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Francisco Miguel Escandell-Rico^{a,*},
Lucía Pérez-Fernández^b, Juana Requena Puche^c

^a *Departamento de Enfermería, Universidad de Alicante, Alicante, Spain*

^b *Centro de Salud Almoradí, Departamento de Salud de Orihuela, Almoradí, Alicante, Spain*

^c *Hospital General Universitario de Elda, Departamento de Salud de Elda, Elda, Alicante, Spain*

* Corresponding author.

E-mail address: francisco.escandell@ua.es
(F.M. Escandell-Rico).

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Efficacy of a virtual reality-based intervention in children with medulloblastoma: case series



Eficacia de una intervención basada en realidad virtual en niños con medulloblastoma: serie de casos

Dear Editor:

Medulloblastoma accounts for 20% of all paediatric brain tumours as the second most frequent type. It arises from the embryonic neuroectodermal cells of the cerebellum, and it is characterized by decreased speech, mutism, cerebellar dysfunctions, and apathy.¹ Children with medulloblastoma can experience a broad range of functional problems due to the effects of the primary tumour and complications of treatment. There is a dearth of evidence on balance rehabilitation in children with medulloblastoma. Ospina et al. found no trials comparing the effects of physical therapy interventions focused on symptom relief and compensation of adverse effects of treatment in children and adolescents with cancer. Thus, there are no standardised rehabilitation exercise programmes for children with brain tumours.² At present, approaches to rehabilitation are frequently attempted in children with brain tumours. The assessment of physical activity and performance in functional skills and activities daily living of children is useful in clinical practice. The correct implementation of rehabilitation therapy requires accurate and reliable evaluation. This paper focuses on the effect of the Nintendo Wii Fit Plus® (NWFP), which we have and use in our clinic as an intervention to improve balance in children with medulloblastoma.

Case series

The study was approved by the ethics committee of the local university ethics committee. We obtained the signed informed consent and assent for participation from children and their parents. The evaluations and intervention were supervised by the same physical therapist in a sample of children with medulloblastoma treated with the same protocol and followed up in the department of paediatric haematology and oncology of our university hospital. We excluded children currently in treatment, treated with cranial irradiation, in relapse or with any impairment that could pose a barrier to performing the exercises. [Table 1](#) summarises the demographic and clinical characteristics of the participants. Children were assessed with the body test included in the NWFP. The body test evaluated (1) centre of gravity (CoG), and (2) Fit Age. The CoG reflects the percentage of the weight placed on the right and left sides of the body to assess balance. We recorded the differences between the left and right sides of the body. In healthy subjects, the difference is zero (0%), with equal distribution in both sides. The Fit Age is a number obtained through the board of the NWFP balance test system. The fit age should be the same age as the chronological age. The difference between these ages shows a deviation from the normal range. Five children with medulloblastoma completed the intervention. Children participated in the NWFP intervention for 12 weeks, in 45-min sessions 2 days a week. The intervention included 5 different balance games under the supervision of an experienced physical therapist ([Table 2](#)). We made measurements before, during and after the intervention. The sample exhibited significant progressive improvement in game scores in each session (first week mean vs last week mean: soccer

Table 1 Demographic and clinical characteristics of the patients.

	Sex	BMI	Age	Age at diagnosis	CTx	RTx	PT	Fit Age			CoG right-left Δ (%)		
								Before	After	Δ	Before	After	Δ
Case 1	Male	21.33	14	12	8	35	12	25	24	1	7.6	3.4	4.2%
Case 2	Female	19.6	7	4	8	46	24	55	26	29	15.6	0.4	15.2%
Case 3	Female	31.55	14	11	8	35	24	50	36	14	47.2	0.9	46.1%
Case 4	Male	16.45	7	4	8	30	24	31	21	10	7.6	2	5.6%
Case 5	Female	16.16	10	9	8	35	16	30	22	8	12.6	2.2	10.4%

BMI, body mass index; CoG, centre of gravity; CTx, chemotherapy; PT, physical therapy; RTx, radiotherapy.

Table 2 Details of the games.

	Soccer heading	Ski jumping	Penguin slide	Ski slalom	Balance bubble
General Description	Tilting the body towards the appropriate object to collect points	Standing up from the squatting position to jump forward	Shifting weight to collect items from the left and right to get points	Finishing the game making the least mistakes as fast as possible	Moving forward in the balloon without hitting the objects on the edges
Therapeutic Goals	Body control, transfer of weight to the right and left and proprioception, enhancing visual perception	Protection of squat position, standing and balance with lower extremity force transmission	Body control to improve transfer of weight to the right and left	Body control, transfer of weight to the right and left, maintaining hip-knee-ankle control	Improving body control, visual feedback, attention and coordination
Repetition	5 times	5 times	4 times	5 times	Once
Duration	1 min per game	1 min per game, each game has 2 jumps	1.5 min per game	1 min per game	Depends on the child
Scoring	High scores indicate better performance	High scores indicate better performance	High scores indicate better performance	Lower scores indicate better performance	High scores indicate better performance, and the maximum score is 1200.

heading, 20.42 vs 132.18; ski jumping, 46.064 vs 143.08; penguin slide, 37.636 vs 72.434; ski slalom, 63.36 vs 32.952; balance bubble, 350.504 vs 941.1). Fig. 1 presents the mean weekly score for each game obtained by each participant.

