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Bocha en los Juegos Paralímpicos: La evolución de 1984 a 2016 y perspectivas futuras

Boccia in Paralympic Games: The evolution from 1984 to 2016 and future perspectives

Boccia nos Jogos Paralímpicos: A evolução de 1984 a 2016 e perspetivas futuras

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RESUMEN

El objetivo de este estudio fue analizar la evolución de la Bocha de 1984 a 2016 en los Juegos Paralímpicos (JP) y vislumbrar perspectivas futuras en el paradeporte. Los datos se obtuvieron de la página oficial del Comité Paralímpico Internacional, de 1984 a 2016 y asociados a la clasificación de atletas, formato competitivo y número de partidos disputados, número, nacionalidad y sexo de los participantes, así como resultados. El número de atletas que participaron en el JP aumentó de manera constante entre 1984 (19) y 2016 (106), lo mismo se observó para los países representados (1984 = 5 vs 2016 = 21) y países que ganan medallas (1984 = 5 vs 2012 y 2016 = 11). En cuanto al género, se observó un aumento evidente, aunque no continuo a lo largo de las ediciones (masculino 1984 = 11 vs 2016 = 73 / femenino 1984 = 8 vs 2016 = 33). A pesar de la cantidad total de juegos ha aumentado entre 1984 (19) y 2016 (180), este no fue uniforme, incluso disminuyó entre 2004 (252) y 2012 (161). Esta evidencia está relacionada con factores como el modelo de clasificación y el formato de la competición, que ha cambiado con el tiempo, así como el sistema de clasificación (BC4 implementado en 2004) y el formato de parejas y equipos. Cabe señalar también que, en la edición de 1984, los JP se realizaron con separación de género. La Bocha es un paradeporte en desarrollo con varios desafíos, a saber: i) el aumento continuo de participantes; ii) igualdad de género; iii) mejoría del sistema de clasificación; y iv) formato competitivo para acomodar a un número cada vez mayor de participantes.

Palabras clave: Bocha; Juegos Paralímpicos; Atletas; Clasificación; Rendimiento.

ABSTRACT

This study aimed to analyze the participation in Boccia from 1984 to 2016 in Paralympic Games (PG) and envision future perspectives in the parasport. Data was obtained from official International Paralympic Committee webpage, from the first edition (1984) until 2016 and associated to athlete's classification, competitive format and number of played games, the number, nationality and gender of participants, and also the results. The number of athletes

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participating in PG has steadily increased between 1984 (19) and 2016 (106), the same was observed with relation to represented countries (1984 = 5 vs 2016 = 21) and medal countries (1984 = 5 vs 2012 and 2016 = 11). With respect to athletes' gender, an evident increase was observed, although not continuous throughout the PG editions (male 1984 = 11 vs 2016 = 73 / female 1984 = 8 vs 2016 = 33). Despite the total number of played games increased between 1984 (19) and 2016 (180), this has not been uniform, having even decreased between 2004 (252) and 2012 (161). This evidence is related to factors such as forms of qualification and competition format, that have changed over time, as well as classification system (BC4 was implement in 2004), and pairs and teams' format. It should also be highlighted that, in 1984 edition, PG were performed separating genders. Boccia is a developing parasport with several challenges, namely: i) the continuous increase in participants; ii) gender equally; iii) improvement of classification system; and iv) the competitions format to accommodate an increasing number of participants.

Keywords: Boccia; Paralympic Games; Athletes; Classification; Performance.

RESUMO

O objetivo deste estudo foi analisar a evolução do Boccia de 1984 a 2016 nos Jogos Paralímpicos (JP) e vislumbrar futuras perspetivas na modalidade paralímpica. Dados foram obtidos da página oficial do Comité Paralímpico Internacional, de 1984 até 2016 e associados à classificação dos atletas, formato competitivo e número de jogos disputados, número, nacionalidade e género dos participantes, e também resultados. O número de atletas participantes nos JP aumentou constantemente entre 1984 (19) e 2016 (106), o mesmo foi observado relativamente aos países representados (1984 = 5 vs 2016 = 21) e países medalhados (1984 = 5 vs 2012 e 2016 = 11). No que respeita ao género, um aumento evidente foi observado, embora não contínuo ao longo das edições (masculino 1984 = 11 vs 2016 = 73 / feminino 1984 = 8 vs 2016 = 33). Apesar do número total de jogos ter aumentado entre 1984 (19) e 2016 (180), este não foi uniforme, tendo mesmo diminuído entre 2004 (252) e 2012 (161). Esta evidência está relacionada com fatores como modelo de qualificação e formato da competição, que mudaram ao longo do tempo, bem como sistema de classificação (BC4 implementada em 2004) e formato de pares e equipas. De realçar ainda que, na edição de 1984, os JP foram realizados com separação de géneros. O Boccia é uma modalidade paralímpica em desenvolvimento com vários desafios, nomeadamente: i) o aumento contínuo de participantes; ii) igualdade de género; iii) melhoria do sistema de classificação; e iv) formato competitivo para acomodar um número crescente de participantes.

