Article

Wheelchair basketball: fitness and quality of life

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Abstract: The aims of the study were to assess the physical activity (PA) level, subjective perception of quality of life (QOL), muscle strength, flexibility, and agility in wheelchair basketball (WB) players from Pelotas/Rio Grande do Sul. The sample consisted of 10 WB amateur athletes. For muscle strength, we applied three isometric handgrip tests - maximum handgrip test (MIHS in kgf), sub-maximum handgrip test (to assess strength endurance at 70% of MIHS (70MIHS in s) and scapular isometric test (SIS), - and two isotonic tests to measure strength endurance (maximum repetitions in 1 min) in: i) elbow flexor muscles (EFS) and ii) shoulder abductors (SAS). To evaluate agility, it was conducted adapted 20-m Shuttle Run (SR). For flexibility, we adopted Apley's and Back Stretch tests. Physical activity (PA) and QOL were measured by IPAQ and World Health Organization Quality of Life (WHOQOL) BREF-version, respectively. Descriptive statistics and t test were used with significance level at 5%. The performance in MIHS, 70MIHS, SIS, EFS, SAS and Apley's test was, respectively, 46.2±5.1 kgf, 49.3±15.8 s, 28.4±11.5 kgf, 37.1±9.9 reps, 28.3±6.6 reps and 12.7±10.9 to right side and 47.5±9.0 kgf, 45.4±11.3 s, 30.8±12.6 kgf, 40.4±7.8 reps, 29.8±5.6 reps and 13.4±5.1 cm to left side. The athletes reached 93.0±10.9 cm in the Back Stretch (cm) test and 16.2±1.9 s in the SR. They showed 736±120 min/week of moderate and 467±191.4 min/week of vigorous PA, and the WHOQOL-bref overall score was 67.6±5.5. The WB players exhibited QOL near to the reference values and superior performance in agility test when compared with people with physical impairments from other sports.

Keywords: adapted sport; spinal cord injury; physical fitness; muscle strength

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Introduction

The aims for sport practice with a focus on rehabilitation are therapeutic gains and social interaction among people with disabilities (Fiorilli et al., 2013). In addition, there is commitment to well-being and especially with the social aspects of quality of life (QOL) of the people involved (Leduc & Lepage, 2002; Sherrill, 2004). Moreover, participation in sports activities can generate positive response in relation to mental health and perceived self-efficacy (Fiorilli et al., 2013). In fact, it is recognized that high levels of physical fitness may be associated with positive health outcomes (Ozmen, Yuktasir, Yildirim, Yalcin, & Willems, 2014), even when considered individuals with low mobility (Cardoso, Palma, Bastos, & Corredeira, 2014).

Among all the different adapted sports, wheelchair basketball (WB) has emerged as one of the most popular, based on the progressive growing number of participants since its creation in the 40s (Ozmen et al., 2014). Generally, it is played by amputees, wheelchair users and people with cerebral palsy (International Paralympic Committee, 2015; Ozmen et al., 2014). Currently, WB is a Paralympic sport and has several national associations in many countries. The National Wheelchair Basketball Association, in the USA has more than 200 affiliated teams (National Wheelchair Basketball Association, 2016). Its regular practice may be related to the prevention of cardiovascular and musculoskeletal diseases (Silva, Oliveira, & Conceição, 2005). Among the characteristics of this sport, there is high-energy demand, which could prevent increase in the percentage of fat and obesity (Gorla, Araujo, Calegari, Carminato, & Silva, 2007). Furthermore, WB has been one of the ways that people with disabilities found to enhance their physical abilities, and it is recognized that WB can provide: i) high social interaction between people with equal conditions (Cardoso, 2011), ii) better adaptation of the individual to the wheelchair and development of wheelchair use skills (Pereira &

Gabriel, 2006), and iii) increased muscle strength due to this sport's characteristics (Ozmen et al., 2014).

During WB practice, players perform bodily efforts to fast movements and quick direction changes, which requires power from the upper limbs (Gorgatti & Bohme, 2002). Additionally, they are dribbling, passing and throwing the ball to the basket; thus, the strength of the upper limbs tends to be more required (Oudejans, Heubers, Ruitenbeek, & Janssen, 2012). Thus, muscle strength and power are determinants and fundamental to success in this sport (Cardoso, 2011).

