

## The effects of boccia training load on emotional intelligence and quality of life in individuals with cerebral palsy

### Los efectos de la carga de entrenamiento de boccia sobre la inteligencia emocional y la calidad de vida en personas con parálisis cerebral

Farzad Rezavandzayeri, Helena Vila Suarez, Amir Khortabi, José María Cancela Carral  
Universidad de Vigo (España)

**Abstract.** The aim of this research was to determine the correlation between the load (volume) of boccia training and emotional intelligence and quality of life in individuals with cerebral palsy (CP). 165 individuals with CP who had severe activity limitations in their legs, arms and trunk (BC1) were voluntarily enrolled in this study. The type of design is characterized by being sectional-correlational. The participants were assigned to one of the boccia groups: G2 (2 hours/week), G4 (4 hours/week) and G6 (6 hours/week). The Schutte Self-Report Emotional Intelligence Test (SSEIT) and WHOQOL-Bref world health organization's quality of life questionnaire assessed these patients' emotional intelligence and quality of life of these patients respectively. To determine the degree of association, the Pearson Correlation Coefficient was used, and one-way ANOVA and Bonferroni were applied to compare the variables between the groups. The normality of the sample was tested through the Kolmogorov-Smirnov test. Results showed how the training load is a conditioning factor for the levels of quality of life and emotional intelligence, identifying that the greater the load, the better the levels of the indicated parameters. The dimensions of quality of life: physical and psychological health are those with the greatest difference between group G2 (physical health:  $19.61 \pm 6.83$ ; psychological =  $18.71 \pm 5.37$ ) and group G4 (physical health:  $58.25 \pm 16.61$ ; psychological =  $54.17 \pm 16.24$ ) and G6 (physical health:  $61.56 \pm 8.85$ ; psychological =  $56.29 \pm 3.48$ ). Regarding emotional intelligence, we must highlight the emotion perception dimension as the one that is most influenced by the weekly training load (G2:  $27.78 \pm 3.51$ , G4:  $38.20 \pm 1.90$ , G6:  $39.76 \pm 2.66$ ). The results have indicated a moderate to strong evaluation between boccia training volume and emotional intelligence ( $0.842 > r > 0.744$ ). and quality of life ( $0.899 > r > 0.770$ ). Based on the results, and with the aim of optimizing the effects, it is recommended to practice Boccia in individuals with CP for four days a week.

**Keywords:** Para-sport, Physical exercise, Brain impairment, Emotional.

**Resumen.** El objetivo de esta investigación fue determinar la correlación entre la carga de entrenamiento de boccia (volumen) con respecto a la calidad de vida e inteligencia emocional en personas con Parálisis Cerebral (PC). En este estudio participaron de forma voluntaria 165 personas con PC que presentaban limitaciones severas de actividad en piernas, brazos y tronco (BC1). El tipo de diseño se caracteriza por ser seccional-correlacional. Los participantes fueron asignados a uno de los grupos de boccia: G2 (2 horas/semana), G4 (4 horas/semana) y G6 (6 horas/semana). El test de inteligencia emocional de autoinforme de Schutte (SSEIT) y el cuestionario de calidad de vida de la organización mundial de la salud WHOQOL-Bref evaluaron la inteligencia emocional y la calidad de vida de estos pacientes respectivamente. Para determinar el grado de asociación se utilizó el Coeficiente de Correlación de Pearson y para comparar las variables entre los grupos se aplicó ANOVA unidireccional y Bonferroni. La normalidad de la muestra fue contrastada a través del test de Kolmogorov-Smirnov. Los resultados mostraron como la carga de entrenamiento es un factor condicionante de los niveles de calidad de vida y de inteligencia emocional, identificándose que a mayor carga mejores niveles de los parámetros indicados. Las dimensiones de calidad de vida: salud física y psicológica son las que presenta mayor diferencia entre el grupo G2 (salud física:  $19,61 \pm 6,83$ ; psicológica =  $18,71 \pm 5,37$ ) y el grupo G4 (salud física:  $58,25 \pm 16,61$ ; psicológica =  $54,17 \pm 16,24$ ) y G6 (salud física:  $61,56 \pm 8,85$ ; psicológica =  $56,29 \pm 3,48$ ). Respecto a la inteligencia emocional, hay que destacar la dimensión percepción de emoción como la que más se ve influenciada por la carga de entrenamiento semanal (G2:  $27,78 \pm 3,51$ , G4:  $38,20 \pm 1,90$ , G6:  $39,76 \pm 2,66$ ). Los resultados han indicado una correlación de moderada a fuerte entre el volumen de entrenamiento de boccia y la inteligencia emocional ( $0.842 \geq r \geq 0.744$ ). y la calidad de vida ( $0.899 \geq r \geq 0.770$ ). En base a los resultados, y con el objetivo de optimizar los efectos, se recomienda practicar Boccia en individuos con PC durante cuatro días a la semana.

