	Poland	30.43 ±5.32	7	0	3	2	5	1.25	2.75	71.43
6	Mongolia	29.30 ±4.88	10	0	1	4	5	1.25	1.75	50.00
7	Portugal	25.25 ±5.56	6	2	1	1	4	1.00	3.50	66.67
8	Kazakhstan	29.00 ±9.64	9	0	1	2	3	0.75	1.25	33.33
9	Turkey	23.00 ±7.60	15	0	1	2	3	0.75	1.25	20.00
10	Mexico	24.50 ±3.54	2	2	0	0	2	0.50	2.50	100.00
11	France	27.67 ±2.31	3	0	2	0	2	0.50	1.50	66.67
12	Argentina	21.00 ±1.41	2	0	0	2	2	0.50	0.50	100.00
13	Algeria	22.00 ±4.24	2	0	0	2	2	0.50	0.50	100.00
14	Australia	31.00 ±0.00	1	1	0	0	1	0.25	1.25	100.00
15	USA	38.00 ±0.00	1	1	0	0	1	0.25	1.25	100.00
16	Belarus	26.00 ±1.00	3	0	1	0	1	0.25	0.75	33.33
17	Hungary	26.00 ±0.00	1	0	0	1	1	0.25	0.25	100.00
18	Brazil	24.83 ±11.36	6	0	0	0	0	0.00	0.00	0.00
19	India	20.80 ±3.90	5	0	0	0	0	0.00	0.00	0.00
20	Cuba	18.50 ±3.54	2	0	0	0	0	0.00	0.00	0.00
21	Slovenia	26.00 ±0.00	1	0	0	0	0	0.00	0.00	0.00
22	RSA	17.00 ±0.00	1	0	0	0	0	0.00	0.00	0.00
23	Mali	30.00 ±0.00	1	0	0	0	0	0.00	0.00	0.00
24	Ghana	28.00 ±0.00	1	0	0	0	0	0.00	0.00	0.00
25	Kyrgyzstan	32.00 ±0.00	1	0	0	0	0	0.00	0.00	0.00

G= Gold medal; S= Silver medal; B= Bronze medal; * - RUSSIA did not participate in DG in 2022; RSA - Republic of South Africa

Karate 2009 – 2022

Male and female karate results at the Deaflympics by country are available in Tables 5 and 6, respectively. European countries had the most individual archived records (38 male; 22 female) followed by Asia (42 male; 38 female), South America (24 male; 12 female), North American (3 male; 0 female), and Australia and Oceania (1 male, 1 female). The most successful players are Milad Sadeghzadehmoghadam (IRI, 2 gold

medals), Oleksandr Makhno (UKR, 1 gold medal, 1 silver medal), Yorman Gonzalo VEGA PARRA (VEN, 1 (two) gold medal, 1 (two) silver medal), Mohammad Khodayar (IRI, 1 gold medal, 1 bronze medal). In total, nine athletes won two medals each. The most medals were won by Inna Ryeznik Vizir (UKR, 2 gold medals, 1 silver medal, 1 bronze medal) and Karyna Yanchuk (UKR, 3 (four) gold medals) and Wen-Fang LIN (TPE, 1 silver medal, 2 bronze medals). Twelve athletes won two medals each, including Maryna Hubanova (UKR, 1 gold medal, 1 silver medal), Ana Esther Riviera (VEN, 1 gold medal, 1 bronze medal).