Then, the use of new physical fitness evaluation methods is particularly important for professional athletes with disabilities. Findings from the evaluation should be considered for physical training in order to improve athletic performance of athletes (Cardoso et al., 2014). Thus, to know whether QOL profile and physical fitness level from athletes with disabilities could contribute to better development of sport programs addressed to non-athletes with a similar profile, in this study we aimed to evaluate perceived quality of life, muscle strength, flexibility, and agility in WB players in Pelotas/ Rio Grande do Sul.

Materials and Methods

The study had an observational design and involved ten adult WB players who had a 6-month-required experience and were state-level competitors. The training frequency was twice per week, and each session lasted 90 minutes. For involvement in the study, the athletes gave written consent and the Ethics Committee for Research of the Superior School of Physical Education of Federal University of Pelotas (ESEF/UFPEL) approved this study (COCEPE 52837030/2014 code).

Three previously trained evaluators conducted data collection. The sessions were 40-minute in duration. The same procedures and the same criteria was applied on all participants. At the beginning of the session, athletes answered questionnaires about physical activity level and perceived QOL. After this step, we measured performances on muscle strength, flexibility, and agility tests.

Data collection procedures

Physical Fitness

To evaluate isometric force we applied three tests. In order to measure maximal and submaximal isometric handgrip strength, we used digital dynamometer (model EH101, DayHome™ Ltda), and analogical dynamometer (CROWN®) to measure scapular strength. Both dynamometers were calibrated, approved by the National Institute of Weights and Measures (INMETRO®, Brazil) and were used according to manufacturer's procedures.

The first test evaluated the maximal isometric handgrip strength (MIHS, in kgf), with the athlete in his wheelchair with the elbow flexed at 90° and pressing the dynamometer for 3 s. The individual's value was considered the best result among the three attempts (Garcia, Dias, Dias, Santos & Zampa, 2011). Normative reference values for MIHS was 44.50 kgf (Yanci, Granados, & Otero, 2015). The test has been validated with excellent ICC for right hand (0.985) and left hand (0.985) (Reis, & Arantes, 2011).

The second test was submaximal and evaluated resistance strength with 70% of MIHS (70MIHS in seconds). It was performed after calculating the 70MIHS, and the athlete should hold the dynamometer in as long as possible within a range of MIHS of ±5kgf (Henriksson, Katz, & Sahlin, 1986). The time spent in the specific range was considered as 70MIHS performance. The reproducibility of this protocol was evaluated previously, and it was reported an Intraclass correlation coefficient (ICC) equals to 0.88 (Zanchet, & Del Vecchio, 2013).

The last test evaluated the scapular isometric strength (SIS, in kgf), in which the individual, in his wheelchair, pulling the dynamometer toward him for 3 s with the elbow flexed at 90˚. The highest value achieved by the device was registered and after three attempts the highest-reached value was computed (Cools, Johansson, Cambier, Velde, Palmans & Witvrouw 2010). Previous study evaluated the reproducibility of this protocol, and found ICC between 0.83 and 0.95 (Cools et al., 2010).

There were two strength resistance tests to upper limbs, which registered the maximum number of repetitions in 1 min. One of them evaluated strength on elbow flexor muscles (EFS) with a three-kilogram dumbbell (Winnick, & Short, 2001). The second assessment evaluated shoulder abductors strength (SAS) and used a 7-kg dumbbell. It was considered a valid repetition when the dumbbell was raised above the shoulder with full elbow extension. The count ended up either when the participant was no longer able to lift the weight with full extension, needed to rest for more than four seconds between reps, or completed 50 repetitions (Winnick, & Short, 2001).

For flexibility assessment, two tests were applied: Apley's test and Back Stretch test (Winnick, & Short, 2001), which measured flexibility of the upper end of the body and the shoulder abductors, respectively. Firstly, the Apley's test was conducted with the athlete sitting in his wheelchair, fully stretching the right shoulder and flexing the elbow of the same arm, touching his middle finger on his back. Then, he should flex the elbow on the left side, so his hand touched his back underneath. Secondly, the individual tried to touch the middle fingers of his hands in each other, and remain in this position for 1-2 s. Thus, the distance between the tip of the middle fingers was the considered result. If the athlete could override a finger to the other, the evaluator would register how much they were overlapping. After the recorded result, the athlete performed the same rating but at this time with left arm over the back and right arm underneath (Winnick, & Short, 2001). In addition, the Apley's test can be conducted to diagnose degenerative rotator cuff tendonitis (Pereira, & Gabriel, 2006), because this joint includes extreme rotational glenohumeral movement, putting in tension its rotational sheath. Subsequently, the Back Stretch test was performed to measure the shoulder abductors flexibility. To perform this measurement, the athlete should be at sitting position with his arms extend and parallel to the ground and holding a 50-m tape measure between them, with the beginning of it in his right hand. Then, the player should try to perform rotational motion of his shoulder, clockwise, holding the tape. To consider full rotation, the evaluator should note in what value the tape was pointing at its end when was left by the athlete's hand. Both tests – Apley's and Back Stretch - were performed only once by each athlete. Hesseberg, Bentzen and Bergland (2015) validated the reproducibility of Apley's test with ICC of 0.97.