**Palabras claves:** Deporte adaptado, Ejercicio físico, Deterioro cerebral, Emocional.

Fecha recepción: 29-10-23. Fecha de aceptación: 21-02-24

Farzad Rezavandzayeri  
farzad.rezavandzayeri@uvigo.es

### Introduction

According to the Department of Social Welfare (DSW), there are seven categories of disability: physical disability, hearing disability, visual disability, intellectual disability, learning disability, speech disability, and other disabilities (any disability not mentioned in the earlier grouping) (Abdullah, Hanafi, & Hamdi, 2017). Cerebral palsy (CP) is categorized under physical disability and refers to posture and a group of movement disorders generally associated with behavioral and emotional difficulties, epilepsy, intellectual disability, communication, and language issues (Ying et al., 2021). In addition, CP is a non-

progressive neuromotor disorder that affects the developing fetal or infant brain (Oskoui, Coutinho, Dykeman, Jette, & Pringsheim, 2013). Based on different studies (Johnson, 2002; Oskoui, Coutinho, Dykeman, Jette, & Pringsheim, 2013; Sadowska, Sarecka-Hujar, & Kopyta, 2020), estimated the prevalence of CP in developed countries is 2.11 children with CP per 1000 live births. CP can cause different types of neurodevelopmental disorders, such as muscle weakness, selective voluntary motor control, reduced coordination, contracture, and spasticity (Gormley, 2001). Physical activity can help reduce some of the secondary conditions in individuals with CP and improve balance, muscle tone, and posture (Cho & Lee, 2020). Disability can affect an individual mentally and

physically, and participation in social life is an issue for them. Because a person with CP perceives themselves as inadequate due to their disabilities, they have a low perception of quality of life (QOL) and lack of motivation, increasing their social anxiety. Regardless of disability degree and disability status, participating in physical activities and exercises can give pleasure and increase motivation and QOL (Adar et al., 2017; Atasoy & Pekel, 2021).

In sports such as Boccia, individuals compete with the goal of achieving success (Atasoy & Pekel, 2021). Boccia is a sport that is particularly well-suited for individuals with severe physical disabilities and is inclusive of all disability groups. The aim of this sport is to improve the quality of life of its participants and facilitate their integration into society (Atasoy & Pekel, 2021). Through its emphasis on strategy, teamwork, and social interaction, boccia fosters emotional regulation, empathy, and interpersonal skills, contributing to the development of emotional intelligence (Barak, Mendoza-Laiz, Gutiérrez Fuentes, Rubiera, & Hutzler, 2016a). This sport is competitive, and research has revealed that competitive sports reduce anxiety and depression and increases the QOL (Giacobbi, Stancil, Hardin, & Bryant, 2008; Gioia et al., 2006). For individuals with severe disabilities, Boccia is the most established and the only group game activity available. There are four categories in the classification of this sport: BC1- athletes with CP who have poor sitting balance and restricted trunk movement, but they can throw the ball usually over-hand; BC2-athletes with CP who have more ability to maintain sitting balance than BC1 athletes, and also they can pick up the ball and throw it over or underhand; BC3- athletes with CP who cannot hold or release the ball, and accordingly they need a ramp and an assistant; and BC4- athletes with a diagnosis other than CP who have a severe physical disability such as progressive muscular dystrophy (Barak, Mendoza-Laiz, Gutiérrez Fuentes, Rubiera, & Hutzler, 2016b).

Studies demonstrated that individuals with CP have social and emotional difficulties (Adegboye, Sterr, Lin, & Owen, 2017; Vitrikas, Dalton, & Breish, 2020). Because having problems with social interaction in these individuals would lead them to become socially isolated (Uldall, 2013). However, contributing to exercise and sports can be helpful. It has been observed that exercise practice could have a positive effect on the right hippocampus and potentially on the overall and other parts of the hippocampus (Li, et al., 2017). Other parts of the brain which can be affected by exercises are the cingulate cortex and the medial temporal areas of the Default Mode Network (DMN) (Ling et al., 2018). Functional connectivity of the left superior parietal lobule (SPL) region and the DMN is correlated with EI (Sivoshy & Bolurian, 2016). The evidence has pointed out that exercise can affect DMN and increase functional connectivity or activation in the hippocampus (Ling et al., 2018). There are few studies directly related to Boccia, and there is a strong need to do more research in this area. For example, Barak et al. (2016) reported that competitive Boccia has a more significant psychosocial effect on individuals with

severe physical disabilities than a rehabilitation program (Barak, Mendoza-Laiz, Gutiérrez Fuentes, Rubiera, & Hutzler, 2016b).