Table 5. Male Karate Deaflympic Summer Game Results (2009-2022)

Rank	Country	Age (years) (Mean, \pm)	No. of records	G	S	B	Total Medals	Index M	Index P	Efficiency
1	Russia*	27.70 \pm 7.90	10	2	3	5	10	2.50	6.00	100.00
2	Venezuela	26.86 \pm 6.00	14	4	2	3	9	2.25	7.25	64.29
3	Ukraine	25.10 \pm 8.18	10	2	3	4	9	2.25	5.75	90.00
4	Iran	27.17 \pm 8.42	12	4	0	4	8	2.00	6.00	66.67
5	Italy	29.33 \pm 6.42	9	0	2	5	7	1.75	2.75	77.78
6	Taipei	26.50 \pm 10.81	12	1	1	3	5	1.25	2.75	41.67
7	Turkey	25.27 \pm 8.44	11	0	2	3	5	1.25	2.25	45.45
8	Algeria	30.00 \pm 2.00	3	1	1	1	3	0.75	2.25	100.00
9	New Zealand	39.00 \pm 0.00	1	1	0	0	1	0.25	1.25	100.00
10	Japan	23.67 \pm 4.51	3	1	0	0	1	0.25	1.25	33.33
11	Malaysia	17.00 \pm 0.00	1	0	1	0	1	0.25	0.75	100.00
12	Argentina	36.00 \pm 2.83	2	0	1	0	1	0.25	0.75	50.00
13	Bulgaria	21.00 \pm 2.83	2	0	0	1	1	0.25	0.25	50.00
14	Israel	36.00 \pm 0.00	1	0	0	1	1	0.25	0.25	100.00
15	Brazil	30.86 \pm 8.71	7	0	0	1	1	0.25	0.25	14.29
16	Chile	49.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
17	England	28.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
18	Germany	40.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
19	Greece	21.00 \pm 2.83	2	0	0	0	0	0.00	0.00	0.00
20	India	21.50 \pm 3.54	2	0	0	0	0	0.00	0.00	0.00
21	Mexico	25.00 \pm 1.73	3	0	0	0	0	0.00	0.00	0.00
22	Nederland	22.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
23	Norway	42.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
24	Portugal	29.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
25	Thailand	18.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
26	France	25.67 \pm 2.25	3	0	0	0	0	0.00	0.00	0.00
27	Sweden	38.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
28	Nepal	33.00 \pm 3.42	2	0	0	0	0	0.00	0.00	0.00
29	TRI	33.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00

G= Gold medal; S= Silver medal; B= Bronze medal; * - Russia did not participate in DG in 2022;

TRI - Trinidad and Tobago

Table 6. Female Karate Deaflympic Summer Game Results (2009-2022)

Rank	Country	Age (years) (Mean, \pm)	No. of records	G	S	B	Total Medals	Index M	Index P	Efficiency
1	Iran	21.93 \pm 3.77	24	0	3	8	11	2.75	4.25	45.83
2	Ukraine	23.80 \pm 4.80	16	8	1	1	10	2.50	11.00	62.50
3	Russia*	25.10 \pm 2.69	16	1	6	3	10	2.50	6.50	62.50
4	Turkey	21.13 \pm 4.03	19	1	2	7	10	2.50	4.50	52.63
5	Venezuela	18.80 \pm 4.13	12	3	0	3	6	1.50	4.50	50.00
6	Taipei	40.75 \pm 3.40	4	0	2	2	4	1.00	2.00	100.00
7	Japan	17.00 \pm 3.00	4	2	0	1	3	0.75	2.75	75.00
8	Italy	28.00 \pm 0.00	2	0	1	0	1	0.25	0.75	50.00
9	New Zealand	40.00 \pm 0.00	1	0	0	1	1	0.25	0.25	100.00
10	Kazakhstan	34.50 \pm 4.25	2	0	0	1	1	0.25	0.25	50.00
11	Greece	22.50 \pm 4.24	2	0	0	1	1	0.25	0.25	50.00
12	Bulgaria	21.50 \pm 6.50	2	0	0	0	0	0.00	0.00	0.00
13	TRI	19.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
14	Brazil	30.00 \pm 0.00	2	0	0	0	0	0.00	0.00	0.00
15	Czech Rep.	16.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
16	Mexico	18.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00

G= Gold; S= Silver; B= Bronze; * - RUSSIA did not participate in DG in 2022; TRI - Trinidad and Tobago

