

## Original Research

# Expert consensus statement to guide research into evidence-based classification of athletes for Para-Taekwondo -- A Delphi study

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## Abstract

**Background and Objective:** The objective of this study was to investigate various issues surrounding participation in Para-Taekwondo Kyorugi (sparring), with the aim of focusing on future research initiatives to improve the classification system and safety for participation in Para-Taekwondo. **Material and Methods:** For this, a series of online questionnaires and in-person round-table discussions were conducted prior to the World Para-Taekwondo Championships (Antalya, Turkey, 2019), with a final online questionnaire thereafter. A select group of experts, such as athletes, coaches, administrators, classifiers, and athletes were invited to partake, with the main outcome measures being the expert opinions and ranking of importance for research into issues affecting Para Taekwondo athletes. **Results:** The results of the discuss provide suggestions and opinions for the following areas are provided for the aim of classification, minimum impairment criteria, fairness of classes, combination of classes, competition time, mixing of different impairments, safety of cerebral palsy athletes, weight classes, gender differences, intentional misrepresentation, personal protectors, time for re-classification, and research priorities. **Conclusion:** The most prevalent issue highlighted was the concern for athlete safety, especially for the K44 class, which has a mixture of neurological impairments, i.e. an athlete with mild cerebral palsy (CP) competing against an athlete with an amputation. Furthermore, on the issue of safety, developing protectors for athletes was another key issue raised. Therefore, in the future, we can strongly recommend research initiatives to examine the safety of athletes with various impairment types in the same class, and the development of protectors for Para Taekwondo athletes.

## Keywords

Classification; Safety; Injury prevention; Paralympics; Para-Taekwondo

## 1. Introduction

Taekwondo is a dynamic martial art that gained official sport recognition in 2015 for inclusion in the 2020 Paralympic Games [1, 2]. More specifically, it was Kyorugi (Sparring), the competition format, that was approved for the Tokyo 2020 Paralympic Games [3]. Para-Taekwondo is a martial art and combat sport

of Korean origin that allows the participant to evolve physically, mentally and spiritually. Para-Taekwondo is the term used for competitive Taekwondo players with impairments, whether intellectual, motor, or sensory. The word "para" is derived from the Paralympic movement and currently has two modalities: sparring and forms [1, 4]. In Para-Taekwondo, important performance characteristics include speed, agility, explosive power,

and dynamic balance [5, 6]. For Kyorugi, physical impairments such as amputation, dysmelia, neurological impairments, limb length differences, and impaired passive joint range of motions (ROMs), etc. are currently included, and, thus, with such a large range of physical impairments included, it makes classifying athletes a challenge [4, 6].

Para-Taekwondo is still a relatively new sport to the Paralympic program, officially accepted by the International Paralympic Committee (IPC) on October 10, 2015, and so changes/improvements are needed to help maintain fairness and the safety of the athletes [7]. For a fair and safe competition, the classification of the para-athletes is crucial to 'minimize the impact of eligible impairments on the outcome of competition' [8, 9]. Since there are many different impairments, (e.g. physical, visual, and intellectual, each with varying levels and severity), it is very difficult in practice to take all the factors that affect the performance into account when developing a classification system [10, 11]. Furthermore, not only does physical prowess affect the performance on the field, so too does the strategy an athlete can use to overcome their impairments, similar to the way a shorter athlete will try to overcome their lack of reach in Taekwondo by staying closer to their opponent, making it more difficult for the taller athlete to attack.

Currently, Para-Taekwondo classification comprises 3 parts: medical diagnosis form to show impairment, classification by technical and medical classifier, followed by the athlete's observation at the first appearance in the competition [10]. During the classification, usually obligatory before a major international competition, the athlete will be seen by a classification panel consisting of both a medical and a technical classifier [9]. A medical classifier must have experience with athletes of a similar impairment, so as to accurately understand and diagnose the athlete, while the technical classifier must be experienced in Taekwondo and have a sports science/physical education background in order to provide sport-based advice and knowledge during classification [9, 10].