Few scientific studies have been done on Boccia, despite its 30 years of playing history. The majority of studies focus on learning the biomechanical and technical aspects of throwing in Boccia (Dickson, Fuss, & Wong, 2010; Huang, Pan, Ou, Yu, & Tsai, 2014; Morriss & Wittmannová, 2010). However, the psychological benefits of this sport have yet to be studied. physical activity positively affects self-perception, mood, reduction in anxiety, and reduced risk of developing depression (Barak, Mendoza-Laiz, Gutiérrez Fuentes, Rubiera, & Hutzler, 2016b). Moreover, physical activity can play an essential role in increasing the emotional health of individuals (Li, Lu, & Wang, 2009). Based on Goleman's definition, emotional quotient or emotional intelligence (EI) is to understanding other's feelings, being able to regulate and monitor our feelings, and using the knowledge of feeling or emotion to guide actions and thoughts (Goleman, 1996). In Boccia, individuals with CP can have social interaction and have the chance to express their feeling. This game provides an excellent chance for these individuals with severe physical disabilities to participate in society and have a social life. However, Boccia and its effects on quality of life and emotional intelligence in individuals with CP have yet to be investigated. Our objective was to examine the relationship between the amount of Boccia training (training load) and emotional intelligence and quality of life among individuals with cerebral palsy.

## Materials and Methods

### Participants

The present study is cross-sectional and correlational in design. The sample was selected for convenience and consisted of adults with a mean age of  $20.01 \pm 5.45$ , with 61.82% of them being male. All participants had a diagnosis of CP and were affiliated with associations from three provinces in Iran. According to their physical abilities and performance and based on the world boccia classification, all participants were classified as BC1 (BC1 athletes have severe activity limitations affecting their legs, arms, and trunk, and typically dependent on a powered wheelchair.) (Romero & Hernández, 2000). The sample was selected based on the following inclusion criteria: Presenting CP, attending physical exercise programs in the gym. Play Boccia, with a minimum time of 6 months. At least goes to practice boccia two hours in a week. A total of 165 participants were selected. Considering the volume of boccia training, three groups were created: G2 (playing Boccia 2 hours per week), G4 (playing Boccia 4 hours per week), G6 (playing Boccia 6 hours per week). Before collecting data, the research project was explained to participants, family members, and coaches. Data was collected and analyzed in such a way that subjects cannot be identified, directly or through subject-linked identifiers. In this study, the ethical standards contained in the Declaration of Helsinki were followed, and

the participants, relatives or legal guardians signed an informed consent for the development of the research. Informed consent was obtained from all participants, but the data was collected using a questionnaire and the ethical committee of the faculty of education and sport sciences in the University of Vigo approved this project with code of HF01-1021-02.

### **Data collection**

The participants were contacted through the East Azerbaijan Association of people with disabilities. Authorization was obtained, and the questionnaires were completed in person. Once all the authorizations had been collected, the study groups were formed. After explaining the study, the dates of data collection were determined. An ad hoc general data questionnaire was prepared to characterize the sample and QOL and EI were measured using validated questionnaires specific to this group. The questionnaires were translated into Persian language, and their validity was confirmed by academic experts. Data collection was performed for each participant in a single session. The EI and QOL variables were evaluated in a personal interview due to the difficulty of the subjects to complete the questionnaires. The examiner asked all the questions in the questionnaire and the subjects answered them with their movement or blinking or sometimes their parents helped the researcher in answering. EI was assessed using the Schutte Self-Report Emotional Intelligence Test (SSEIT). The data was collected between September and November 2022.

### *Emotional Intelligence (EI)*

The Schutte Self-Reported Emotional Intelligence Test (SSEIT) is a method of measuring general emotional intelligence. It contains 33 self-reported items which are rated using a Likert scale - a 1 to 5 scale of responses, ranging from one (strongly disagree) to five (strongly agree). This test has five subscales: emotional perception, utilizing emotions, managing self-relevant emotion, managing others' emotions, and uncategorized. Higher scores indicate greater emotional intelligence ranging from 33 to 165 points. This version was validated by (Hajibabae, Farahani, Ameri, Salehi, & Hosseini, 2018). The reliability and internal consistency of the Persian version of this questionnaire were reported to be 0.75 and 0.89, respectively.

### *Quality of Life (QOL)*

WHOQOL-BREF questionnaire, a brief version of the WHOQOL-100, was used to assess the QoL (Nedjat, Montazeri, Holakouie, Mohammad, & Majdzadeh, 2008). The Persian version of WHOQOL-Bref was used, and it was reported that the validity of all subscales was more than 0.70, except for social relationships, which was 0.55. This questionnaire comprises 26 items divided into four

sections: physical health, psychological health, social relationships, and environmental issues. Each item was rated on a 5-point Likert scale from 1 (very poor/very dissatisfied/never/none) to 5 (very good/very satisfied/always/extremely). The higher the score, the better the subject's quality of life.

### **Statistical analysis**

Descriptive statistics were used to obtain measures of central tendency, deviation, and percentages. The descriptive analysis was performed by stratifying the sample based on the number of Boccia training sessions. The normality of continuous variables was analyzed using the Kolmogorov-Smirnov test. One-way ANOVA followed by Bonferroni was used to compare the three groups (G2, G4, G6). The relationship between QOL or EI dimensions/domains was examined using Pearson correlation analysis, based on Taylor levels of correlation (Taylor, 1990) weak correlation ( $r < 0.35$ ), moderate correlation ( $0.35 < r < 0.68$ ) and strong correlation ( $0.68 < r > 1.0$ ). All statistical analyzes were performed using SPSS version 25 (SPSS Inc., Chicago, IL, USA). The p value was set at  $< 0.05$ .

