

Examination of Physical Activity Level and Psychosocial Status in Children and Adolescents with Juvenile Idiopathic Arthritis: A Comparative Study

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What is already known on this topic?

- While the functional level of the child can be evaluated in the performance of physical activity, the psychosocial status is evaluated comprehensively with parameters such as anxiety, depression, insomnia, and fatigue.
- Future research on psychosocial outcomes and physical activity in juvenile arthritis is needed.

What does this study add on this topic?

- Compared to healthy controls, children/adolescents with juvenile idiopathic arthritis (JIA) had lower body composition and poorer functionality. In the clinic, body composition assessment and follow-up can be performed so that children and adolescents with JIA do not fall behind in their development. Function-oriented approaches can be adopted in treatment and rehabilitation.
- Although fatigue levels of children/adolescents with JIA were higher and their metabolic equivalent of task and energy consumption and energy expenditure was lower than healthy controls, there was no significant difference. Although larger samples are needed for more analysis of these parameters, it can be kept in mind, in the clinic, that fatigue and physical activity levels may be low.
- As the disease activity increases, the functionality of these children/adolescents decreases and they may be affected more psychosocially.

ABSTRACT

Objective: The aim was to examine the physical activity level (PAL) and psychosocial status in children/adolescents with juvenile idiopathic arthritis (JIA) and compare them with healthy controls.

Methods: This is a case-control study. The data was collected between September 01, 2022 and November 01, 2022 at Pamukkale University Hospital Pediatric Rheumatology Clinic and Pediatric Rheumatology Physiotherapy and Rehabilitation Unit. Fourteen children/adolescents with JIA (mean age = 12.35 ± 2.16 years) and 15 healthy children/adolescents (mean age = 13.20 ± 1.61 years) participated in the study. Childhood Health Assessment Questionnaire (CHAQ), 1-day PAL (MET-Metabolic Equivalent of Task and Energy Consumption), and Pediatric Quality of Life Inventory TM 3.0 Multidimensional Fatigue Scale (PedsQL-MFS) (general, sleep/rest, and cognitive) were used for evaluation. In addition, 27-joint Juvenile Arthritis Disease Activity Score (JADAS-27) and Juvenile Arthritis Biopsychosocial Scale (JAB-Q) (child, family, and clinician) were used in JIA.

Results: Height ($P = .005$) and body weight ($P = .023$) were lower in JIA compared to healthy controls. In group comparison, CHAQ dressing ($P = .002$), reaching ($P < .001$), eating ($P < .001$), arising ($P < .001$), grip ($P < .001$), walking ($P < .001$), hygiene ($P < .001$), activity ($P < .001$), and total score ($P < .001$) were significant in favor of healthy controls. The groups were similar in MET ($P = .621$), energy expenditure ($P = .425$), PedsQL-MFS (sleep/rest) ($P = .405$), PedsQL-MFS (general) ($P = .710$), and PedsQL-MFS (cognitive) ($P = .599$). The JADAS-27 score of JIA was correlated with CHAQ total ($r = 0.571$, $P = .033$) and JAB-Q child ($r = 0.567$, $P = .035$) and JAB-Q clinician ($r = 0.811$, $P < .001$).

Conclusion: Compared to healthy controls, JIA patients had lower body composition and functionality. Although fatigue and MET-energy expenditure were worse, there was no statistical difference. Disease activity was associated with functionality and child and clinician psychosocial status. The disease may have caused developmental delays and affect the psychosocial status as well as limitations in daily activities in JIA. Energy expenditure and fatigue need to be investigated with larger sample sizes.

Keywords: Fatigue, juvenile idiopathic arthritis, physical activity

Introduction

Juvenile idiopathic arthritis (JIA) is the most common rheumatic disease of childhood. Patients with JIA may experience a variety of articular or extra-articular symptoms and signs. The first symptoms usually include morning stiffness, easy fatigue, joint pain, and joint swelling. Swelling, pain, effusion, and tenderness in the joints in JIA cause limitation of joint movements, atrophy, balance, muscle weakness, and walking disorders.¹ Fatigue is also common in children with JIA. It may become apparent, especially in

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the early stages of the disease and when the disease is not well controlled. In children with systemic polyarticular JIA, conditions such as anorexia, weight loss, and growth retardation may be observed.²

