INFLUENCE OF PHYSICAL ACTIVITY ON THE QUALITY OF LIFE OF PEOPLE WITH DISABILITIES

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DOI: https://doi.org/10.51267/jehhm2026.1.08

Abstract. *The quality of life of people with disabilities is influenced by their physical and mental health, but also by their relationship with the environment and the individuals with whom they interact. Down syndrome is the most common genetic cause of intellectual disability, which involves mental, physical and behavioural health disorders. Although there are studies about quality of life in people with disabilities, we focused on adults with Down syndrome, more specifically, on how physical activity influenced their quality of life. For this, we used the International Physical Activity Questionnaire – Short-Form (IPAQ-SF), which we supplemented with three questions that helped us to better capture the investigated aspects. The respondents were 50 caregivers of adults with intellectual disability, namely Down syndrome, whose average age was ± 22.3 years. Based on the responses received, we can state that 60% of the people with this condition had a moderate level of engagement in physical activity. For most of them, the preferred physical activities were dancing, walking and gymnastics; the expected effects of participating in these activities were related to emotional well-being (32%), psychological well-being (40%), self-confidence (10%) and physical well-being (17%). In order to maximise the involvement of people with disabilities, the proposed physical activities should be attractive, enjoyable and give them the opportunity to be with peers and friends.*

Keywords: *Down syndrome; physical activity; IPAQ-SF.*

Introduction

Down syndrome is the most common genetic cause of intellectual disability and is due to an extra copy of chromosome 21. Individuals with this disability face a high prevalence of multiple conditions affecting their cardiovascular (Bull & Committee on Genetics, 2011), respiratory (Paul et al., 2019), endocrine (Salehi et al., 2009), immune (Bull & Committee on Genetics, 2011; Salehi et al., 2009), neuromuscular (Vuori, 2004) and musculoskeletal systems (Asonitou et al., 2018); in addition, attention deficits (Ekstein et al., 2011) and depression (Hodapp et al., 2019), among others, are likely to be experienced by this category of patients. Because of delays in motor and mental development, people with Down syndrome receive education in special schools and need help in carrying out activities of daily living (Palomba et al., 2020). However, they have the right to quality live, medical services and education.

Quality of life (QOL) is defined by the World Health Organization (1998) as "individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" (p. 11). This complex concept is influenced by the individuals' physical and psychological health, personal beliefs and relationships with their environment and with other people.

The European Union has initiated a series of studies to prove the possibility of statistically measuring indicators related to the quality of life of an individual, a group or a whole society. The 8 core QOL domains are: emotional well-being, interpersonal relations, material well-

being, personal development, physical well-being, self-determination, social inclusion and rights (Galloway, 2005).

The very rapid changes that take place in today's society have an impact on the daily lives of all people and therefore on those with Down syndrome, leading to stress and overstrain. As a result, quality of life is affected by mental and physical fatigue, which reduces the standard of living and can decrease the quality of developmental processes (Murgas et al., 2022).

One of the indicators of physical well-being, as part of the core QOL domain, is health, which manifests itself on several levels: physical, mental, social, spiritual, economic, etc. Health is strongly influenced by participation in motor activities, knowing that a physically active person maintains the structure of their different tissues and organs for a longer period of time, limiting the decline that occurs with aging.

Maintaining a high level of health can be achieved through a variety of physical activities, some of which are also addressed to people with intellectual disabilities. However, to be able to perform such activities, people with Down syndrome need to develop their physical fitness (Matute-Llorente et al., 2013; Asonitou et al., 2018), with the main goal of training their basic and practical-utilitarian motor skills (Malak et al., 2015; Bota, 2016; Alesi et al., 2018) that can be transferred and exploited in everyday life, as well as training motor skills specific to their favourite sports.

In this context, the purpose of our research is to analyse aspects related to the quality of life of people with Down syndrome, focusing our approach on physical activities and their influence on quality of life. The assessment carried out identifies potential areas where individuals with Down syndrome may face challenges or achieve positive outcomes, thus providing a clear picture of the effects of physical activity on quality of life.