### **Results**

Table 1 shows the results obtained by each of the groups in variables such as age, gender, quality of life (physical health, psychological, social relationships, environment) and emotional intelligence (perception of emotion, managing own emotion, managing other's emotion, utilization of emotion, uncategorized). The average age of the sample was  $20.01 \pm 5.45$  years old, with 61.82% of them being male. The inferential analysis indicated that Group 2 (G2) presented statistical differences in all analyzed variables compared to the other two groups (G4 and G6). The authors highlight the results obtained in the dimensions of quality of life: physical health and psychological, as it presents a greater difference between the G2 group (physical health:  $19.61 \pm 6.83$ ; psychological =  $18.71 \pm 5.37$ ) and groups G4 (physical health:  $58.25 \pm 16.61$ ; psychological =  $54.17 \pm 16.24$ ) and G6 (physical health:  $61.56 \pm 8.85$ ; psychological =  $56.29 \pm 3.48$ ). With respect to emotional intelligence, we must highlight the perception of emotion dimension as the one that is most influenced by the weekly training load (G2:  $27.78 \pm 3.51$ , G4:  $38.20 \pm 1.90$ , G6:  $39.76 \pm 2.66$ ). According to the Bonferroni test results, there was a significant difference between all groups in all emotional intelligence subscales. However, no significant difference was observed between the 4-hour and 6-hour groups in QOL (physical health, psychological, social relationships, and environment). The only significant difference between the 4-hour and 6-hour groups was in the overall subscale.

Table 1.  
Characteristics of the participants and results of the quality of life and emotional intelligence.

Variable	Groups			ANOVA		
	G2 (2 hours) n=55	G4 (4 hours) n=55	G6 (6 hours) n=55	F <sub>2, 162</sub>	p	
Age (years)	Mean±SD 19.58±5.27	Mean±SD 20.25±5.62	Mean±SD 20.21±5.53	0.262	0.770	
Gender (Male) %	56.36%	65.46%	63.63%	-	-	
(Female)	43.64%	34.54%	36.36%	-	-	
Quality of life	Physical health	19.61±6.83*	58.25±16.61	61.56±8.85	223.83	0.001
	Psychological	18.71±5.37*	54.17±16.24	56.29±3.48	241.35	0.001
	Social relationships	25.15±7.61*	59.85±12.43	60.45±10.42	209.94	0.001
	Environment	23.47±5.20*	53.64±9.25**	64.32±5.06	535.60	0.001
Emotional Intelligence	Perception of emotion	27.78±3.51*	38.20±1.90	39.76±2.66	304.32	0.001
	Managing own emotion	16.04±1.94*	20.27±1.16	22.16±1.74	100.18	0.001
	Managing other's emotion	14.31±1.56*	17.93±0.84	18.67±1.82	139.66	0.001
	Utilization of emotion	11.40±1.74*	15.38±0.93	16.53±0.50	288.11	0.001
	Uncategorized	20.07±2.35*	24.07±2.10	28.51±3.70	124.43	0.001

\* Significant difference between Group 2 and Group 4 and Group 6. \*\* Significant difference between Group 4 and Group 6.

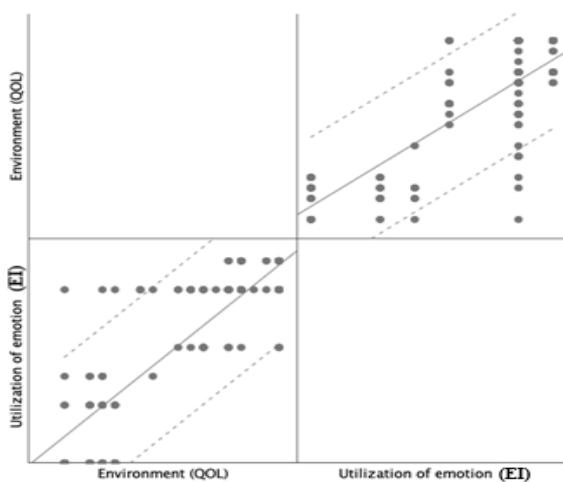


Figure 1. Correlational analysis between Environment (Quality of Life) and Utilization of emotion (Emotional Intelligence).

Table 2.  
The correlation of training volume, quality of life and emotional intelligence.