In daily life, any movement that uses skeletal muscles and requires energy expenditure is defined as physical activity.³ Although the daily energy expenditure in children with JIA seems comparable to that of healthy children, their engagement in sports and intense physical activities is considerably less.⁴

Physical activity is a process that is affected by various factors. These factors include physical, biological, psychological, and environmental elements. Psychological, emotional, and mental factors include elements such as psychological and mental state, emotional health, personality changes, self-confidence level, motivation, lack of sufficient knowledge about exercise and its health benefits, and awareness of movement disorders.⁵ Social support from family and friends, attitudes and motivations, compatible groups, and social isolation are some of the environmental factors that can change the physiological effects of activities.⁶

Lupini et al⁷ stated that children with arthritis experience significant physical pain, anxiety, depression, social determinants of health, and behavioral problems, and they are also more likely to see a mental health professional and receive treatment for emotional or behavioral issues. This is a study that emphasizes the need for future research on psychosocial outcomes in juvenile arthritis. Health professionals and families understanding the psychosocial effects of the disease and meeting children's needs in this regard can increase the success of the treatment process. This approach may contribute to a healthier life for patients with JIA, not only physical health but also emotional and social aspects. Because when patients experience more severe pain, they often experience more symptoms of depression and anxiety, lower self-esteem, and more behavioral problems.⁸ However, there are few studies in the literature that evaluate the physical activity levels (PALs) and psychosocial status of children with JIA together. While the functional level of the child can be evaluated in the performance of physical activity, the psychosocial status is evaluated comprehensively with parameters such as anxiety, depression, insomnia, and fatigue. Therefore, in the present study, the functional level was specifically addressed with the evaluation of activities performed in 1 day's life and the amount of energy spent for these activities for the measurement of PAL, while the psychosocial status was addressed in detail using the Juvenile Arthritis Biopsychosocial Scale (JAB-Q) and fatigue questionnaires specially developed for children with JIA. The hypotheses of the study were that the PALs of children and adolescents with JIA were lower than their healthy peers and that the PAL affected the psychosocial status of these children.

This study was planned to evaluate the PALs and psychosocial status of children and adolescents with JIA and compare them with healthy controls. Do children and adolescents with JIA have lower PALs and psychosocial status compared to healthy peers?

Materials and Methods

Study Design

In this study, which was planned to compare JIA patients with their healthy peers, participants were included cross-sectionally. The data was collected between September 01, 2022 and November 01, 2022.

Participants

Fourteen children/adolescents with JIA (mean age = 12.35 ± 2.16 years) and 15 healthy children/adolescents (mean age = 13.20 ± 1.61 years) participated in the study. Patients with JIA were selected from

among children/adolescents who were followed up by the hospital's pediatric rheumatology clinic and diagnosed with JIA according to the International League of Associations for Rheumatology (ILAR) criteria. Healthy children/adolescents were selected from among the healthy relatives of the researchers and the patients.

Inclusion criteria (JIA group): aged 6-18 years, diagnosed with JIA according to the ILAR classification, and accepting to participate in the study. Exclusion criteria: lung pathology and heart failure at a level that affects daily living activities, failure to cooperate, had any surgery within the last year, other concurrent rheumatic disease, and any neurological disease.

Inclusion criteria (healthy group): accepting to participate in the study and aged 6-18 years. Exclusion criteria: any known chronic disease, failure to cooperate, and had any surgery within the last year.

Ethics Committee Approval

The study received ethics committee approval from the Ethics Committee of Pamukkale University on July 26, 2022, with the approval number 60116787-020-237104. Each individual received verbal information and gave their consent by signing the informed consent form.

Measures

After demographic data is recorded, functional levels were assessed with Childhood Health Assessment Questionnaire (CHAQ), 1-day physical activity level with PAL (MET-Metabolic Equivalent of Task and Energy Consumption), and fatigue with Pediatric Quality of Life Inventory TM 3.0 Multidimensional Fatigue Scale (PedsQL-MFS) (sleep/rest fatigue, general fatigue, and cognitive fatigue). In addition, disease activities of JIA were assessed with 27-joint Juvenile Arthritis Disease Activity Score (JADAS-27) and psychosocial status with JAB-Q (child, family, and clinician).