This work presents the effect of the NWFP intervention for management of balance impairment in children with medulloblastoma. Based on the findings in this case series, the NWFP intervention is beneficial for rehabilitation of balance impairment. The body test (CoG and Fit Age) and game scores in the NWFP system improved after the intervention in children with medulloblastoma. Thus, our analysis of the NWFP intervention in these children, with physical, physiological and cognitive improvements, reflects that the body can adapt to physical activities. The mean improvement after the intervention in children with medulloblastoma was 16.3% in the CoG and 12.4 years in the Fit Age. These improvements in balance and functional mobility, which would apply to activities of daily living, is important given that balance impairment has a significant impact in the performance of other activities that are part of everyday life, such as walking. Although this intervention

does not focus primarily on training for activities like walking or running, these games train the body to improve balance and coordination, which support walking or running.

Children with medulloblastoma require rehabilitation to reduce symptoms, improve function and perform activities of daily living. Rehabilitation has a role not only in symptom management but also to continue to participate in daily activities. For example, increasing scores along with motor learning facilitates engaging in activities of daily living. Since the integration of games into functional activities is important, the treatment program should be planned considering the International Classification of Functioning, Disability and Health. Based on it, different rehabilitation approaches are necessary for children with brain tumours.³ Cognitive and affective barriers associated with medulloblastoma can negatively impact motivation and adherence to the intervention, and therefore can have an impact on the success of rehabilitation.^{4,5} We encouraged participation in virtual reality-based exercises for 12 weeks and reported verbally (mean 8.5/10) by children and their families. The adherence to the NWFP intervention was 83.3%. Customisa-