Variable	Training volume	
	Pearson Correlation (r)	Sig
Quality of Life (QOL)		
Physical health	0.771	0.001
Psychological	0.770	0.001
Social relationships	0.742	0.001
Environment	0.899	0.001
Emotional Intelligence (EI)		
Perception of emotion	0.817	0.001
Managing own emotion	0.823	0.001
Managing other's emotion	0.744	0.001
Utilization of emotion	0.842	0.001
Uncategorized	0.778	0.001

Obs. The variables of the study were assessed from 165 samples which were categorized into 3 groups of 2 hours, 4 hours, and 6 hours of playing Boccia in week.  
\* P<0.05

Table 2 presents the correlational analysis between training load (training volume) and the different dimensions of quality of life and emotional intelligence. The results of the present study indicated a significant and directly proportional correlation between hours of Boccia playing and quality of life and emotional intelligence. This correlation is stronger the greater the training volume that the participants have. The dimension of quality of life that showed the highest degree of correlation with the training volume was

environment ( $r=0.899$ ), while the dimension of emotional intelligence with the highest degree of correlation was use of emotion (0.842), all of which were correlations directly proportional to the training load.

The analysis of the relationship between the dimensions of QOL and EI (Figure 1) shows that the strongest association ( $r=0.834$ ) is found between the Environment (QOL) and the Utilization of emotion (EI).

## Discussion

This study examined the potential relationship the amount of Boccia training (measured in hours per week) and emotional intelligence and quality of life in individuals with cerebral palsy. The results suggest a strong and consistent correlation between the number of hours spent playing Boccia and both EI and QOL. Specifically, increasing the amount of time spent playing Boccia was found to enhance EI and QOL in individuals with CP. Additionally, there was a notable difference in QOL among three distinct groups, as measured by EI. However, apropos of QOL, between 4-hour and 6-hour groups, only the difference in the environment variable of the QOL scale was significant. Our findings confirm the effect of volume of training at boccia on EI and QOL in CP individuals.

As a modifiable factor that is the physical activity is associated with a higher quality of life in people with physical disabilities. Accordingly, in the current study, there was a significant difference between 2 hours playing Boccia per week and 4-6-hour playing Boccia per week. This study's data illustrate a moderate to the strong relationship between quality of life and the number of hours of playing Boccia.

The difference between 4 and 6-hour groups in all quality-of-life subscales was insignificant except in the overall subscale. The nature of this item may be the reason for this outcome because this item consists of two general questions. By participating in activities such as Boccia, individuals with physical disabilities become active participants in community life (Barak, Mendoza-Laiz, Gutiérrez Fuentes, Rubiera, & Hutzler, 2016b). Siavoshy et al. (2016) investigated the effect of practicing boccia on the

social development of children with cerebral palsy and intellectual disability. The outcome of this study showed that the intervention could improve self-help in general, self-help eating, verbal communication, socialization, and locomotion significantly (Siavoshy & Bolurian, 2016). Studies have shown that individuals with cerebral palsy who possess higher levels of emotional intelligence tend to experience better social relationships, greater self-esteem, and improved coping abilities in the face of challenges associated with their condition (Battaglino, 2023; Papoutsis, Drigas, & Skianis, 2022; Wang, Huang, & Kong, 2020). Furthermore, interventions targeting the enhancement of emotional intelligence skills, such as social-emotional learning programs or cognitive-behavioural interventions, have demonstrated promising outcomes in improving emotional regulation, interpersonal skills, and overall quality of life among individuals with cerebral palsy (Jackman et al., 2022). Continued research in this area is crucial for developing tailored interventions to support the emotional well-being and overall functioning of individuals with cerebral palsy. Emotional intelligence plays a significant role in the lives of individuals with cerebral palsy, impacting various aspects of their well-being and adaptation to the challenges associated with their condition. Emotional intelligence serves as a vital factor in navigating the unique challenges faced by individuals with cerebral palsy, contributing significantly to their psychological adjustment and overall quality of life. Research by Morgan et al. (2020) suggests that higher emotional intelligence is associated with better adaptive coping strategies and increased resilience in individuals with cerebral palsy, enabling them to effectively manage stressors and overcome obstacles (Morgan et al., 2016). Moreover, the emotional intelligence skills, such as self-awareness and emotion regulation, are closely linked to mental health outcomes and subjective well-being among individuals with cerebral palsy. By fostering emotional intelligence through targeted interventions and supportive environments, individuals with cerebral palsy can enhance their social competence, interpersonal relationships, and overall psychosocial adjustment, ultimately leading to a more fulfilling and satisfying life (Alshryda & Wright, 2013).

Boccia is a game played by individuals, pairs, or teams of three, and it is a mixed-gender sport. Therefore, these people can play in a group. This sport has excellent effects on motor skills. Also, individuals in this game have to maintain their concentration. Regular mental stimulation improves the quality of life and independence (Ovenden, Denning, & Beer, 2019). When individuals are playing boccia, they have the opportunity to improve functionality and to integrate with people with similar life problems and know them. Boccia is a tool to activate people with all types of disabilities. Based on studies, Boccia improves functional health and quality of life and helps in the inclusion/integration process (Calado et al., 2020). Studies have proved that a variety form of exercises can improve the quality of life in individuals with CP. Arruda et al. (2023) showed, a lower