Childhood Health Assessment Questionnaire

The CHAQ was created to assess functional abilities in children, comprising 8 sub-sections (dressing, reaching, eating, arising, grip, hygiene, walking, activity) and 30 questions in total. The score ranges from 0 to 3. Higher scores reflect greater disability.⁹ The instrument's internal reliability was excellent (Cronbach's alpha = 0.94).

Physical Activity Level

A 1-day activity diary was used to assess the PALs. Both the patient and healthy groups were asked to record their 24-hour activities on paper during the middle of the week. Every hour, participants documented their activities and the duration (such as sleeping, eating, sitting, writing, walking, standing, computer games, or sports). The diary was completed by the patients, and if they were uncertain about any activity, they were instructed to check with their parents or teachers. The Ainsworth Compendium of Physical Activities was taken as a reference to calculate Metabolic Equivalent of Task (MET) values for each activity.¹⁰ One MET corresponds to the energy expended at rest, $\sim 1 \text{ kcal} \cdot \text{kg}^{-1} \cdot \text{h}^{-1}$ (Intraclass correlation coefficient = 0.76). The MET values were multiplied by the time spent on each activity (in hours per day). This process was repeated for all daily activities, and the total MET values for all participants were recorded. Energy expenditure was then calculated by multiplying the total MET by the participant's weight.¹¹

Pediatric Quality of Life Inventory TM 3.0 Multidimensional Fatigue Scale

The PedsQL-MFS provides detailed information about fatigue symptoms and fatigue severity. It is composed of 18 items comprising 3 dimensions (sleep/rest fatigue, general fatigue, and cognitive fatigue). Each item is rated for a 5-point scale from 0 "never" to 4 "almost always." Children (ages 8-12) and teens (ages 13-18) forms were used in

this study. The total score is between 0 and 100. Higher scores means better quality of life and fewer problems or symptoms.¹² (Cronbach's alpha for total score = 0.95, for sleep/rest fatigue = 0.88, for general fatigue = 0.93, for cognitive fatigue = 0.93).

27-Joint Juvenile Arthritis Disease Activity Score

Developed to evaluate disease activity in children, the JADAS-27 comprises 4 sections: Patient-Visual Analog Scale, Doctor-Visual Analog Scale, the erythrocyte sedimentation rate (between 0 and 10), and number of active joints (27 joints). The JADAS is calculated by the arithmetic sum of 4 sections. Total score is between 0 and 40.¹³ The internal consistency of the JADAS-27 was reported as Cronbach's alpha = 0.73, indicating good reliability.

Juvenile Arthritis Biopsychosocial Scale

The JAB-Q was developed for biopsychosocial evaluation of JIA children aged 6-18 years and has 3 forms: child, family, and clinician. The child form includes 26 questions, and the total score ranges from 0 to 52. The family form evaluates the parent's biopsychosocial status from their viewpoint, with a score range of 0 to 38. A higher score indicates worse results on all aspects of the JAB-Q. The total score of the clinician form is between 0 and 14. A high score indicates a poor biopsychosocial status.¹⁴ For the clinician form, the Cronbach's alpha coefficient was 0.952. For the child and the family' forms, the Cronbach's alpha coefficient was 0.891 and 0.856, respectively.

Statistical Analysis

In the power analysis conducted based on the physical activity score of the reference article,¹⁵ the effect size was high ($d = 1.468$). It was calculated that 95% power would be obtained with 95% CI if at least 22 participants were included (11 JIA, 11 healthy controls). However, in order to prevent data loss, it was aimed to include at least 15 participants for both groups.

Data analysis was conducted with the SPSS 26.00 software (IBM SPSS Corp.; Armonk, NY, USA). Descriptive statistics for categorical variables included frequency and percentage distributions, while means and standard deviations were calculated for continuous variables. The Mann-Whitney *U*-Test was employed to compare 2 groups. Spearman Correlation Analysis was used to examine the relationships between continuous variables, with correlation values classified as high (r : 0.70-1.00), moderate (r : 0.50-0.69), or low (r : 0.10-0.499).¹⁶ A *P* value of <0.05 was regarded as statistically significant. Effect size was measured with the Cohen's *d* coefficient.