Palavras chave: Boccia; Jogos Paralímpicos; Atletas; Classificação; Desempenho.

INTRODUCTION

Boccia is a sport of precision, consisting of a sequence of rounds in which players must try to place the game soft leather balls (in red or blue color) as close as possible to the target ball (in white color) (Reina, Dominguez-Diez, Urban, & Rondán, 2018), it also requires strong tactical skills (Roldan, Barbado, Vera-Garcia, Sarabia, & Reina, 2020). The parasport is played in an indoor court with two sides (of one or two players each). Each side has six balls and must throw these balls, using a method determined by their classification, out into the playing zone and as close as possible to the jack (a white ball). Players have a time limit for launching all their balls. The time of the game gets measured for each throw, it is the time from the referee's call to the player to throw until the ball stops on the court. For different categories of players, the time limit for the game varies, ranging from 4 to 8 minutes.

Play is conducted on a hard surface court 12.5 × 6 m with 2 m of empty, in-bounds, playable space around it. The throwing area is divided into six rectangular throwing boxes in which the athletes must stay completely within during play. During the game, the colored balls (red and blue) can be thrown by hand, kicked by feet, or, if the competitor's disability is severe, launched with an assistive device. At the end of each round the referee measures the distance of the colored balls closest to the jack and awards points

accordingly. Individual competition consists of four ends and six balls per player per end, whilst paired competition is four ends and six balls per pair per end (three per player). Team competition is six ends, and six balls per team per end (two per player). The team/player with the highest number of points at the end of game is the winner. If both teams have the same number of points after all ends have been played, one additional end is played to determine a winner.

This parasport requires a high degree of muscle control, accuracy, concentration, and tactical awareness. Considering the later, Powell and Meyers (2018) indicated that para-athletes have experienced adversity-growth opportunities and more recently Pons, Ramis, Viladrich, and Checa (2020), addressing youths, highlighted that facing the emotions represents one of the most important demands of sport, but there are differences, depending on the characteristics of the practiced sport. This fact is aligned with the suggestion of Amorim, Travassos, and Mendes (2018) that coaches of Boccia may include the training of mental visualization. Moreover, Jodra, Galera, Estrada, and Domínguez (2019) stressed that trained athletes increase cognitive performance in tasks that require attention and decision-making when they are at an optimal level of arousal, which is relevant in Boccia, parasport associated to emotions and consequently to rise in thoughts, ideas, images, and behaviors (Peris-Delcampo, 2020), fact that should be considered since threats and challenges can generate stress and hinder the athlete's performance (Almeida Pereira, Passos, Pesca, & Cruz, 2020).

There are competitions at both national and international levels for disabled athletes who require wheelchairs for locomotion, and it is a sport in broad growth in the community. Nevertheless, a reflection of the long road that society still must go, in pursuit of the normalization of the group of people with disabilities, is the absence of research that deepen for example into the social interaction - prosocial and antisocial behaviors - that takes place in Boccia's competition (Lapresa Ajamil, Pascual Laguna, Arana, & Anguera 2020). Boccia is administered by the International Boccia Committee, which is governed by the Cerebral Palsy International Sports and Recreation Association (CPISRA). Since 2013 has been governed by the International Boccia Sport Federation (BISFed), is one of the fastest growing parasports and together with goalball, a sport that is included in the Paralympics Games (PG) program that does not have a counterpart in the Olympic program (Koper, Nadolska, Urbański, & Wilski, 2020).