The adapted version of the Shuttle Run Test (SR; ICC> 0.97) was used to measure agility among the athletes (Brunelli, et al., 2006). They should go through a 20 m distance from the starting point and round back to it in the shortest time possible (Brunelli et al., 2006). The test begins when the athlete passed the starting line. Subsequently, the athlete performed contour around the cone which was in the final line of the distance and returned to the starting site of the test. The timer stopped when the wheelchair passed the initial line. After performing the route three times with 5 min interval between them, the best result of the trials was considered (Brunelli et al., 2006). Barreto, Paula and Ferreira (2010) and Cardoso, Palma, Bastos, and Corredeira (2012) reported 20.84 seconds and 18 seconds on this test at wheelchair dance (WD) and wheelchair handball (WH) athletes, respectively, which were taken as reference values in the present study.

Subjective perception of health-related quality of life (QOL)

We used the World Health Organization's Questionnaire for Quality of Life (WHOQOL-BREF) to measure athletes' QOL (WHO, 1996). The questionnaire divides and evaluates this variable in four domains: physical, psychological, environmental and social domains, as well as providing an overall score (WHO, 1996). This questionnaire has been validated for the Brazilian population, with Cronbach's alpha coefficient of 0.69 to 0.91 (Fleck, Louzada, Xavier, Chachamovich, Vieira, & Santos, 2000) and later for people with physical disabilities (alpha = 0.81; Power, & Green, 2010). The average QOL for people with disability was analyzed by Çetin, Çağlayan, Kïrïmoğlu and Çokluk (2011), with values equal to 14.28, 14.81, 15.08 and 12.99 for the physical, psychological, social and environmental domains, respectively.

Physical Activity (PA) Level

This variable was recorded through the International Physical Activity Questionnaire (IPAQ), short version, validated for Brazilian adults (Spearman's Rho correlation coefficient = 0.71) (Pardini, et al., 2001). The evaluators were trained to apply this instrument. Where there were terms like "walk", they were recommended to consider the activity performed using the wheelchair. This same form of application of the IPAQ was used previously (Saebu, & Sørensen, 2011), because there is no adapted and validated version of this questionnaire to this population in the literature. To calculate the values obtained through IPAQ, we used the guidelines produced by the Marshall & Bauman (2001) on which the numbers of days of a physical activity should be multiplied by the daily time of that physical activity. Nevertheless, for vigorous activity, it should multiply the obtained value by 2.

Data were collected on a sports court, in which the WB athletes trained as a team, at around 7 pm. The athletes performed warm-up that lasted between 10 and 15 minutes, and just after it, the evaluators led the data collection. The order of the measures were; QOL, IPAQ, MIHS, 70MIHS, SIS, EFS, SAS, Apley's test, Back Stretch, and SR. This sequence was determined in order to minimize the damage and fatigue in the players. Moreover, there was a 5-minute interval between measurements of strength, agility and flexibility. All data collection lasted up to 30 minutes.

Statistics

After checking for normal distribution using Shapiro Wilk test, descriptive statistics involved mean, median, standard deviation (SD), minimum (MIN) and maximal (MAX) values, as well as the coefficient of variation (CV). For PA level (IPAQ) and WHOQOL-BREF, dispersion data were shown with standard error (SE). For comparisons, we used descriptive statistics and one-sample t-test, and respective effect size (ES). ES it was considered small near 0.2, medium 0.5 and large higher than 0.8 (Cohen, 1994). We inserted reference values to each variable that had values available in the literature in order to verify difference between means from the present sample and from the reference groups. The internal consistency of each variable was tested by Cronbach's alpha. The level of significance adopted was 5% and the data were analyzed using the IBM SPSS version 22.