Results

A total of 29 volunteer children/adolescents, aged between 8 and 16 years, participated in this study (JIA group $n = 14$, mean age = 12.35 ± 2.16 years; healthy group $n = 15$, mean age = 13.20 ± 1.61 years). The mean height of JIA was 153.35 ± 12.73 cm and the mean body weight was 49.14 ± 18.26 kg. The mean height of healthy controls was 164.60 ± 6.35 cm and the mean body weight was 58.33 ± 9.75 kg. The groups were similar in demographic characteristics except for height and weight parameters ($P > .05$). The gender distribution of children/adolescents with JIA was 9 females (70%) and 5 males (30%). Healthy children/adolescents consisted of 9 girls (60%) and 6 boys (40%) (Table 1). The data related to the disease in children/adolescents with JIA can be found in Table 2. Physical activity level (MET-metabolic equivalent of task and energy consumption) of children/adolescents with JIA was shown in Figure 1.

Comparison Results of 2 Groups

Height ($d = 1.118$, $P = .005$) and body weight ($d = 0.627$, $P = .023$) were significantly lower in JIA compared to healthy controls. As a result of

Table 1. Demographic Data of Participants

	JIA Group (n = 14) Mean $\pm$ SD	Healthy Group (n = 15) Mean $\pm$ SD	<i>P</i> *	Cohen's <i>d</i>
Age (years)	12.35 $\pm$ 2.16	13.20 $\pm$ 1.61	.377	0.446205
Height (cm)	153.35 $\pm$ 12.73	164.60 $\pm$ 6.35	.005	1.118378
Body weight (kg)	49.14 $\pm$ 18.26	58.33 $\pm$ 9.75	.023	0.627856
Body mass index (kg/m ²)	20.29 $\pm$ 5.26	21.46 $\pm$ 2.71	.134	0.279637
Disease duration (years)	5.71 $\pm$ 2.97			
Gender	n (%)	n (%)		
Female	9 (70)	9 (60)	1.000**	
Male	5 (30)	6 (40)		

SD, standard deviation.

*Mann-Whitney *U*-test.

**Chi-Square test.

Bold values denote statistical significance at the $P < 0.05$ level.

comparative analysis, CHAQ dressing ($d = 0.579$, $P = .002$), reaching ($d = 0.928$, $P < .001$), eating ($d = 0.638$, $P < .001$), arising ($d = 1.014$, $P < .001$), grip ($d = 1.077$, $P < .001$), hygiene ($d = 0.888$, $P < .001$), walking ($d = 0.836$, $P < .001$), activity ($d = 0.888$, $P < .001$), and total score ($d = 1.198$, $P < .001$) were significantly in favor of healthy controls. The groups were similar in MET ($P = .621$), energy expenditure

Table 2. Disease-Related Data for Children/Adolescents with JIA

Variables	Participants with JIA (n = 14)	
	n	%
Family history		
Yes	7	50
No	7	50
Pharmacological treatment		
Methotrexate	4	28.60
Biological therapy	4	28.60
Methotrexate + biological therapy	6	42.90
First symptom		
Swelling in joints	4	28.60
Pain in joints	8	57.10
Morning stiffness	1	7.10
Difficulty in walking	1	7.10
First joint involvement		
Knee	8	57.10
Ankle	3	21.40
Wrist	2	14.30
Hip	1	7.10
Morning stiffness		
Yes	7	50
No	7	50
Consanguineous marriage		
Yes	2	14.30
No	12	85.70
Disease status		
Clinical remission with pharmacological treatment	12	85.70
Clinical remission without pharmacological treatment	2	4.30
	Median	Min/Max
JADAS-27	8.5	0/21
JAB-Q Child (0-52 score)	38.5	31/52
JAB-Q Family (0-38 score)	10	1/24
JAB-Q Clinician (0-14 score)	2	1/7

JAB-Q, Juvenile Arthritis Biopsychosocial Scale; JADAS-27, 27-joint Juvenile Arthritis Disease Activity Score.