Depending on their physical and functional abilities, Boccia athletes are assigned to one of the four sports classes, BC1-BC4 (CPISRA, 2009). It was originally designed for individuals with cerebral palsy (CP) but is now played by athletes with other severe disabilities affecting motor skills such as spinal muscular atrophy. Specifically, BC1 hosts players with CP diagnosed with spastic quadriplegia or athetosis, or those with severe ataxia, players can either kick or throw the ball and may request the use of an assistant, whereas BC2 hosts CP players diagnosed with spastic quadriplegia or with athetosis/ataxia, they are able to better throw the ball than BC1 players, consequently they are not allowed the use of an assistant (BISFed, 2017). Specifically, BC1 and BC2 sport classes are for para-athletes who are "diagnosed with a neurological impairment affecting the central nervous system; spastic hypertonic quadriplegia or dyskinesia (athetosis/dystonia) or who may have a mixed picture including those with severe ataxia" (BISFed, 2018) This entails in significant coordination and trunk control limitations (Szopa & Domagalska-Szopa, 2015).

BC3 is open to players with several different types of disabilities, including CP. They use an assistive device and may be assisted by a person, who will remain in the player's box but who must keep his/her back to the court and eyes averted from play. Lastly, since 2004 BC4 was implemented in PG for players with severe physical disabilities other than CP, such as progressive muscular dystrophy (Avila Romero & Moreno Hernández, 2000), but they are not eligible for assistance during the game. Nowadays all events are mixed in gender and feature individual, pair, and team competitions. Despite Boccia is considered to require a great tactical ability and concentration by players, an ability to analyze the game and good accuracy (Reina, Caballero, Roldan, Barbado, & Sabido 2015), unfortunately, there are few scientific studies reported in the literature that explore this parasport (Fong, Yam, Chu, Cheung, & Chan, 2012; Huang, Pan, Ou, Yu, & Tsai, 2014; Reina et al., 2015; Tsai, Yu, Huang, & Cheng, 2014). Two possible reasons for this are the progressive disappearance of athletes with high

support needs (most severe impairments) from big sport events, such as the PG (Howe & Jones, 2006) and a lack of interest in the scientific community in a minority group with great inter-individual variability and difficult access to the study sample.

Notably, despite Boccia was introduced in PG in 1984, the number of studies in this sport are scarce compared to other parasports. Add to this fact that to our best knowledge no study so far has characterized Boccia's evolution in the PG in terms of participation, information that is relevant to understand the evolution of the parasport and at the same time try to identify and understand challenges for the near future in the context of the dynamization of Boccia in PG. Hence, the aim of this study was to analyze the participation in Boccia from 1984 to 2016 in PG and envision future perspectives in the parasport.

MATERIALS AND METHODS

Data regarding Boccia was obtained from official International Paralympic Committee webpage (https://www.paralympic.org/), from 1984 until 2016 PG editions. Detailed information regarding different topics related to PG participation in Boccia was gathered and organized: i) competitive format; ii) athlete's classification; iii) number of played games and; iv) number, nationality, and gender of participants. Information related to other parasports was also analyzed in order to enable to comparation with Boccia.

Data searching and analysis occurred between March and June 2020, performed by three of the authors. For data organization and figures creation Microsoft Excel® was used. The study was not related to either human or animal use, consequently, ethical approval was not necessary.

RESULTS

Boccia is a recent parasport considering that the Paralympic movement started in 1960 at Rome, and compared to other parasports such as archery, athletics, swimming, table tennis, wheelchair basketball and wheelchair fencing, included in the PG from 1960 to the present day. Nine editions of PG involving Boccia have taken place between 1984 and 2016, since the 2020 edition in Tokyo has been postponed. The first edition, 1984, was divided between two cities, New York and Stoke Mandeville (respectively in United States of America and United Kingdom). Afterwards, 1988 Seoul (South Korea), 1992 Barcelona (Spain), 1996 Atlanta (United States of America), 2000 Sydney (Australia), 2004 Athens (Greece), 2008 Beijing (Republic of China), 2012 London (United Kingdom) and 2016 Rio de Janeiro (Brazil). The number of participating athletes in Boccia in PG editions is presented in figure 1.