Results

The athletes were 31.4 ± 9.5 years, 77.7 ± 18.92 kg, 173.2 ± 4.7 cm in height and overall self-reported injury time of 76.5 ± 59.1 months (Appendix A). Among those surveyed, 60% had spinal cord injury which etiology was car accident, with average injury time of 82.33 ± 59.54 months. All individuals practiced WB for at least 6 months, and had a mean practice time of 22.55 ± 24.83 months. Regarding the functional classification, 20% of the sample was classified as 1.5, 40% between 2.0 and 3.5, and 40% between 4.0 and 4.5.

The results of isometric (α = 0.98) and isotonic (α = 0.84) muscular strength, flexibility (α = 0.65), and agility (α = 0.81) test results are shown in Table 1. Likewise, in Table 2, the data on the subjective health-related perception of QOL considering each domain and the overall score. Internal consistency of this instrument was also assessed by Cronbach's alpha. Physical health, psychological, social, and environmental domain achieved alpha equal to 0.61, 0.38, 0.65, 0.87, respectively. For all 26 questions the alpha was equal to 0.90.

Finally, in Table 3 there was statistically superior performance in the agility test compared to the reference groups ($p < 0.05$). However, this difference was not observed in the other variables that had population values: MIHS and QOL.

The results obtained from IPAQ showed a total time of moderate-intensity physical activity of 736 ± 120 min/week. Likewise, vigorous-intensity physical activity achieved an average of 467 ± 191.4 min/week. Also, the highest values reported for each activity were 1440 min/week and 1680 min/week, respectively. On the other hand, the lowest value found for both moderate and vigorous intensity physical activity was 0 min/week.

Table 1. Descriptive statistics from muscular strength, flexibility, and agility tests performed by the WB players (n = 10)

Variables	Mean±SD (CV)	Median (MIN-MAX)
Muscular strength - Isometric[a]		
MIHS - Right Side (kgf)	46.17±5.06 (0.10)	44.18 (37.00-60.37)
MIHS - Left Side (kgf)	47.51±8.98 (0.19)	46.24 (35.40-61.47)
70MIHS - Right Side (s)	49.31±15.75 (0.32)	45.20 (26.20-75.00)
70MIHS - Left Side (s)	45.41±11.28 (0.25)	42.30 (29.70-61.01)
SIS – Right Side (kgf)	28.44±11.53 (0.40)	22.73 (18.25-50.00)
SIS – Left Side (kgf)	30.75±12.64 (0.41)	25.61 (18.48-50.00)
Muscular strength - Isotonic[b]		
Elbow Flexor – Right Side (reps)	37.10±9.89 (0.27)	34.00 (24.00-60.00)
Elbow Flexor – Left Side (reps)	40.40±7.79 (0.19)	39.50 (27.00-57.00)
Shoulder Abductor – Right Side (reps)	28.30±6.56 (0.23)	29.50 (11.00-36.00)
Shoulder Abductor – Left Side (reps)	29.80±5.55 (0.19)	30.00 (21.00-37.00)
Flexibility[c]		
Back Stretch (cm)	93.00±10.92 (0.11)	77.50 (62.00-149.00)
Apley's test – Right Side (cm)	12.70±10.94 (0.86)	14.00 (-2.00-38.00)
Apley's test – Left Side (cm)	13.35±5.06 (0.37)	12.00 (8.00-23.00)
Agility[d]		
Shuttle Run (s)	16.23±1.93 (0.12)	15.00 (14.51-21.03)

SD: standard deviation; CV: coefficient of variation; MIN: lowest value; MAX: highest value. MIHS: Maximum Isometric Handgrip Strength; 70MIHS: 70% of Maximum Isometric Handgrip Strength; SIS: Scapular Isometric Strength; reps: repetitions; cm: centimeters. [a] $\alpha = 0.98$; [b] $\alpha = 0.86$; [c] $\alpha = 0.65$; [d] $\alpha = 0.81$

Table 2. Scores of health-related quality of life from WB athletes (n = 10)

	Quality of Life				
	Physical	Psychological	Social	Environmental	Overall
Mean±SE	66.08±5.84	77.51±5.96	70.01±7.05	56.89±5.71	67.62±5.45
Median	67.85	85.40	70.85	54.70	69.70
Minimum	39.30	41.70	41.70	28.10	38.60
Maximum	92.90	100.00	100.00	84.40	94.30