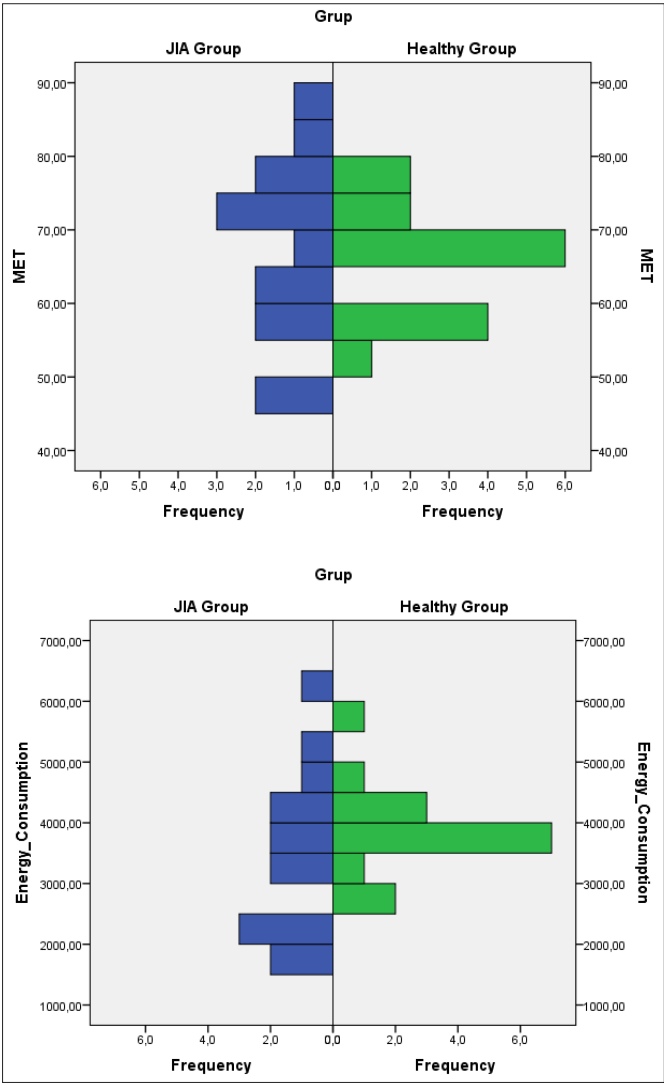


Figure 1. Physical activity level (MET-metabolic equivalent of task and energy consumption) of children/adolescents with JIA.

($P=.425$), PedsQL-MFS (sleep/rest fatigue) ($P=.405$), PedsQL-MFS (general fatigue) ($P=.710$), and PedsQL-MFS (cognitive fatigue) ($P=.599$) (Table 3).

Correlation Results in Children/Adolescents with Juvenile Idiopathic Arthritis

While the JADAS-27 score of JIA was correlated with CHAQ total score ($r=0.571$, $P=.033$) and JAB-Q child ($r=0.567$, $P=.035$) and JAB-Q clinician ($r=0.811$, $P<.001$), it wasn't correlated with MET ($P=.787$), energy expenditure ($P=.535$), and the JAB-Q family ($P=.511$) (Table 4).

The MET and energy expenditure of JIA weren't correlated with JAB-Q child ($P=.416$), family ($P=.838$), and clinician ($P=.585$) (Table 5).

Discussion

Compared to healthy controls, children/adolescents with JIA had lower body composition and poorer functionality. Although their fatigue levels were higher and their MET and energy expenditure were lower, it did not make a difference. Disease activity was associated with functionality, child and clinician psychosocial status, but not with physical activity parameters and family psychosocial status. There was also no

Table 3. Comparison Results of Groups

	JIA Group (n = 14) Mean $\pm$ SD	Healthy Group (n = 15) Mean $\pm$ SD	P^*	Cohen's d
CHAQ				
Dressing	0.57 $\pm$ 1.39	0.000	.002	0.579929
Eating	0.42 $\pm$ 0.93	0.000	<.001	0.638677
Reaching	0.42 $\pm$ 0.64	0.000	<.001	0.928078
Arising	0.71 $\pm$ 0.99	0.000	<.001	1.014234
Walking	0.71 $\pm$ 1.20	0.000	<.001	0.836743
Grip	0.64 $\pm$ 0.84	0.000	<.001	1.077496
Hygiene	0.71 $\pm$ 1.13	0.000	<.001	0.888577
Activity	0.71 $\pm$ 1.13	0.000	<.001	0.888577
Total score	0.61 $\pm$ 0.72	0.000	<.001	1.198153
MET (metabolic equivalent of task)	67.49 $\pm$ 11.89	65.67 $\pm$ 7.95	.621	0.179954
Energy expenditure	3497.81 $\pm$ 1380.62	3827.92 $\pm$ 752.44	.425	0.29691
PedsQL-MFS				
General fatigue	67.49 $\pm$ 23.04	72.02 $\pm$ 15.36	.710	0.231356
Sleep/rest fatigue	65.89 $\pm$ 19.20	72.34 $\pm$ 15.53	.405	0.36938
Cognitive fatigue	69.39 $\pm$ 20.74	74.40 $\pm$ 19.94	.599	0.246265

$P<.05$, statistical significance.
CHAQ, Childhood Health Assessment Questionnaire; PedsQL-MFS, Pediatric Quality of Life Inventory TM 3.0 Multidimensional Fatigue Scale, SD, standard deviation.
*Mann–Whitney U-test.