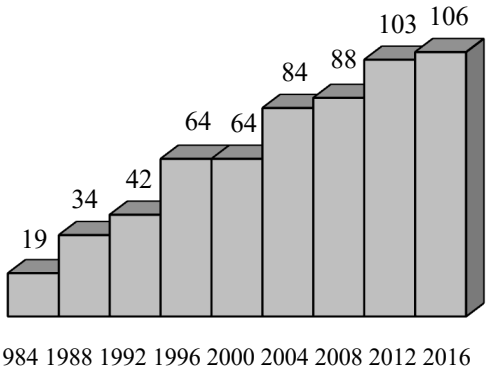

Figure 1. Number of participating athletes in Boccia in Paralympic Games editions.

The number of participants in Boccia has grown in line with the number of PG editions, with a trend towards greater stabilization in the most recent editions. Some details have emerged since 1984, namely the fact that in this specific edition, the game of Boccia considered the division between genders. Since 1988 until now, mixed has prevailed as the criteria for Boccia in PG.

The number of female athletes presented in PG more than tripled between 1984 and 2016 (536 and 1,671, respectively), contrary to the reality in males, which did not even double (1.569 and 2.657, respectively). When considering this gender topic and all parasports, it is noteworthy to state that the 1.687 women athletes present in Rio 2016, more than double the number that participated at the Atlanta 1996 PG. This global evidence in a time span of 20 years also presents correspondence in Boccia, table 1 highlights the athletes' gender in Boccia in all PG editions.

Table 1. Participating athletes' gender in all Paralympic Games editions with Boccia.

	Male athletes	Female athletes
1984	11	8
1988	23	11
1992	33	9
1996	52	12
2000	48	16
2004	64	20
2008	62	26
2012	76	27
2016	73	33

The expansion from the territorial point of view is also observed in Boccia, as PG occurred in America, Asia, Europe and Oceania continents. Noteworthy saying that with exception of Antarctica (that is characterized by no indigenous population), only Africa received no PG with Boccia play, a continent with a 1.2 billion population and more than 30.000,000 km^2 of area. The number of Boccia participating countries in PG competition has systematically increased as well as the number of countries with medaled athletes. Table 2 shows the number of participating countries and athletes' medalists in each of the PG editions with Boccia competition, and the number of played Boccia games in each event. We should highlight that in Rio 2016, the participating athletes represented a total of 159 countries. The number of Boccia participating countries in PG competition has systematically increased as well as the number of countries with medaled athletes. Since 1996, the number of Boccia played games has shown oscillations with a relevant decrease for example between 2004 and 2012. This fact occurred in parallel with different formats of Boccia athletes' qualifications for PG and different formats of competition in Boccia in different editions of PG.

Table 2. Participating countries and number of countries with medaled athletes in Boccia Paralympic Games editions. Number of played games in each Paralympic Games edition.

	Participating countries	Number of countries with medaled athletes	Number of games played
1984	5	5	19
1988	8	4	70
1992	11	6	97
1996	14	9	219
2000	14	6	192
2004	18	8	252
2008	20	9	222
2012	21	11	161
2016	21	11	180

From 1984 to 1992 the competition format modification was factual. In 1984 only individual C1 and C2 classes, divided by male and female athletes, and also mixed team. In 1988 and 1992 mixed individual C1 and C2, as well as mixed team C1-C2. In 1996, the competition format was the same of 1988 and 1992, although in this PG edition a new individual and team class was included, denominated "wad" an intermediate class for people with more severe CP. From 2000 to nowadays, the class definition stabilized, with mixed individual of each class, aside of mixed pairs BC3 and mixed team BC1-BC2 (five different events). The only difference occurred from 2004 forward was the new inclusion of mixed individual BC4 and mixed pairs BC4, therefore the number of Boccia events increased from five to seven. Figure 2 depicts the number of Boccia mixed individual classes games in PG editions from 2000 to 2016.

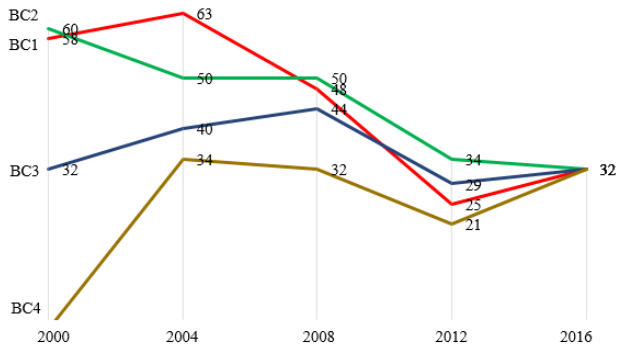

Figure 2. Number of Boccia mixed individual classes games in Paralympic Games editions from 2000 to 2016.