Taekwondo 2009 – 2022

Male and female taekwondo results at the Deaflympics by country are available in Tables 7 and 8, respectively. For Taekwondo, European countries had the most archived records (33 male; 27 female) followed by Asia (78 male; 60 female), South America (13 male; 3 female), North American (8 male; 3 female), Australia and Oceania (1 male, 0 female) and Africa. For taekwondo poomsae, European countries had the most archived records (4 male; 7 female), following by Asia (11 male, 15 woman) South American (0 male, 1 female), North America (0 male, 1 female). The most successful taekwondo and taekwondo poomsae individual athletes were: Muhammed Guler (TUR, 2 gold medals, 1 silver medal), Hak Seong Lee (KOR, 3 gold medals), Daeho Lim (1 gold medal, 1 silver medal, 1 bronze medal). A total of thirteen athletes won two medals, including Angel Rafael Roman-Martinez (PUR, 2 gold medals), Aleksandr Vladimirovich Barkalov and Vladislav Eduardovich Bobrovnik (RUS, 1 gold medal, 1 silver medal), Minjae Kim (KOR, 1 gold medal, 1 bronze medal). Four athletes stood on the podium three times: Merve Yazici (TUR, 3 gold medals), Selver Seker (TUR, 2 gold medals, 1 silver), Maryam Khodabandeh (IRI, 1 gold medal, 2 bronze medals), Szu-Ting Peng (TPE, 2 silver medals, 1 bronze medal). Eight athletes won two medals each, including Marina Igorevna Dobrovidova (RUS, 2 gold medals), Matea Kolovrat (CRO, 1 gold medal, 1 silver medal).

Table 7. Male Taekwondo Deaflympic Summer Game Results (2009-2022)

Rank	Country	Age (years) (Mean, \pm)	No. of records	G	S	B	Total Medals	Index M	Index P	Efficiency
1	Korea	26.19 \pm 7.59	17	10	4	3	17	4.25	16.25	100.00
2	Turkey	25.05 \pm 4.76	19	3	5	8	16	4.00	9.50	84.21
3	Russia*	24.54 \pm 5.02	14	3	4	4	11	2.75	7.45	78.57
4	Iran	32.18 \pm 5.46	13	1	2	7	10	2.50	4.50	76.92
5	Ukraine	33.63 \pm 7.46	9	2	0	2	4	1.00	3.00	44.44
6	Greece	32.79 \pm 7.59	7	1	1	2	4	1.00	2.50	57.14
7	Kazakhstan	25.25 \pm 5.75	8	1	0	3	4	1.00	2.00	50.00
8	Taipei	33.15 \pm 5.87	12	0	2	1	3	0.75	1.75	25.00
9	China	21.67 \pm 2.12	3	0	0	2	2	0.50	0.50	66.67
10	Puerto Rico	27.00 \pm 2.83	2	2	0	0	2	0.50	0.00	100.00
11	Hong Kong	19.00 \pm 2.00	3	0	1	0	1	0.25	0.75	33.33
12	Kyrgyzstan	23.00 \pm 4.55	4	0	1	0	1	0.25	0.75	25.00
13	Argentina	31.25 \pm 5.24	4	0	0	1	1	0.25	0.25	25.00
14	Mexico	26.33 \pm 6.66	3	0	0	1	1	0.25	0.25	33.33
15	Portugal	31.00 \pm 4.00	3	0	0	1	1	0.25	0.25	33.33
16	Uzbekistan	22.90 \pm 6.65	6	0	0	1	1	0.25	0.25	16.67
17	Venezuela	30.67 \pm 8.02	6	0	0	1	1	0.25	0.25	16.67
18	Indonesia	18.00 \pm 0.00	1	0	0	1	1	0.25	0.25	100.00
19	Azerbaijan	30.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
20	Brazil	24.00 \pm 2.45	3	0	0	0	0	0.00	0.00	0.00
21	Gabon	23.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
22	England	26.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
23	India	20.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
24	Singapore	24.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
25	Thailand	23.00 \pm 2.00	2	0	0	0	0	0.00	0.00	0.00
26	USA	26.00 \pm 6.65	3	0	0	0	0	0.00	0.00	0.00
27	Afghanistan	23.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
28	Ecuador	22.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
29	Germany	40.00 \pm 0.00	1	0	0	0	0	0.00	0.00	0.00
30	Ghana	19.00 \pm 2.50	2	0	0	0	0	0.00	0.00	0.00