Table 4. Correlation Results Between Disease Activity and Functional Level, Physical Activity Parameters, Psychosocial Status in Children/Adolescents with Juvenile Idiopathic Arthritis

Variables	JADAS-27	
	r	P
CHAQ	0.571	.033
MET	−0.080	.787
Energy Expenditure	−0.181	.535
JAB-Q Child	0.567	.035
JAB-Q Family	0.192	.511
JAB-Q Clinician	0.811	<.001

Spearman Correlation Analysis, r , correlation coefficient; $P<.05$: statistical significance.
CHAQ, Childhood Health Assessment Questionnaire; JAB-Q, Juvenile Arthritis Biopsychosocial Scale; JADAS-27, 27-joint Juvenile Arthritis Disease Activity Score; MET, metabolic equivalent of task.

Table 5. Correlation Results Between Physical Activity Parameters and Psychosocial Status of Children/Adolescents with Juvenile Idiopathic Arthritis

Variables	MET		Energy Expenditure	
	r	P	r	P
JAB-Q Child	0.223	.443	0.236	.416
JAB-Q Family	−0.116	.693	0.060	.838
JAB-Q Clinician	−0.117	.692	−0.160	.585

Spearman Correlation Analysis, r : correlation coefficient; $P<.05$: Statistical significance.
JAB-Q scale, Juvenile Arthritis Biopsychosocial Scale; MET, metabolic equivalent of task.

relationship between physical activity parameters and psychosocial status.

Body mass index and lean body weight methods are frequently used to evaluate the body composition of patients with JIA.¹⁷ Shafferman

et al¹⁸ showed deterioration in body composition in patients with JIA and stated that patients with JIA experience excessive weight gain due to medication side effects and physical inactivity, and that this contributes to the inflammatory process. However, Nesbitt et al¹⁹ found no significant difference in body weight, BMI, and lean body weight between the JIA group and the control group. The body weight and height of the children/adolescents with JIA in the present study were lower than the healthy children. The disease may have caused developmental delays in children and adolescents with JIA. Therefore, disease management should not only control the child's disease symptoms but also support their development. Exercise approaches, which are among the nonpharmacological approaches in disease management, can support body composition.

The CHAQ is a widely used self-report questionnaire designed to assess the functional abilities of children with JIA.^{20,21} This scale is also frequently used as an outcome measure in intervention studies on children with JIA.^{22,23} Therefore, the present study preferred to use this questionnaire to evaluate the functionality of both children and adolescents with JIA and healthy controls. In the present study, patients with JIA were less able to dress, eat, reach, arise, walk, grip, hygiene, and perform activities according to the CHAQ results compared to healthy controls. That is, these children and adolescents can perform these activities with more difficulty or in a more limited way than their healthy peers. These results indicate that JIA causes limitations in the child's daily activities.

Physical activity, which is considered an important determinant of health,²⁴ is defined as any movement that requires the use of skeletal muscles and energy expenditure in daily life activities. A review by Takken et al²⁵ aimed to determine whether children/adolescents with JIA have lower physical activity compared to their healthy peers. Nine studies were reviewed and data from 5 of these studies (144 patients in total) were combined in a meta-analysis. According to these data, children with JIA were reported to have 21.8% lower VO₂ peak levels compared to their healthy peers. In the present study, although children/adolescents with JIA had lower MET and energy expenditure scores in physical activity parameters, these results did not create a statistical difference compared to their healthy peers. This may be due to the increase in dependency on computers, tablets, and phones as a result of today's technological advances, which reduces physical activity. Also, disease severity, medication use, socioeconomic status, etc. are confounding variables. The JIA patients in the study were heterogeneous in terms of these variables and could not be controlled. These may have affected the results of MET and energy expenditure. Examining the factors that reduce physical activity and taking measures to increase it is very important to develop healthy adults in society. In the present study, PAL was not associated with psychosocial status in JIA. This situation may be due to the small number of children and adolescents with JIA in the sample. Therefore, the authors recommend that this situation be examined in future studies with larger samples of children with JIA.