When analyzing other parasports, we should underline some particularities. Boccia was one of the very few parasports in 2016 in which the number of male athletes more than double the female. In parallel with Sailing, Wheelchair Rugby, and Equestrian presents mixed events. Sailing started in PG in 1996 with a total of 59 athletes (56 men and 3 women), in 2016 the number of participants increased to 80 (65 men and 15 women). Wheelchair Rugby also started in PG in 1996 with 47 participants, but only involved female participation in 2004 (87 men and 1 women), 2008 (85 men and 3 women), 2012 (88 men and 2 women) and (94 men and 2 women).

Equestrian in PG started in the same year as Boccia (1984) with a total of 15 athletes (9 men and 6

women), but in 1988 and 1992 was not present in the PG program, having returned in 1996 with a new competitive model and a relevant increase in female participation (15 men and 46 women), contrary to other parasports. Afterwards, the parasport was always present in PG programs with a number of participants without major changes, in 2000 (18 men and 54 women), 2004 (22 men and 47 women), 2008 (23 men and 50 women), 2012 (22 men and 56 women) and finally 2016 (17 men and 59 women). A particularity emerges in this parasport, it is the only in which the number of female participants since 1996 systematically more than double the male participants. In another perspective regarding this topic, in 2016, some parasports only present men events, such as the cases of Football 5-a-side and Football 7-a-side.

DISCUSSION

This study aimed to analyze the participation in Boccia from 1984 to 2016 in PG and envision future perspectives in the parasport. The main evidences to be derived from the current study are the following: 1) Boccia included nine editions of PG, from 1984 to 2016; 2) The number of participants has grown in line with the number of PG editions, with a trend towards greater stabilization in the most recent editions; 3) The classification criteria and competition format of Boccia in PG as changed since 1984; 4) The gender difference is evident in all PG editions; 5) The number of participating countries and countries with medaled athletes as increased in line with the PG editions; 6) The number of played games in Boccia in PG has shown oscillations with a relevant decrease between some of the recent editions and; 7) The classification system in Boccia as changed over the years, consequently the number of Boccia mixed individual classes games also changed and sometimes decreased in PG editions.

Despite Boccia more than 30 years playing history in PG, very little research reported scientific evidence related to Boccia athletes. Most studies focus on the technical and learning aspects of Boccia throwing (Dickson, Fuss, & Wong, 2011; Morriss & Wittemannóva, 2010; Huang et al., 2014; Fong et al., 2012). Nonetheless, competitive parasports have been reported to induce several psychosocial effects in persons with a disability (Webborn & Van de Vliet, 2012) (e.g., increased self-esteem, well-being, and quality of life and reduced anxiety and depression) (Blinde & Taub, 1999; Hutzter & Bar-Eli, 1993; Hutzler & Sherrill, 1999; Campbell & Jones, 1994; Gioia et al., 2006; Giacobbi, Stancil, Hardin, & Bryant, 2008; Stevens, Caputo, Fuller, & Morgan 2008). Associated to these facts, previously, in a group of people with severe disability due to neuromuscular and other neurological disorders, playing Boccia as part of a multidisciplinary rehabilitation program was shown to be a feasible therapy. However, practicing this game did not lead to significant improvements in upper limb impairments, except for wrist flexion and ulnar deviation active range of motion (Suárez-Iglesias, Ayán Perez, Mendoza-Laiz, & Villa-Vicente, 2020).

The increase in the number of Boccia participants in PG is currently a challenge in terms of qualification criteria and competitive format since the number of countries represented in Boccia in Rio 2016 (21) was very different compared to 1984 (5) but remain very different and distant compared to the total number of countries presented in Rio 2016 PG edition (159), considering all parasports. This fact is observed not only in Boccia, but also in parasports such has Equestrian, a parasport that was included in PG program in the same year as Boccia (1984), but since the competitive model changed in 1996, the number of participating athletes significantly increased, namely the female athletes, without major changes in the total number of participants between 2000 and 2016 (approximately 70 participants by PG edition).