G= Gold medal; S= Silver medal; B= Bronze medal; * - RUSSIA did not participate in DG in 2022

Table 8. Female Taekwondo Deaflympic Summer Game Results (2009-2022)

Rank	Country	Age (years) (Mean, \pm)	No. of records	G	S	B	Total Medals	Index M	Index P	Efficiency
1	Turkey	23.38 \pm 4.43	21	6	4	3	13	3.25	11.25	61.90
2	Iran	24.18 \pm 3.97	16	3	1	7	11	2.75	6.25	68.75
3	Russia*	21.90 \pm 3.11	16	2	2	5	9	2.25	5.25	56.25

4	Korea	22.13 ±2.70	13	2	4	3	9	2.25	6.25	69.23
5	Taipei	24.00 ±3.39	6	3	1	2	6	1.50	500	100.00
6	Croatia	21.75 ±4.11	4	1	3	0	4	1.00	3.50	100.00
7	Greece	23.00 ±7.53	5	0	1	2	3	0.75	1.25	60.00
8	Uzbekistan	20.44 ±3.84	11	0	0	3	3	0.75	0.75	27.27
9	Puerto Rico	25.00 ±2.83	2	1	0	1	2	0.50	1.50	100.00
10	Ukraine	23.60 ±5.94	9	0	0	2	2	0.50	0.50	22.22
11	China	18.00 ±3.37	7	0	0	2	2	0.50	0.50	28.57
12	Latvia	29.00 ±2.83	2	0	1	0	1	0.25	0.75	50.00
13	Venezuela	26.50 ±3.54	2	0	0	1	1	0.25	0.25	50.00
14	Kazakhstan	24.83 ±6.74	7	0	0	1	1	0.25	0.25	14.29
15	Kyrgyzstan	18.50 ±0.71	2	0	0	1	1	0.25	0.25	50.00
16	Canada	21.00 ±0.00	1	0	0	0	0	0.00	0.00	0.00
17	Hungary	26.00 ±0.00	1	0	0	0	0	0.00	0.00	0.00
18	Ghana	18.00 ±0.00	2	0	0	0	0	0.00	0.00	0.00
19	Argentina	24.00 ±0.00	2	0	0	0	0	0.00	0.00	0.00
20	Hong Kong	21.00 ±0.00	1	0	0	0	0	0.00	0.00	0.00
21	India	24.00 ±0.00	1	0	0	0	0	0.00	0.00	0.00
22	Italy	20.00 ±0.00	1	0	0	0	0	0.00	0.00	0.00
23	Mexico	16.50 ±2.50	2	0	0	0	0	0.00	0.00	0.00

G= Gold; S= Silver; B= Bronze; * - RUSSIA did not participate in DG in 2022

4. Discussion

This The purpose of this review was to discuss judo, karate, and taekwondo performance and results from 2009, 2013, 2017, and 2021 Deaflympic summer games. Combat sports has a rich history around the world but only in recent years has it become part of the competitions at the Deaflympics games. Regarding Judo competition, the review demonstrates that the most successful Deaflympic athletes are from Russia and Ukraine. Russia and Iran produced the most successful athletes for Deaflympic Karate competition while Korea and Turkey yielded the most successful athletes in Taekwondo.