Research question: Does regular participation of people with Down syndrome in physical activity have a positive impact on different aspects of their quality of life, including physical, emotional and social well-being?

Methodology

Research methods

The literature review based on printed and online sources allowed us to get complete and updated information on the topic of interest, but also to contextualise our results in the light of existing research. To study the behaviour of people with Down syndrome, we used the observation method throughout the proposed physical activities, and the information gathered helped us to supplement the questionnaire with three additional items. Using the questionnaire survey method, we collected relevant data on the perception and experience of people with Down syndrome, from the perspective of their caregivers, as regards the physical activities performed by them and the impact of these activities on the investigated group. Our questionnaire was based on the International Physical Activity Questionnaire (IPAQ) (2004), which was modified by both changing the form of addressing the caregivers of people with Down syndrome and adding questions aimed at identifying the sample, the physical activities most often performed by these patients and the effects on them after participating in such

activities. The questionnaire was applied using Google Forms, which helped us to obtain a large number of responses from different areas of the country.

The use of mathematical statistics to analyse the collected data allowed us to provide a clear picture of the data distribution and characteristics of the studied sample. With the specific formula, we calculated, in an Excel document, the IPAQ results of people with Down syndrome in order to find out their level of engagement in physical activity. The obtained data were entered into the online Potential Outliers Calculator (Hackmath.net, 2024) to ensure that the group was homogeneous. Subsequently, the numerical dataset was introduced into the online Descriptive Statistics Calculator (Furey, 2023) to analyse the group results. This approach helped us verify the reliability of the results, providing concise information to draw conclusions.

Research tools

The International Physical Activity Questionnaire (IPAQ) was developed by the World Health Organization to assess physical activity levels in adult populations from various countries (Craig et al., 2003). IPAQ has two forms: a short version consisting of 7 items and a long version including 27 items (Craig, 2002). In this study, we used the 7-item version and adapted the form of addressing the caregivers of people with Down syndrome. We also included questions aimed at identifying the sample, the physical activities most often performed by these patients and the effects on them after participating in such activities.

The questionnaire assesses the physical activity performed by a person during the previous 7 days, in all situations involving some type of movement.

The questions covered three situations that varied according to the intensity of the physical activity performed by the person with Down syndrome:

- vigorous-intensity activities (e.g., mountain hiking, cross-country cycling);
- moderate-intensity activities (e.g., lifting light objects);
- walking.

The questionnaire was distributed to the sample between May and June 2024. Participants had no time limit to complete the questions, but all questionnaire items were mandatory.

The total physical activity of each participant was calculated using the formula: Total Physical Activity (MET minutes per week) = (3.3 * M min* M days) + (4 * MIA min* MIA days) + (8 * VIA min* VIA days) (International Physical Activity Questionnaire – IPAQ, 2004), where:

- MET is the metabolic equivalent expressed in minutes per week;
- W means walking;
- MIA means moderate-intensity activity;
- VIA means vigorous-intensity activity.

Depending on the intensity of physical activities and the time dedicated to them, the score achieved is interpreted on three levels (International Physical Activity Questionnaire – IPAQ, 2004):

1. low level – people who do not meet the criteria of the other categories and have values below 600 METs;

2. medium level – people who perform vigorous-intensity activity of at least 20 minutes per day for 3 or more days; people who perform moderate-intensity activity of at least 30 minutes per day for 5 or more days; people who perform any combination of walking, moderate-intensity or vigorous-intensity activities for 5 or more days, achieving a minimum of 600 METs;

3. high level – people who perform vigorous-intensity activity for 3 days or more, achieving a minimum of 1500 METs; people who perform any combination of walking, moderate-intensity or vigorous-intensity activities for 7 days, achieving a minimum of 3000 METs.