weekly frequency of training at home during social isolation had better overall results than those who practiced more frequently, mainly in the perception of physical health and quality of life. Additionally, when the type of disability and the need for help were included as covariates (classes BC1 and BC3), potentiation of the effects of the exercise was verified, both this and a more significant influence in other domains on quality of life, especially related to socialization. In this way, these results can be supported and help associations, clubs, and coaches to develop better strategies to supervise athletes when training at home, regardless of the severity and dependence that the disability manifests. In this way, we believe that supervision programs carried out at home for all functional classes can positively influence or preserve the condition of each athlete regarding psychological aspects. Athletes showed a significant difference in the perception of physical health in quality of life through the weekly frequency of training practiced during social isolation. Another important finding was that all domains in mood state did not show significant differences in typical training characteristics during social isolation (Arruda et al., 2023). Of course, this should also be considered the quality of training plays a crucial role in optimizing outcomes for individuals with cerebral palsy, often outweighing the significance of the duration or frequency of sessions but while the duration and frequency of training sessions are important considerations, prioritizing the quality and individualization of interventions is essential for maximizing outcomes and enhancing the overall well-being of individuals with cerebral palsy (Novak et al., 2013).

Kim et al. (2020) showed that combining resistance and group exercises could improve quality of life in total score, general moods, self-perception, physical well-being, autonomy, relationship with parents, and home life (Kim et al., 2020). There is a correlation between adaptive sport participation and quality of life and quality of social life (Diaz, Miller, Kraus, & Fredericson, 2019). Based on the study of Groff et al. (2009) I, the majority of their sample (73 international athletes competing in the 2005 CP World Championships) agreed or strongly agreed that adaptive sport influenced their quality of social life (56.1%), quality of family life (53.4%), quality of life (80.8%), and overall health (84.9%) positively (Groff, Lundberg, & Zabriskie, 2009). Maher et al. (2016) found that there is a positive relationship between physical activity, happiness, and social and physical quality of life in young people with CP (Maher, Toohey, & Ferguson, 2016). Feitosa et al. (2017) stated, "adaptive sports have a positive effect on the quality of life and biopsychosocial profile of children/adolescents with CP, especially considering the global and upper extremity function, capacity for transfers and mobility, and benefits in the problems related to difficulties in attention" (Feitosa, Muzzolon, Rodrigues, Crippa, & Zonta, 2017). The present results proved that a higher training load adaptive sports could positively affect the quality of life and psychological factors.

The limitations of the present study were 1: there was

any classification when they were playing 2: participants' daily activity was not equal 3: they did not receive equal medical care. However, in the present study, the researcher tried to reduce the effect of this limitation by increasing the number of participants.

### Conclusion

There was a positive correlation between training volume and emotional intelligence and quality of life. Based on the results, and with the aim of optimizing the effects, it is recommended to practice Boccia in CP individuals for four days a week.

### Conflicts of interest

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the paper.