Since Para-Taekwondo has become a Paralympic sport, the IPC and Para-Taekwondo athletes have been more stringently examining the current classification system, with annual evaluation by the IPC research and medical committees. These evaluations by the IPC, athletes, and coaches have raised concerns about the severity of the injury, backed up by research overall injury rate of 48.4 per 1000 athletic exposures (A-E) (95% CI: 16.7 to 80.0) and 23.9 per 1000 minute exposures (M-E) (95% CI: 8.3 to 39.6) that has encouraged World Taekwondo to refocus their attention on the classification system [11]. Currently, the Kyorugi classes range from the most severe class, K41, to the least severe, K44. Detailed information on the impairments in each of the K41 to 44 classes is provided in the WT classification manual [10, 12]. Therefore, the purpose of this study was to investigate the various issues surrounding participation in Para-Taekwondo Kyorugi (sparring), with the aim of focusing on future research initiatives to improve the classification system and safety for participation in Para-Taekwondo.

## 2. Methods

Based on concerns brought up by coaches, team managers, World Taekwondo staff, and athletes, we focused the study on

**TABLE 1. Characteristics of survey participants**

Variables	Round 1 N (%)	Round 2 N (%)	RoundTable N (%)
Sex			
Male	20 (76.9)	11 (64.7)	10 (71.4)
Female	6 (23.1)	6 (35.3)	4 (28.6)
Continent			
Africa	3 (11.5)	1 (5.9)	2 (14.3)
American	7 (26.9)	6 (35.3)	4 (28.6)
Australasia	3 (11.5)	4 (23.5)	2 (14.3)
Europe	12 (46.2)	6 (35.3)	6 (42.9)
Role in Para Taekwondo*			
Administrator	7 (26.9)	1 (5.9)	1 (7.1)
Athlete	5 (19.2)	4 (23.5)	1 (7.1)
Coach	6 (23.1)	2 (11.8)	3 (21.4)
Classifier	6 (23.1)	9 (52.9)	8 (57.1)
Researcher	1 (3.8)	1 (5.9)	1 (7.1)

\*Only the main role of the participant was recorded for data analysis purposes.

the following areas: fairness between classes and combining classes, rounds duration, change of class through the use of equipment, safety issues relating to mixing different impairments, e.g. amputations/dysmelias with cerebral palsy (CP), the effect of weight divisions on fairness/safety [12], possible issues regarding intentional misrepresentation, development of individual protectors, and the period between re-classification (Table 1).

Two rounds of online questionnaires were developed and completed by the stakeholders and experts (Round 1; 26 participants, Round 2; 17 participants). These stakeholders and experts were selected from a list of coaches, athletes, classifiers and administrators that worked with Para Taekowndo athletes was provided by the World Para Taekwondo Director. It is important to note here that as the sport was still at its infancy during this study, the number of English speaking experts involved in Para Taekowndo is very limited. To be included in this study each of the participants had to be able to communicate well in English and have at least 4 years experience in the sport. Each of these experts were contacted and invited to participate in the study by email invitation sent by the World Taekwondo. For the second round of questionnaires the same participants were invited but there was a drop off in participation. These online questionnaires were based on the questionnaire developed by Ravensbergen, Mann, and Kamper (2016) [14]. Round 1 (Appendix 1) focused on the aim of classification, Minimum Impairment Criteria (MIC), the suitability of current classification, combination of existing classes, competition duration, use of equipment to alter classification, the safety of weight classes, intentional misrepresentation, development of protectors, and general comments. Round 2 (Appendix 2) focused on fairness, MIC, eligible impairments (Passive range of motion; PROM), leg length difference, hypertonia, ataxia, Athetosis, impaired muscle power), reduction of classes, a combination of classes, permission to compete in the lower class to qualify for Paralympics, protective equipment, and various factors to improve the classification. Questions in Round 2 was developed to clarify any issues that arose in Round 1. Round 2 compromised 14 'yes', 'no', or 'not sure' answers, and 4 open-ended questions.