We mention that the use of IPAQ to assess the level of physical activity engagement for adults with Down syndrome, which actually reflects their quality of life, represents the novelty of this research. Studies on the same topic have assessed the quality of life of these patients using other questionnaires, for example, QualityMetric Short Form-12 version 2 (Graves et al., 2016) or KidsLife Scale (Gomez et al., 2020; Moran et al., 2022).

Participants

The adapted IPAQ was sent to respondents in compliance with ethical principles, the caregivers of people with Down syndrome giving their consent for completion. Caregivers who did not consent for their responses to be used were eliminated from the beginning, so they had no access to the questionnaire items.

Our sample consisted of 50 people with Down syndrome, 54% female and 46% male, with an average age of ± 22.3 years. They were members of associations or day-care centres in Bucharest, Cluj, Târgu Mureș and Timișoara.

Results

The first question identified the relationship between the caregiver and the person with Down syndrome (Table 1).

Table 1. *Relationship between the caregiver and the person with Down syndrome*

Respondents	Frequency	Percent	Valid Percent
Parents	42	84.0	84.0
Coordinators of centres for people with intellectual disabilities	8	16.0	16.0
Total	50	100.0	100.0

In the next item, respondents were asked about the physical activities most often performed by the patients they cared for. They had the opportunity to choose multiple responses and complete them if the activity done by adults with Down syndrome was not on the support list. Most of them preferred dancing (74%), walking in the park (70%) and gymnastics (64%), followed by bocce (40%), football (32%) and basketball (22%); the fewest liked swimming (14%), physiotherapy (10%), table tennis and roller skating (4%) (Figure 1).

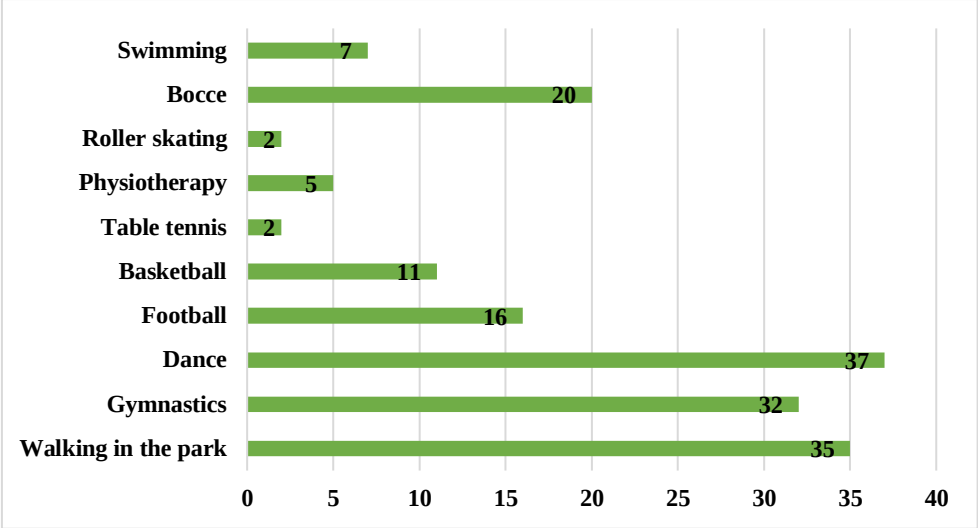

Figure 1. Physical activities most often performed by people with Down syndrome

Through the next item, we asked the opinion of caregivers on the effects observed in people with Down syndrome after participating in various physical activities (Table 2).

Table 2. *Effects observed in people with Down syndrome after participating in their favourite physical activities*

Observed effects	Frequency	Percent	Valid Percent
Joyful or happy	16	32.0	32.0
Relaxed and peaceful	14	28.0	28.0
Less anxious	6	12.0	12.0
Better physically fit	9	18.0	18.0
More confident	5	10.0	10.0
Total	50	100.0	100.0

Subsequently, we used the 7 adapted questions of IPAQ. For the first item (During the last 7 days, on how many days did the person you care for engage in vigorous-intensity physical activity?), the responses received are shown in Table 3.