### References

- Abdullah, N., Hanafi, H., & Hamdi, N. I. M. (2017). The rights of persons with disabilities in malaysia: The underlying reasons for ineffectiveness of persons with disabilities act 2008. *International Journal for Studies on Children, Women, Elderly and Disabled*, 1(1), 127-134.
- Acebes-Sánchez, J., Diez-Vega, I., Esteban-Gonzalo, S., & Rodríguez-Romo, G. (2019). Physical activity and emotional intelligence among undergraduate students: A correlational study. *BMC Public Health*, 19(1), 1-7.
- Adar, S., Dündar, Ü., Demirdal, Ü. S., Ulaşlı, A. M., Toktaş, H., & Solak, Ö. (2017). The effect of aquatic exercise on spasticity, quality of life, and motor function in cerebral palsy. *Turkish Journal of Physical Medicine and Rehabilitation*, 63(3), 239.
- Adegboye, D., Sterr, A., Lin, J., & Owen, T. J. (2017). Theory of mind, emotional and social functioning, and motor severity in children and adolescents with dystonic cerebral palsy. *European Journal of Paediatric Neurology*, 21(3), 549-556.
- Alshryda, S., & Wright, J. (2013). Development and reliability of a system to classify gross motor function in children with cerebral palsy. *Classic papers in orthopaedics* (pp. 575-577) Springer.
- Arruda, S. F., de Oliveira, J. I. V., Winckler, C., Costa, A. S., Neto, P. P. P., Simim, M. A. M., & Oliveira, S. F. M. (2023). Can home-based training influence mood states and quality of life in paralympic boccia athletes? *Retos*, 50, 943-949.
- Atasoy, T., & Pekel, A. (2021). The relationship between quality of life level and social appearance anxiety level of physically handicapped boccia athletes. *Physical Educator*, 78(1), 1-10.
- Barak, S., Mendoza-Laiz, N., Gutiérrez Fuentes, M. T., Rubiera, M., & Hutzler, Y. (2016a). Psychosocial effects of competitive boccia program in persons with severe chronic disability. *Journal of Rehabilitation Research & Development*, 53(6)
- Barak, S., Mendoza-Laiz, N., Gutiérrez Fuentes, M. T., Rubiera, M., & Hutzler, Y. (2016b). Psychosocial effects of competitive boccia program in persons with severe chronic disability. *Journal of Rehabilitation Research & Development*, 53(6)
- Battaglino, A. (2023). Evaluation of the factors that impact upper limb coordination in children with cerebral palsy: A narrative review. *Retos: Nuevas Tendencias En Educación Física, Deporte Y Recreación*, (48), 470-480.
- Calado, A., Marcutti, S., Silva, V. C. A., Vercelli, G., Novais, P., & Soares, F. (2020). Towards a virtual coach for boccia: Developing a virtual augmented interaction based on a boccia simulator.
- Cho, H., & Lee, B. (2020). Effect of functional progressive resistance exercise on lower extremity structure, muscle tone, dynamic balance and functional ability in children with spastic cerebral palsy. *Children*, 7(8), 85.
- Diaz, R., Miller, E. K., Kraus, E., & Fredericson, M. (2019). Impact of adaptive sports participation on quality of life. *Sports Medicine and Arthroscopy Review*, 27(2), 73-82.
- Dickson, M. J., Fuss, F. K., & Wong, K. G. (2010). Benchmarking of boccia balls: Roll distance, accuracy, stiffness, rolling friction, and coefficient of restitution. *Sports Technology*, 3(2), 131-140.
- Feitosa, L. C., Muzzolon, S. R. B., Rodrigues, D. C. B., Crippa, A. C. d. S., & Zonta, M. B. (2017). The effect of adapted sports in quality of life and biopsychosocial profile of children and adolescents with cerebral palsy. *Revista Paulista De Pediatria*, 35, 429-435.
- Giacobbi, P. R., Stancil, M., Hardin, B., & Bryant, L. (2008). Physical activity and quality of life experienced by highly active individuals with physical disabilities. *Adapted Physical Activity Quarterly*, 25(3), 189-207.
- Gioia, M. C., Cerasa, A., Di Lucente, L., Brunelli, S., Castellano, V., & Trallesi, M. (2006). Psychological impact of sports activity in spinal cord injury patients. *Scandinavian Journal of Medicine & Science in Sports*, 16(6), 412-416.
- Goleman, D. (1996). Emotional intelligence. why it can matter more than IQ. *Learning*, 24(6), 49-50.
- Gormley, M. E. J. (2001). Treatment of neuromuscular and musculoskeletal problems in cerebral palsy. *Pediatric Rehabilitation*, 4(1), 5-16. doi:10.1080/13638490151068393
- Groff, D. G., Lundberg, N. R., & Zabriskie, R. B. (2009). Influence of adapted sport on quality of life: Perceptions of athletes with cerebral palsy. *Disability and Rehabilitation*, 31(4), 318-326.
- Hajibabae, F., Farahani, M. A., Ameri, Z., Salehi, T., & Hosseini, F. (2018). The relationship between empathy and emotional intelligence among iranian nursing students. *International Journal of Medical Education*, 9,

239.