After Round 2 (Appendix 2), participants who appeared to be the most experienced and knowledgeable on the classification procedures and overall understanding of how classification affects the outcome of Taekwondo Kyorugi were selected to meet for a 1-day discussion on the most important and urgent issues affecting the classification procedures. The objective of this meeting was to see if we could clarify the reason for a lack of consensus. For Delphi studies, in general, a consensus of 70-80% of the participants is a target for agreement [15]. However, as the main aim of this research was to select certain areas of classification that needed to be focused on for future research, we focused on the reasons why there was a difference of opinion among the participants, and the commonalities between the experts, to lead the research team to invest time in more critical issues [16]. At the end of each of the questionnaires, there was a section with open ended questions, which helped us to understand the reasoning why that were difference in opinions between the experts. All participants of this study had to sign a World-Taekwondo solicitor-approved informed consent form to ensure that ethical procedures were followed and those involved were protected in accordance with the Declaration of Helsinki, and the protocol was approved by the World Taekwondo Ethics Committee.

After analyzing all the participants' comments and suggestions from the online questionnaires (Round 1 & 2) and the roundtable discussion, we further reduced these into 10 different research areas required for future study (Appendix 3).

**TABLE 2. Descriptive statistics for the Round 1 and Round 2 online questionnaire**

Question	Round 1 (%)				Round 2 (%)		
	Yes	No	Partially	Not sure	Yes	No	Not Sure
1	62.5	0	33.33	4.17	70.59	5.88	23.53
2	45.83	12.5	33.33	8.33	76.47	0	23.53
3	54.17	8.33	16.67	20.83	76.47	0	23.53
4	58.33	8.33	12.5	20.83	68.75	12.5	18.75
5	47.83	17.39	13.04	21.74	47.06	17.65	32.29
6	54.17	12.5	16.67	16.67	52.94	29.41	17.65
7	29.17	45.83	12.5	12.5	76.47	17.65	5.88
8	26.09	52.17	4.35	17.39	11.76	58.82	29.41
9	54.17	25	8.33	12.5	29.41	58.82	11.76
10	20.83	37.5	20.83	20.83	41.18	47.06	11.76
11	37.5	50	4.17	8.33	82.35	0	17.65
12	45.83	16.67	29.17	8.33	58.82	35.29	5.88
13	45.83	33.33	16.67	4.17	41.18	23.53	35.29
14	50	16.67	29.17	4.17			

### 3. Results

The results of Round 1 and Round 2 questionnaires are provided in Table 2. Table 3 shows the 10 research areas suggested, each participant is asked to rank these areas in order of importance from 1 to 10, 1 being most important, and 10 being least important.

### 4. Discussion

#### 4.1 Section 1: Aim of classification

There were commonalities between the answers in both rounds of the online questionnaire. The participants highlighted the same issues: the difficulty of mixing neurological and amputations in the same class, and, equally, the mixing of upper and lower limb deficiencies in the same class. Some participants even referenced the issue of having congenital versus acquired impairments in the same division, as they perceived acquired impairments as giving an advantage. In the second round, the large variance (25% unsure) between the MIC and the maximum impairment in the K44 class was commented on, especially in terms of how the different arm lengths can affect both active and passive blocking during Kyorugi.

#### 4.2 Section 2: Minimum impairment criteria

For the first round, there were calls in this section for more precise ROM and muscle strength testing, adding leg length difference (32.3% unsure) (which was included in the Round 2 questionnaire), the inclusion of more impairments, addition of an open class, removing cerebral palsy (CP) from Kyorugi due to safety concerns, and looking at the functionality of the hand, instead of the cut-off point being the existence of carpal bones in the hand. In Round 2, there were calls to have the impairment for over five years, a comparison between loss of the first metatarsal and the reduced ROM of the ankle joint, concerns for CP athletes in terms of safety, and the perceived disadvantage if a competitor has a neurological impairment as opposed to an amputation.

#### 4.3 Section 3: Fairness of each class K41 to 44

During both online questionnaires, the participants were mainly concerned with the safety of the athletes, especially for those with CP, and athletes with brachial plexus. Functionally, there were contradicting views on whether athletes with brachial plexus should be classified in K42 (54% yes, remaining against or unsure), with their arm inside the Taekwondo chest protector (hogu in Korean), or in K44 with their arm outside the hogu [17]. Here, there were numerous reasons for and against, such as the dangers of an arm with severe atrophy being hit outside the hogu with the potential to fracture, as well as its ability to passively block. On the contrary, some athletes prefer to have it in the hogu as it doesn't get in their way, and they have the added incentive of being classified in a more limited class, such as K42.