Discussion

In this study we assessed physical fitness, physical activity level and health-related quality of life levels among WB players. Our main finding is that the present sample of WB players showed agility level higher than the average value found in the literature for wheelchair dance and wheelchair handball athletes ($p = .03$). This finding is relevant because agility is related to bone mineral density, an important health-related parameter that is significantly reduced in people with spinal cord injury. Additionally, Gracia-Marco, Vicente-Rodriguez, Molnar, Castillo & Moreno (2011) observed agility is positively associated with bone mineral content regardless physical activity level. Then, these results suggest WB would be a recommended adapted sport for persons with physical disabilities because it appears to be more efficient to prevent bone mass losses, which can decrease medical complications and improve quality of life.

Table 3. Comparison between sample values (n=10) and population-referenced means

	Sample	Population	t	ES	Magnitude	p
Isometric handgrip						
MIHS (kgf)	46.56	44.50[a]	0.795	0.26	Small	0.45
MIHS -Right Side (kgf)	46.17	44.90[b]	0.221	0.07	Small	0.41
MIHS - Left Side (kgf)	47.51	40.70[b]	1.369	0.42	Small	0.10
Agility test						
Shuttle run test (s)	15.40	20,84[c]	-12.74	0.97	Large	<0,001
Shuttle run test (s)	15.40	18.00[b]	-1.98	0.55	Medium	0.03
QOL – Physical	14.50	14.28[d]	0.23	0.08	Small	0.82
QOL – Psychological	16.50	14.81[d]	1.8	0.51	Medium	0.10
QOL - Social	15.30	15.08[d]	0.19	0.06	Small	0.84
QOL - Environmental	13.00	12.99[d]	0.01	0.003	Small	0.99

QOL: Quality of life; [a] Yanci, Granados & Otero, 2015 [b]=Cardoso; Palma, Bastos, & Corredeira, 2012; [c] = Barreto, Paula & Ferreira, 2010; [d] = Çetin et al., 2011. ES = Effect size

Furthermore, Yanci et al. (2015) measured handgrip strength in WB athletes, and Cardoso, Palma, Bastos, and Corredeira (2012) evaluated handgrip strength in wheelchair handball. The strength values (44.50 Kgf; Yanci et al. 2015: 40.7 Kgf and 44.9 Kgf; Cardoso et al. 2012) were not significantly different when compared to the values from WB athletes in our study. This similarity among the athletes may be explained due to WB and wheelchair handball have similar characteristics, such as throwing the ball in a determined target. Likewise, the sample in Yanci et al.'s (2015) study, there were some characteristics alike with the athletes in our study, such as age (31.04; 33.06), level of injury, and frequency of training (2x / week; 3x / week). However, there was significant difference in agility between WB and wheelchair dancers (15.84 and 20.84 seconds, respectively with p <0.001), and between WB and wheelchair handball (15.84 and 18 seconds, respectively with p =0.03), which the better value was from our study. Gorgatti and Bohme (2002) reported that agility is important during a WB match because the athletes need performing quick changes in direction, without loss of speed or rhythm. The speed depends, in addition to hereditary factors, coordination, dynamic balance, and speed and power of upper limbs (Ozmen et al., 2014; Sheppard, Young, Doyle, Sheppard & Newton, 2006).

It is considered that muscle strength is the key component of fitness for competitive success (Turbanski, & Schmidtbleicher, 2010), as well for wheelchair handball players, because power, which is associated with muscle strength, is critical to perform quick movements combined with force to complete the movement (Cardoso et al., 2014). Furthermore, significant statistical differences were found when comparing Barreto et al.'s (2010) MIHS values with those from the present study. Likewise, Gorgatti and Bohme (2011) reported significant differences in power between WB players and sedentary individuals with physical impairments. Also, for people with disabilities who are affected, especially at lower limbs muscle strength of upper limbs, it is very relevant as a result of the lack of movement, that is supplied by upper limbs and trunk (Barreto et al., 2010). Moreover, besides performance-related benefits, muscle strength is positively correlated with decreased overall mortality in adolescents, adults, and elderly (Ruiz et al., 2008; Ortega, Silventoinen, Tynelius, & Rasmussen, 2012; Kraschnewski et al., 2016). Likewise, strength training or practice of sports in which muscle strength is required is important for all types of individuals, especially for those who physical impairments.