Likewise, gender equity is also a challenge in Boccia, a parasport where the number of female athletes continues to be considerably lower compared to male, despite the global number of female athletes, considering all parasports, has noticeably increased (more than tripled between 1984 and 2016), in Rio 2016 the gender difference was observed (2657 men and 1670 women). The trend of participation in PG editions in these two parasports and comparing to other parasports seem to indicate that two major constrains regarding participation are associated to PG editions, the competition format (men, woman, mixed) and daily schedule, which limits the increase of

participants and implies restrictions in the qualification and PG events.

CP is considered the most common cause of childhood physical disability (Novak et al., 2013), with an estimated prevalence of 1.5-2.5 children per 1000 live births (Surveillance of Cerebral Palsy in Europe, 2002). More recently, only in one country, a pooled prevalence of 2.95 per 1.000 estimates suggest there are at least 2.5 million people with CP in India (Chauhan et al., 2019). CP refers to a group of permanent, non-progressive, developmental disorders that mainly affects movement and posture (Bax et al., 2005), with associated secondary impairments such as cognitive, language, and visual impairments (Odding, Roebroeck, & Stam, 2006), and with repercussions in daily activity since affects muscle tone, strength, coordination, and motor skills during human development (Woollacott et al., 2005). To improve or maintain their movement function, children with CP typically require substantial daily rehabilitation exercises or activities (Willis, Morello, Davie, Rice, & Bennett, 2002).

In the genesis of Boccia are the persons with CP diagnosis. Nonetheless, mixed team and pairs were introduced over the years and more recently, in 2004, BC4 was introduced in PG for players with other severe physical disabilities other than CP. The Boccia players with the highest impairment present a severe trunk muscular weakness and altered selective motor control (Chruscikowski, Fry, Noble, Gough, & Shortland, 2017), which hinders them from keeping a vertical position out of the wheelchair and dynamically controlling the trunk (Pavão, Santos, Oliveira, & Rocha 2015). On the one hand, the allocation of a sport class in Boccia is not based solely on players´ trunk function, as there are other factors to consider, such as arm function or manual dexterity (Roldan, Sabido, Barbado, Caballero, & Reina 2017), that usually have greater importance for the classifiers for decision-making due to the high impact on performance (e.g., ball throwing). Consequently, it is essential to develop evidence-based classification to assess the real impact of players' impairment on sports performance, allowing fair and equitable competition and avoiding unfair advantage caused by their degree of impairment (Roldan et al., 2020).

CONCLUSIONS

In conclusion, this study showed that Boccia is a parasport in evident development that requires in-depth study. Contributing to this evidence is the occurrence of PG editions in different continents over the years, but with the possibility of further expansion, namely in the African continent, something that should be considered by the institutions that regulate the Paralympic movement. The number of participating athletes in Boccia has continuously increased throughout the PG editions, but as in other parasports (e.g., Equestrian) a trend towards stabilization is evident, fact that we relate to the specificity of parasports and complexity of the practice organization, which nowadays leads to the reality in Boccia of athletes to play in PG context on the same day in the morning and at the end of the day, a situation that can influence sports performance. These facts associated to participation, as well as the gender issue are close related to the need of reflection about the qualification and competition model in the PG, since the evolution of Boccia in PG environmental is conditioned by these.

It is expected that the evolution of Boccia in PG implies challenges from the competition's organization perspective and also in the classification system, that changed in Boccia in PG since 1984 and currently presents seven events in PG, namely, mixed individual BC1, BC2, BC3 and BC4, mixed pairs BC3 and BC4 and finally, mixed team BC1-2. Associated to this is the need for improving functional classification with the goal to promote equal opportunity in competition classes in sports involving people with disabilities and to study training prescription and performance determinants.

PRACTICAL APPLICATIONS

This study highlights that Boccia is remarkably a developing parasport, although, some challenges emerge: i) the continuous increase in participants; ii) gender equally; iii) improvement of classification system; and iv) the competitions format to accommodate an increasing number of participants. International Paralympic Committee, federations, coaches, and athletes should reflect about the best strategies to overcome the constraints identified in this study that condition the development and evolution of Boccia in PG, assuming as natural principles the

Paralympic values (courage, determination, inspiration and equality).

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CONFLICTS OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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