#### 4.4 Section 4: Combination of classes

All participants recognized that it would be ideal if some of the classes could be combined to increase the number of athletes in each division; however, there were safety concerns. Overall five participants (5/19) commented that reducing the number of classes to 3 would be possible if there was a combination of K43 and K42.

#### 4.5 Section 5: Competition time

A proposed time change by World Taekwondo to one 5-minute round, with two 30-second timeouts called by the coaches, was deemed to be too long for the athletes (only 26% acceptance)

**TABLE 3. Research priorities ranked by classifiers (medical and technical), coaches, WT administrators and athletes on a scale of 1 to 10**

Research Issue	Total Score	Average Ranking	Importance Ranked (1-10)
Reducing the number of various impairments in the K44 Sport Class	62	6	4
Change to the current weight categories in Para Taekwondo Kyorugi competitions	65	6	7
Methods to include more impairments in the K (Kyorugi) Sport Classes	63	6	5
The effect time period (since becoming impaired) has on the performance	69	6	9
Fairness of having neurological impairments mixing with amputations and dysmelias in K Classes	37	3	2
The safety of CP athletes in the K44 Sport Class	34	3	1
Ways to combine Sport Classes in Kyorugi	64	6	6
Methods to detect & prevent intentional misrepresentation (IM)	68	6	8
Development of more effective and user-friendly protective equipment for the arm and hands	47	4	3
Time required for re-classification after an athlete receiving a Confirmed Class Status	96	9	10

and would make the competition less intense due to the athletes trying to conserve energy. Also, the participants suggested that, before the proposed time change is implemented in Para-Taekwondo, it should be tested in able-bodied Taekwondo first.

#### 4.6 Section 6: Mixing of neurological and physical impairments

In Round 1, some of the participants had the opinion that the neurologically impaired athletes should not be included in the K44 class (37% were against it), as they were concerned for their safety. Some concluded that the neurologically impaired athletes should be in their own class; however, they equally recognized that maybe there were not enough athletes to have a depth of field in each weight category. Similarly, participants in round 2 were also concerned for the safety of the athletes being mixed, for example, athletes with dysmelias in comparison to amputations might be at a disadvantage due to the lack of muscle power [18]. They also suggested that the degree of muscle power loss was a critical factor when considering whether an athlete should be included in the K44 class.

#### 4.7 Section 7: Safety of CP athletes in Kyorugi

There was a general consensus that sub-groups of CPs are suitable for the K44 class (only 40% for but 37% against; however, the rules needed to be more specific and detailed in defining this specific group. Some participants, however, insisted that it was a dangerous risk for CPs to be in K44 and they should therefore only be allowed to participate in Poomsae. Meanwhile, others thought that there should be a completely separate group for CP athletes to do Kyorugi [19].

#### 4.8 Section 8: Weight classes

There was a general consensus that there should be more weight classes available. However, the ability to provide the depth of field required to maintain high standards in competition must be considered.

#### 4.9 Section 9: Intentional misrepresentation

The participants stated that extra care should be taken during the classification process to prevent intentional misrepresentation by ensuring that accurate manual muscle power and passive ROM tests are performed consistently (45% saying intentional

misrepresentation was possible during classification). Athletes with neurological impairment cases involving brachial plexus and CP should be handled with extra care.

#### 4.10 Section 10: Personalized protectors

There was a consensus (45% and 41%) between the participants in Round 1 and 2 that personalized protective equipment should be allowed to increase the level of safety for the athletes. It was suggested that the equipment should not extend the length of the limb. It should be able to protect both sides of the limb, in particular for limbs that did not have any hands, on account of the severity of muscle and bone atrophy, which increases the risk of fracture as seen in competitions [20]. It was also suggested that the equipment must be presented during classification and approved by the referee officials attending the competition, or pre-approved by World Taekwondo.

#### 4.11 Section 11: Time to re-classification

Participants of Round 1 and 2 agreed that athletes with stable impairments, such as amputations and dysmelias, do not need to be reclassified unless the rules changed. 50% in round 1 and 58% in round 2 agreed that athletes should be classified every two years because they thought classification rules should be regularly updated, while others thought this should occur every four years due to the ranking and points linked with the Paralympic cycle.