Table 3. *Number of days on which participants engaged in vigorous-intensity physical activity (VIA)*

Number of days	Frequency	Percent	Valid Percent
1-2 days	22	44.0	44.0
3-4 days	15	30.0	30.0
5-6 days	3	6.0	6.0
7 days	4	8.0	88.0
No vigorous physical activity	6	12.0	12.0
Total	50	100.0	100.0

In the next item, we asked how many minutes people with Down syndrome spent doing vigorous-intensity physical activity during a day. We found that most of them (46%) performed VIA for at least 60 minutes, and 32%, for only 30 minutes per day (Table 4).

Table 4. *Number of minutes per day participants spent doing vigorous-intensity physical activity (VIA)*

	Frequency	**Percent**	**Valid Percent**
10-15 minutes	6	12.0	12.0
20 minutes	3	6.0	6.0
30 minutes	16	32.0	32.0
60 minutes or more	23	46.0	46.0
No vigorous physical activity	6	12.0	12.0
Total	50	100.0	100.0

The next two items were asked in the same form but focused on the moderate-intensity physical activity performed. The responses received indicated that most participants (44%) engaged in such activities 3 or 4 days per week (Table 5).

Table 5. *Number of days on which participants engaged in moderate-intensity physical activity (MIA)*

	Frequency	**Percent**	**Valid Percent**
1-2 days	19	38.0	38.0
3-4 days	22	44.0	44.0
5-6 days	2	4.0	4.0
7 days	6	12.0	12.0
No vigorous physical activity	1	2.0	2.0
Total	50	100.0	100.0

For the next item (How many hours/minutes did the person you care for spend doing moderate-intensity physical activity during a day?), the results are shown in Table 6.

Table 6. *Number of minutes per day participants spent doing moderate-intensity physical activity (MIA)*

	Frequency	**Percent**	**Valid Percent**
10-15 minutes	4	8.0	12.0
20 minutes	12	24.0	6.0
30 minutes	20	40.0	32.0
60 minutes or more	14	28.0	46.0
Total	50	100.0	100.0

Item 5 of the questionnaire focused on a low-intensity physical activity, namely walking, and the responses received showed that 56% of participants used to walk on a daily basis (Table 7).

Table 7. *Number of days on which participants engaged in moderate-intensity physical activity (MIA)*

	Frequency	**Percent**	**Valid Percent**
1-2 days	9	18.0	18.0
3-4 days	7	14.0	14.0
5-6 days	6	12.0	12.0
7 days	28	56.0	56.0
Total	50	100.0	100.0

Responses to the question "How many hours/minutes did the person you care for walk during a day?" revealed that 48% of people with Down syndrome walked for one hour, 20% - for 30 minutes, 20% - for about 10-15 minutes, and 12% - for two or more hours (Table 8).

Table 8. *Number of minutes per day participants spent walking*

	Frequency	**Percent**	**Valid Percent**
10-15 minutes	6	12.0	12.0
20 minutes	10	20.0	6.0
30 minutes	10	20.0	32.0
60 minutes or more	24	48.0	46.0
Total	50	100.0	100.0

Table 9 summarises the results for the last item of the questionnaire, which referred to the time spent sitting by the person with Down syndrome.

Table 9. *Time spent sitting by the person with Down syndrome*

	Frequency	**Percent**	**Valid Percent**
10-15 minutes	1	2.0	2.0
30 minutes	5	10.0	10.0
60 minutes	4	8.0	8.0
120 minutes	14	28.0	28.0
More than 120 minutes	26	52.0	52.0
Total	50	100.0	100.0

Based on the individual responses, we calculated each person's score for the total physical activity expressed in minutes per week. For this, we used the formula: Total Physical Activity (MET minutes per week) = (3.3 * M min* M days) + (4 * MIA min* MIA days) + (8 * VIA min* VIA days). The results are randomly presented in Table 10.