Fatigue in chronic diseases is generally defined as "a persistent feeling of weakness or exhaustion that results in reduced physical and/or mental working capacity and is not relieved by sleep or rest." This definition implies that fatigue is a subjective feeling and has consequences in many areas. Fatigue is multidimensional, meaning its cause can be physical or mental.²⁶ Patients with JIA tire more easily than their peers. The background of this fatigue is usually pain, sleep quality disorders, limited joint movements, inflammation and psychosocial factors.²⁷ It can usually be a side effect of medical treatment, but it can also occur as a subjective symptom specific to JIA.²⁸ Tarakçı et al² found that fatigue has become a common problem in this patient population and

that fatigue and sleep problems are more common in children/adolescents with JIA than in healthy children. One of the results of the study was that although the sleep/rest fatigue, general fatigue, and cognitive fatigue levels of children and adolescents with JIA were higher than those of healthy participants, there was no statistically difference. These results suggest that these factors of fatigue do not significantly affect the daily lives of patients with JIA or this situation may be due to the small number of children and adolescents with JIA in the sample.

Pain, fatigue, fear-avoidance beliefs, and psychosocial effects resulting from the chronic process and systemic effects of the disease occurring in rheumatological diseases need to be evaluated. Sontichai et al²⁹ examined the relationship between disease activity and functionality in children/adolescents with JIA. The results of the study showed that there was a good correlation between CHAQ and JADAS-27 in all JIA subtypes when the disease was active. There was a poor correlation between CHAQ and JADAS-27 when the disease was inactive. According to the researchers, the CHAQ is effective only for assessing functional ability when the disease is active. In the present study, disease activity was associated with functional level and child and clinician psychosocial status, but not with MET, energy expenditure and family psychosocial status. These results showed that the disease affects the psychosocial status of the child as well as functional outcomes. In addition, the fact that child and clinician scores are associated with disease activity but not with family scores may be due to families being more protective of their children and feeling more anxious and afraid of the disease. Additionally, disease activity was not associated with MET and energy expenditure, implying that energy metabolism might be independent of JIA-associated systemic inflammation.

Strengths and Limitations

The present study had some limitations. All of the assessment methods are self-reported measures. The physical activity assessment method (1-day activity diary) is subjective and may introduce recall bias. An important limitation of the present study is that physical activity could not be assessed with objective measures such as accelerometry. Another limitation was not asking participants about their physical activity and regular exercise habits at the beginning. Disease severity, medication use, socioeconomic status, etc. are confounding variables. The third limitation is that the JIA patients in the study were heterogeneous in terms of these variables and could not be controlled. These may have affected the results. The fourth limitation is the small sample size and the fifth limitation is lack of longitudinal data. Despite these limitations, this study adds to the limited body of research examining physical activity levels and psychosocial outcomes together in children and adolescents with JIA, highlighting important relationships between disease activity, functionality, and psychosocial status. Also, the study provides clinically meaningful insights by showing that disease management in JIA should not only focus on physical symptoms but also address psychosocial well-being and developmental aspects.

Conclusion

Compared to healthy controls, children/adolescents with JIA had lower body composition and poorer functionality. In the clinic, body composition assessment and follow-up can be performed so that children and adolescents with JIA do not fall behind in their development. Function-oriented approaches can be adopted in treatment and rehabilitation. Although fatigue levels of children/adolescents with JIA were higher and their MET and energy expenditure was lower than healthy controls, there was no significant difference. Although larger samples are needed for more analysis of these parameters, it can be kept in mind in the clinic that fatigue and PALS may be low. Disease activity was associated with functionality, child and clinician

psychosocial status, but not with physical activity parameters and family psychosocial status. As the disease activity increases, the functionality of these children/adolescents decreases and they may be affected more psychosocially. Precautions can be taken in the management of the disease.

Future studies are needed to track the physical activity of children/adolescents with JIA in larger samples using objective methods and longitudinal designs.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of Pamukkale University (Approval no: 60116787-020-237104; Date: 26.07.2022)

Informed Consent: Verbal informed consent was obtained from the guardians of the children/adolescents.

Peer-review: Externally peer-reviewed.

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