Russia and Ukraine both have a robust judo community that have a rich history of success and continues to have significant impact on the sport landscape [30, 31]. Both countries success at the Deaflympics in combat sport competition may be due to the combination of the large number of Deaflympic athletes competing and the popularity of combat sports within the countries. Since 2009, there have been 55 Russian and 46 Ukrainian Deaflympic athletes participate in Judo competition with the next highest country being Turkey with 42 Deaflympic athletes [32–35]. This success is not only highlighted in Deaflympic athletes but also in athletes who are hearing at the Olympic games and with athletes who are blind at the Paralympic games. Since 2009, Russia has won a total of 16 medals including 5 gold medals [36] while Ukraine has won a total of 4 medals at the Olympics [37]. Since Judo's inception at the Paralympic games in 1988, Russia has won 23 medals, including 2 gold medals, while Ukraine has won 15 medals at the Paralympic games [38].

The combat sport of Taekwondo is the national sport of South Korea with the majority of the trainees beginning at a very young age within the country [39, 40]. The success of South Korea in Taekwondo competition is of no surprise given the sport's presence within South Korean culture. Throughout the history of the Deaflympic Games, South Korean Deaflympic male athletes have been very successful winning 17 medals total medals. South Korean athletes have also been successful at other international competitions such as the Olympics and Paralympics where they have medaled 22 and 1 medal, respectively [41, 42]. Similarly, Taekwondo is also a very popular sport in Turkey with nearly 400 thousand licensed athletes [43]. In addition to Turkish Deaflympic female athletes' success, Turkey has won 9 medals at the Olympics and 2 medals at the Paralympics.

Combat sports at the Deaflympics has significantly grown in recent years. Outside of Deaflympic competitions, world championships in combat sports have also been established. In 2020, the 1st World Deaf Championships in Karate and Taekwondo took place in Malaysia and Greece, respectively [44]. Additionally, the 2nd World Deaf Judo Championships were held in Kazakhstan in 2024 where 17 nations participated [45]. During the World Deaf Judo Championships, Ukraine won the most medals (25 medals) followed by Kazakhstan (22 medals), and South Korea (11 medals) [45]. Combat sport competitions are expected to continue with the next Deaflympic competition occurring Tokyo, Japan in 2025 where combat sports competitions will return and include Judo, Karate, Taekwondo, and freestyle and Greco-Roman wrestling [46].

Practical Applications

Sporting competitions for the D/HoH population in the form scientific research is scarce. Investigating elite athletes who are D/HoH [47, 48] allows for comparison to other types of athletes at different levels of competition including the Olympics [29]. Additionally, athletes who are D/HoH do not receive the same level of financial support that Olympic and Paralympic athletes receive. The current study can also provide deaf sport coaches, deaf sport governing bodies, and sponsors with information regarding financial allocation of resources to better support countries that participate in combat sports for the deaf.

5. Conclusions

We reviewed the Deaflympic competition results of judo, taekwondo, and karate from their inception at the Deaflympic games in 2009. Prior to 2013, there is a paucity of reports and statistics from Deaflympic competitions other than the official website of the International Committee of Sport for the Deaf [28]. Overall, Russia, Ukraine, Iran, South Korea and Turkey have had the most success in the aforementioned combat sports at the Deaflympic Games. Much of these countries success is likely from strong national programs, high level of competition, and cultural emphasis on the respective combat sport. Future research should consider specific physical and mental benefits of combat sport participation as well as biomechanical for athletes who are D/HoH who participate in combat sports relative to athletes who are hearing.

Data Availability Statement: The data supporting this study's findings are available from the corresponding author upon reasonable request.

Institutional Review Board Statement: This study was approved by the bioethics committee of Collegium Medicum at Nicolaus Copernicus University, Bydgoszcz, Poland - No. KB 236/2023, 11.07.2023 y. All procedures followed the ethical standards of the Declaration of Helsinki.

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

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