Table 10. *Level of weekly physical activity for people with Down syndrome*

Participants	**MET (minutes per week)**	**Level**
1.	1638	Medium
2.	2933	High
3.	1546,5	Medium
4.	3588	High
5.	937	Medium
6.	318	Low
7.	1219	Medium
8.	558	Low
9.	1866	Medium
10.	2506	Medium
11.	3412	High
12.	2346	Medium
13.	1493	Medium
14.	2506	Medium
15.	1116	Medium
16.	3066	High
17.	4212	High
18.	2346	Medium
19.	1318	Medium
20.	1356	Medium

21.	1299	Medium
22.	2232	Medium
23.	2148	Medium
24.	3213	High
25.	7812	High
26.	2826	Medium
27.	3093	High
28.	2506	Medium
29.	3786	High
30.	4068	High
31.	2118	High
32.	1352	Medium
33.	1377	Medium
34.	4452	High
35.	4266	High
36.	1752	Medium
37.	4986	High
38.	2346	Medium
39.	4746	High
40.	2826	Medium
41.	438	Low
42.	3268	High
43.	918	Medium
44.	1836	Medium
45.	1973	Medium
46.	2826	Medium
47.	2133	Medium
48.	2666	Medium
49.	899	Medium
50.	2346	Medium

A small percentage of participants, 6%, had a low level of weekly physical activity; the vast majority of the group, 60%, showed a medium level, and 34%, a high level of physical activity (Table 11).

Table 11. *Physical activity levels of people with Down syndrome*

	Frequency	**Percent**	**Valid Percent**
High	17	34.0	34.0
Medium	30	60.0	60.0
Low	3	6.0	6.0
Total	50	100.0	100.0

After finding out the MET values, we studied the dataset with the help of descriptive statistics. To do this, we entered the data into the online Potential Outliers Calculator (Hackmath.net, 2024) to see whether there were any outliers in the numerical dataset. During the preliminary analysis, we noted that one value was very high, namely 7812 minutes per week, indicating the result of a very active person. The presence of this value could influence the descriptive statistics calculations, leading to erroneous conclusions. For this reason, the value was removed from the dataset before performing the next analysis in order to ensure the accuracy of the statistical analysis results. Following the removal of this outlier, we introduced the 49 datasets into the online Descriptive Statistics Calculator (2023). This instrument calculated group tendencies (Table 12) to obtain the clearest and most accurate understanding of the distribution of physical activity levels in people with Down syndrome.

Table 12. *Descriptive statistics values*

Descriptive statistics	
Arithmetic mean	2346.43
Median	2346
Mode	2346
Standard deviation	1153.39
Coefficient of variation	49%
Skewness	0.40
Kurtosis excess	-0.40

Respondents to the questionnaire assessing physical activity levels scored an average of 2346.43 METs. Half of the participants achieved results up to 2346 METs, as an indicator of the group's central tendency. Most individuals scored 2346 METs on the IPAQ. 2506 and 2826 were the next most common values for people with Down syndrome.

Standard deviation shows the tendency of individual values to disperse from the mean. As regards our data, the value 1153 indicates a higher variation. The coefficient of variation is 49%, and this high value emphasises a lack of homogeneity. The normality of data distribution was ensured by the Skewness (0.40) and Kurtosis (-0.40) values, ranging between -1.96 and +1.96.

Discussion

The concept of quality of life has attracted attention and become a topic of study for a long time, but the application of analyses on the quality of life of people with Down syndrome has only been in the attention of specialists for a few decades. Currently, there is no validated instrument that can assess the quality of life of adults with Down syndrome (Goodman & Brixner, 2013; Gomez et al., 2020). Palomba et al. (2020) studied the methods applied to assess quality of life in people with Down syndrome over a period of 10 years and have found that there is a growing interest in measuring their quality of life, with studies continuing to try to identify a reliable instrument and achieve global standardization.