Additionally, no studies were found assessing isotonic strength of people with physical disability using elbow flexion tests or shoulder elevation with free-weights. However, Mercier and Bourbonnais (2004) evaluated this variable in people who had chronic hemiparetic stroke, showing a positive correlation between the isotonic strength of shoulder and elbow flexion, elbow extension, and handgrip strength with the functionality of upper limbs. Also, several researches have suggested that shoulder strength is negatively related with pain in this body site (Kawazu et al., 1999; Mulroy, Hatchett, Eberly, Haubert, Conners & Reguejo, 2015). In addition, Finley and Rodgers (2004) evidenced there is no difference in shoulder pain prevalence among athletes and non-athletes manual wheelchair users, showing that involvement at WB and wheelchair handball games do not increase the risk of shoulder pain, but the regular and correct practice could improve strength in adductors, internal and external rotators. Regarding flexibility, comparisons between WB players and sedentary people with disabilities through Apley's test indicated a significant difference between the groups (Pereira & Gabriel, 2006).

The results on QOL in this study were not significantly different from those presented by WB athletes of Turkish Sports Federation for the Physically Disabled (Çetin, Çağlayan, Kïrïmoğlu, & Çokluk, 2011). Moreover, McVeigh, Hitzig, & Craven (2009) found differences in QOL between participants with physical disability from sport clubs and sedentary people with disabilities. Furthermore, it is stated there is a positive influence of physical activity on QOL and social integration in people with physical disabilities (Kawanishi, & Greguol, 2013). Furthermore, the sample showed a high range of scores in the QOL instrument, either overall or by domains. This could be explained due to the athletes in the sample had different socioeconomic situation, generating different perceptions of environment, self-efficacy and social support.

This study has some limitations. The first one refers to the small number of athletes in the sample. Ten players in the team in which the study was conducted during the study period, and the location in which they trained and played was the only place for systematic practice of WB in that city. Nonetheless, recent studies with WB players showed sample sizes similar to the one used for the present study. Mason, van der Woude, Lenton, and Goosey-Tolfrey (2012) found the effect of wheelchair size on performance of thirteen WB athletes. Breslin, Czyz and Pizlo (2013) measured the presence of a special skill among twelve WB players. Likewise, Kinoshita et al., (2013) analyzed the behavior of interleukin-6 in five athletes during WB matches. Finally, this study had an observational design, and further studies with experimental design to develop physical fitness on WB athletes are needed to understand the behavior of variables according to fitness methods. On the other hand, an important strength of this study is the feasibility of the evaluation methods and identification of superior values of agility and in psychological domain of subjective perception of QOL compared to values found previously.

Perspectives

About muscle strength, it was found that WB players do not have significantly different levels of this physical capacity compared to athletes of the same sport and national-level competitors. Moreover, it became clear that WB players at the regional level from Brazil, have no worse perception of quality of life in all areas compared to the same competitive-level athletes in Eastern Europe, a high-income place. The study also evaluated flexibility of WB players, and is the first study to report this, hence no comparative values were reported. In summary, we conclude that WB players exhibited superior performance in agility test when compared to people with physical disabilities of other sports such as wheelchair dance. The practice at competitive level of WB is increasing among people with physical impairments around the world (National Wheelchair Basketball Association, 2016). Thus, it is necessary for new experimental studies to investigate the effects of WB on physical fitness and health-related quality of life of people with disabilities.

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Appendix A

Clinical and anthropometric characteristics from wheelchair basketball athletes (n=10)

Athlete	Age (years)	Weight (Kg)	Height (cm)	Injury time (months)	Type of impairment	Practice time (months)*	Sport classification#
1	44	64	172	28	Amputation (both legs)	28	2.0
2	30	115	177	180	Spinal cord injury (L4-L5)	180	1.5
3	40	70	168	101	Spinal cord injury (T5)	101	4.5
4	45	96	168	180	Amputation	180	1.5
5	25	68	172	69	Spinal cord injury (T4-T5-T6)	69	4.5
6	23	78	182	48	Spinal cord injury (T9)	48	3.0
7	27	61	176	45	Spinal cord injury (T9-T11-T12)	45	3.5
8	13	58	172	30	Spinal cord injury (T12)	30	3.5
9	30	64	173	60	Spinal cord injury (T11-T12)	60	4.0
10	14	58	172	30	Spinal cord injury (T12)	6	4.0

* Practice of Wheelchair basketball; #According to International Paralympic Committee.