- Huang, P., Pan, P., Ou, Y., Yu, Y., & Tsai, Y. (2014). Motion analysis of throwing boccia balls in children with cerebral palsy. *Research in Developmental Disabilities*, 35(2), 393-399.
- Jackman, M., Sakzewski, L., Morgan, C., Boyd, R. N., Brennan, S. E., Langdon, K., . . . Novak, I. (2022). Interventions to improve physical function for children and young people with cerebral palsy: International clinical practice guideline. *Developmental Medicine & Child Neurology*, 64(5), 536-549.
- Johnson, A. (2002). Prevalence and characteristics of children with cerebral palsy in europe. *Developmental Medicine and Child Neurology*, 44(9), 633-640.
- Kim, S., Shin, H., Hahm, S., Park, S., Cho, H., & Lee, M. (2020). The effect of a program combining resistance exercise and group exercise on balance, grip strength, and quality of life of children with cerebral palsy. *Journal of the Korean Society of Physical Medicine*, 15(4), 75-85.
- Li, G. S., Lu, F. J., & Wang, A. H. (2009). Exploring the relationships of physical activity, emotional intelligence and health in taiwan college students. *Journal of Exercise Science & Fitness*, 7(1), 55-63.
- Li, M., Huang, M., Li, S., Tao, J., Zheng, G., & Chen, L. (2017). The effects of aerobic exercise on the structure and function of DMN-related brain regions: A systematic review. *International Journal of Neuroscience*, 127(7), 634-649.
- Ling, G. C., Lee, I., Guimond, S., Lutz, O., Tandon, N., Öngür, D., . . . Brady Jr, R. (2018). No title. *Individual Variation in Brain Network Topology Predicts Emotional Intelligence*,
- Maher, C. A., Toohey, M., & Ferguson, M. (2016). Physical activity predicts quality of life and happiness in children and adolescents with cerebral palsy. *Disability and Rehabilitation*, 38(9), 865-869.
- Morgan, C., Darrah, J., Gordon, A. M., Harbourne, R., Spittle, A., Johnson, R., & Fetters, L. (2016). Effectiveness of motor interventions in infants with cerebral palsy: A systematic review. *Developmental Medicine & Child Neurology*, 58(9), 900-909.
- Morriss, L., & Wittmannová, J. (2010). The effect of blocked versus random training schedules on boccia skills performance in experienced athletes with cerebral palsy. *European Journal of Adapted Physical Activity*, 3(2)
- Musonda, A., Shumba, O., & Tailoka, F. P. (2020). Validation of the schutte self report emotional intelligence scale in a zambian context. *Validation of the Schutte Self Report Emotional Intelligence Scale in a Zambian Context*, 2(2), 31-41.
- Nedjat, S., Montazeri, A., Holakouie, K., Mohammad, K., & Majdzadeh, R. (2008). Psychometric properties of the iranian interview-administered version of the world health organization's quality of life questionnaire (WHOQOL-BREF): A population-based study. *BMC Health Services Research*, 8(1), 1-7.
- Novak, I., McIntyre, S., Morgan, C., Campbell, L., Dark, L., Morton, N., . . . Goldsmith, S. (2013). A systematic review of interventions for children with cerebral palsy: State of the evidence. *Developmental Medicine & Child Neurology*, 55(10), 885-910.
- Oskoui, M., Coutinho, F., Dykeman, J., Jette, N., & Pringsheim, T. (2013). An update on the prevalence of cerebral palsy: A systematic review and meta-analysis. *Developmental Medicine & Child Neurology*, 55(6), 509-519.
- Ovenden, I., Denning, T., & Beer, C. (2019). "Here everyone is the same"—A qualitative evaluation of participating in a boccia (indoor bowling) group: Innovative practice. *Dementia*, 18(2), 785-792.
- Palisano, R., Rosenbaum, P., Walter, S., Russell, D., Wood, E., & Galuppi, B. (1997). Development and reliability of a system to classify gross motor function in children with cerebral palsy. *Developmental Medicine & Child Neurology*, 39(4), 214-223.
- Papoutsis, C., Drigas, A. S., & Skianis, C. (2022). Serious games for emotional intelligence's skills development for inner balance and quality of life: A literature review. *Retos: Nuevas Tendencias En Educación Física, Deporte Y Recreación*, (46), 199-208.
- Romero, F. Á., & Hernández, F. J. M. (2000). La percepción y la actividad neuromuscular en personas con parálisis cerebral en el deporte de la boccia. una propuesta metodológica de valoración. *Apuntes.Educación Física Y Deportes*, 2(60), 59-64.
- Sadowska, M., Sarecka-Hujar, B., & Kopyta, I. (2020). Cerebral palsy: Current opinions on definition, epidemiology, risk factors, classification and treatment options. *Neuropsychiatric Disease and Treatment*, , 1505-1518.
- Schutte, N. S., Malouff, J. M., Hall, L. E., Haggerty, D. J., Cooper, J. T., Golden, C. J., & Dornheim, L. (1998). Development and validation of a measure of emotional intelligence. *Personality and Individual Differences*, 25(2), 167-177.
- Siavoshi, H., & Bolurian, F. (2016). The effects of 12 weeks of playing boccia on the social development of children with cerebral palsy and intellectual disability. *Journal of Exceptional Children*, 15(4), 45-51.
- Taylor, R. (1990). Interpretation of the correlation coefficient: A basic review. *Journal of Diagnostic Medical Sonography*, 6(1), 35-39.
- Uldall, P. (2013). Everyday life and social consequences of cerebral palsy. *Handbook of Clinical Neurology*, 111, 203-207.
- Vitrikas, K., Dalton, H., & Breish, D. (2020). Cerebral palsy: An overview. *American Family Physician*, 101(4), 213-220.
- Wang, Y., Huang, Z., & Kong, F. (2020). Parenting stress and life satisfaction in mothers of children with cerebral palsy: The mediating effect of social support. *Journal of Health Psychology*, 25(3), 416-425.

Yazicioglu, K., Yavuz, F., Goktepe, A. S., & Tan, A. K. (2012). Influence of adapted sports on quality of life and life satisfaction in sport participants and non-sport participants with physical disabilities. *Disability and Health Journal*, 5(4), 249-253.

Ying, K., Rostenberghe, H. V., Kuan, G., Mohd Yusoff,

M. H. A., Ali, S. H., & Yaacob, N. S. (2021). Health-related quality of life and family functioning of primary caregivers of children with cerebral palsy in malaysia. *International Journal of Environmental Research and Public Health*, 18(5), 2351.

#### Datos de los autores:

Farzad Rezavandzayeri  
Helena Vila Suarez  
Amir Khortabi  
José María Cancela Carral

farzad.rezavandzayeri@uvigo.es  
evila@uvigo.es  
amir.amir.khortabi@uvigo.es  
chemacc@uvigo.es

Autor/a – Traductor/a  
Autor/a  
Autor/a  
Autor/a