Until this tool can be implemented, scientists have initiated various research studies in an attempt to capture aspects related to the quality of life of people with Down syndrome and the influence of physical activity on their well-being and therefore quality of life. Thus, Hardee and Fetters (2017) examined the relationship between quality of life and participation in multiple exercise programmes for people with Down syndrome. The study analysed 19 documents published over three decades and highlighted a beneficial impact on quality of life from the perspective of their engagement in physical activity.

Moran et al. (2022) used an adapted version of the KidsLife Scale and assessed the outcomes related to the quality of life of children with disabilities based on changes observed by families and professional caregivers. The results showed high scores for physical well-being, material well-being and rights, and lower scores for social integration and self-determination. Our research indicated improvements in emotional well-being (32%), psychological well-being (40%), self-confidence (10%) and physical well-being (17%).

Montalva-Valenzuela et al. (2024) highlight that 92% of people with Down syndrome experience at least a significant positive difference in physical health following any type of physical activity. In this case, physical activity is regarded as treatment and therapy for

achieving a high level of quality of life and increasing the functional indicators of people with Down syndrome.

Sheridan et al. (2019) identified two articles in which individuals with Down syndrome presented their views on quality of life. Thus, those interested found out that they appreciated participation in the social activities of their communities, friendship, family relationships and functional independence. We believe that all these aspects can be supported by their engagement in physical activities aimed at the aforementioned objectives. Moreover, the involvement of people with Down syndrome as respondents is extremely valuable and allows social workers to know and understand their needs (Graves et al., 2016). At the same time, the involvement of these patients in the development of their own intervention plans makes them responsible and increases their chances of accomplishing the proposed plans (Graves et al., 2016), which ultimately leads to the desired outcomes.

The effects of physical activity on people with Down syndrome are numerous and result in functional (Matute-Llorente et al., 2013; Bota, 2016; Terblanche & Boer, 2013), intellectual (Malak et al., 2013) and social (Bota, 2016) improvements, which include: increasing self-confidence, correcting physical attitudes or impairments, preventing the onset of disease, increasing resistance to stress and other harmful factors, reducing adipose tissue and toning skeletal muscles (Paul et al., 2019; Boer & de Beer, 2019).

The increased quality of life of people with Down syndrome is also reflected in increased life expectancy (Carmeli et al., 2012), which is based on intervention programmes mainly focused on physical activity. This is associated with physiotherapy and other medical treatments that have been improved over time and help individuals with Down syndrome to lead a better life, as close as possible to that of people without disabilities.

It is certain that physical activity influences all areas of expression of quality of life (Gill et al., 2013). It is found at the intersection between the social and emotional areas, being both a benefit and a motivating factor for participation in various forms of movement, with the ultimate goal of improving quality of life.

Research limitations

Given that this is a cross-sectional study, we cannot draw causal conclusions. More specifically, we cannot determine whether the outcomes were influenced by intermediate factors such as completion of a physiotherapy or intervention programme. For clearer results, a longitudinal study is recommended, where the questionnaire is administered at multiple time points over a period of several months or one year in order to observe whether people with Down syndrome maintain the same level of physical activity.

Data collection was done through the completion of the International Physical Activity Questionnaire (IPAQ) by the caregivers of people with Down syndrome. A self-reported instrument can influence the respondent's subjective understanding and desire for social appearance, which may lead to inaccurate responses.

Conclusion

Most people with Down syndrome included in our research are engaged in various physical activities that are part of their daily routine, stimulating and motivating them to be

active. In order to maximise their involvement, the proposed physical activities should be attractive, enjoyable and give them the opportunity to be with peers and friends.

The physical activities performed individually or in teams, with or without music (dance, gymnastics), at different exercise intensities (from low intensity – walking to moderate or vigorous intensity – swimming, running, sports games) positively influenced the physical, emotional and social well-being of people with Down syndrome, with all the benefits being reflected in their quality of life.

Acknowledgments

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Research Ethics Committee of UNEFS Bucharest (protocol code 630).

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