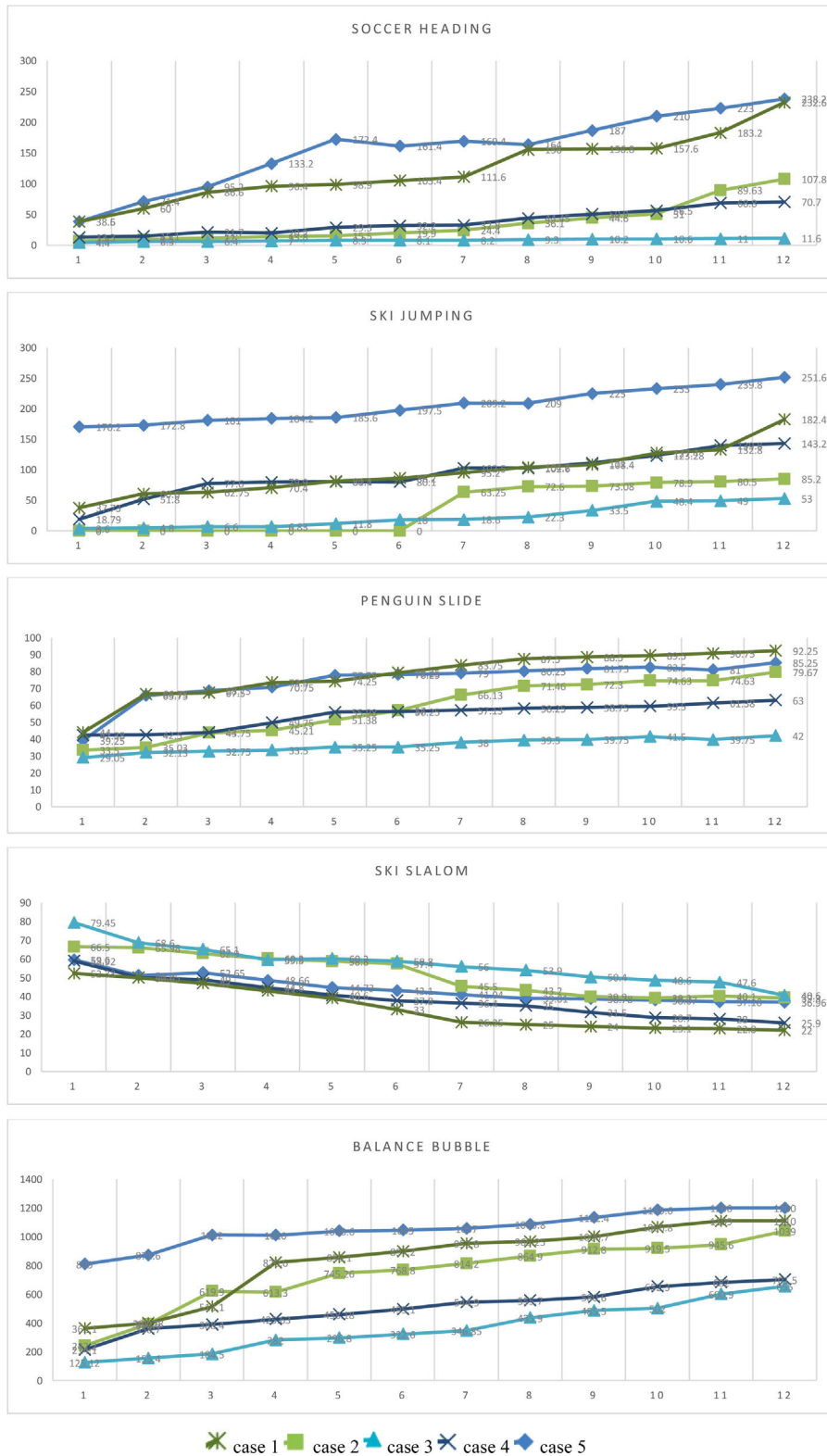


Figure 1 Trends in game scores.

tion of virtual rehabilitation tools seems to have a positive impact on the motivation and effort of both paediatric and adult users.⁶

The NWFP intervention may be an effective home-based rehabilitation strategy, and is worth exploring in a larger trial. This intervention may be useful for providing balance training to children with medulloblastoma.

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Müberra Tanriverdi^{a,*}, Fatma Betül Cakir^b, Fatma Karantay Mutluay^c

^a *Departamento de Fisioterapia y Rehabilitación, Facultad de Ciencias de la Salud, Bezmiâlem Vakıf Üniversitesi, Estambul, Turkey*

^b *Departamento de Hemato-oncología Pediátrica, Facultad de Medicina, Bezmiâlem Vakıf Üniversitesi, Estambul, Turkey*

^c *Departamento de Fisioterapia y Rehabilitación, Facultad de Ciencias de la Salud, İstanbul Medipol Üniversitesi, Estambul, Turkey*

* Corresponding author.

E-mail address: mtanriverdi@bezmialem.edu.tr (M. Tanriverdi).

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Emergency care for children refugees from the Russian–Ukrainian armed conflict



Asistencia en urgencias de la población infantil refugiada procedente del conflicto bélico rusia-ucrania

Dear editor:

Since Russia launched the military offensive against Ukraine on February 24, 2022, more than 4.5 million Ukrainians have fled their country.¹ In Spain, more than 100 000 refugees have sought asylum since March 1,² and based on data from the centres of reception, welfare and referral of Madrid, Alicante, Barcelona and Malaga, 38% are children aged 0–17 years.³

We present the results of a retrospective observational study in 2 tertiary care hospitals of the Community of Madrid between March and July 2022. The primary objective was to describe the care received by refugee children from Ukraine in emergency departments 5 months after the war started. We performed a descriptive analysis of categorical variables by calculating absolute and relative frequencies and of quantitative variables calculating the median and interquartile range (IQR). The study was approved by the research ethics committees of the two participating hospitals (ref. PI-5281).

We analysed 156 emergency department visits made by refugee children from Ukraine in the period under study. The median age was 4.2 years (IQR, 2.1–8.9), and 52.6% of

the patients were female. The number of emergency visits peaked in the second half of March (49/156; 31.4%), followed by a gradual decrease (Fig. 1).

The most frequent presenting complaint was fever (46.7%), followed by gastrointestinal symptoms (23.1%). In 4 cases (2.5%) the visit was related to anxiety symptoms. Chronic diseases were present in 21.1% (33 patients), corresponding to haematological or oncological diseases in 7.7% of the total sample. In the subset of patients with chronic diseases, 21.2% sought care for complications of the underlying disease (Table 1).

In 40.3% of the visits, diagnostic tests were ordered in the emergency department, most frequently blood tests (26.9%). In the subset of children whose presenting com-

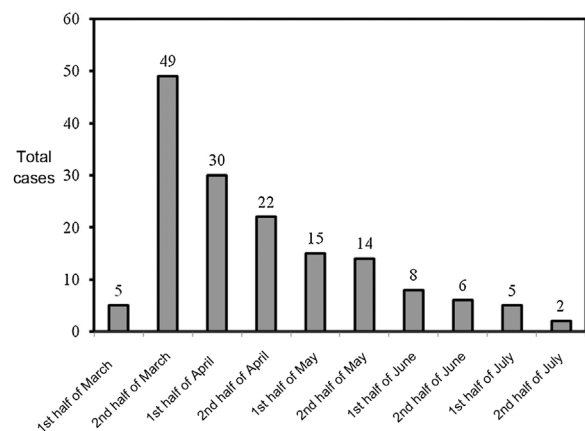


Figure 1 Monthly distribution of emergency department visits.