#### 4.12 Gender differences

According to the latest para-taekwondo injury data, there has been a substantial reduction in both male and female injury exposure from 2017 (male 93.8/1000AE; female 42.9/1000AE) to 2019 (male 4.5/1000AE; female 5.3/1000AE). Initially, 17.1% of the male athletes were injured in 2017 and this was reduced to 6% in 2019. Similarly, there was a reduction from 7.3% to 5.3% for female athletes (unpublished data). With para-taekwondo being a relatively young sport this reduction in injury rate was believed to be the increase in training frequency and competition experience from the athletes. Looking at the injury data it is crucial to examine if there are different injury profiles between the male and female athletes so as to ensure that the athlete is protected. After the 2017 competition, WT medical team was concerned about the relative number of arm fractures, for male athletes with brachial plexus and so they initiated they high-

lighted the issue of athletes with brachial plexus, i.e. an upper limb in atrophy both in terms of muscle and skeletal density. Furthermore, as the number of male athletes is substantially more than the females (123 males, 41 females in 2017, and 167 males, 59 females in 2109) and the number of male athletes is increasing (currently over 600 male athletes worldwide) the effect of injury to a physically impaired athlete is concerning as it may add extra burden to an already difficult daily life.

On a positive note, under the direction of the WT president, the WT para-taekwondo committee has been involved with the development of specialized protectors for para-taekwondo athletes. Additionally, as para-taekwondo became a Paralympic sport, taekwondo member nation associations have increased funding through sources such as the WT development funds, UK sport, Champions Education Fund, Canadian Athlete Assistance Program, etc, which has provided support for the para-taekwondo athletes in preparation and during competition [21]. In terms of the classification rules, there have been no comments by female stakeholders, such as athletes, coaches, administrators, and classifiers on the differences between genders and the effect of classification to be fair [22].

#### 4.13 Research priorities

From the results shown in Table Table 3, it is clear that the safety of the athletes and preventing injury (top 3 ranked areas) seem to be the most prioritized aspects of the questionnaire. The highest-ranked research area was "The safety of CP athletes in the K44 Sport Class" followed closely by "Fairness of having neurological impairments mixing with amputations and dysmelias in K Classes". The "Development of more effective and user-friendly protective equipment for the arm and hands" was ranked third. Issues related to "including more impairments to participants in Para-Taekwondo" were then followed by issues related to fairness.

#### 4.14 Limitations

In some instances, participants ignored the question and just wrote their point of view on how the classification system should be changed. Surprisingly, some of the experts (coaches and athletes) appeared not to fully understand the rules and how they are implemented, meaning that the comments for some of the improvements were already in the rules [23]. This highlights that stakeholders should either be further educated by World Taekwondo or by their national association or that they should read the classification rules in more detail. Another limitation that was not in the scope of this article is to study the effectiveness of participating in Para Taekwondo and martial arts as a method to improve quality of life [24].

### 5. Conclusions

In conclusion, this Delphi study prioritizes some highlighted issues that World Taekwondo needs to address. The safety of athletes seems to be the most common theme appearing in each round of discussion and an online questionnaire. More specifically, the narrowing or reduction of the impairments included in the K44 class, i.e. removing neurological impairments, such as cerebral palsy, was a recurring issue. Another major issue

was the need to develop more personalized protectors for the athletes due to the uniqueness of their limb deficiencies. This makes the use of current standardized and World-Taekwondo-approved equipment difficult. On a side note, it seems that World Taekwondo need to improve the education of the national associations, trainers, coaches and athletes with regard to the classification rules so that there is no misunderstanding on classification procedures and regulations.

#### ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study design was approved by World Taekwondo.

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#### CONFLICT OF INTEREST

There are no conflicts of interest between the authors of this article and World Taekwondo.

#### PROVENANCE AND PEER REVIEW

Not commissioned; externally peer reviewed.

#### APPENDIX

Appendix associated with this article can be found, in the online version, at <https://oss.jomh.org/jomh/article/1370265098482794496/attachment/Appendix.doc>.

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