

REGULAR ARTICLE

Participation in leisure activities and sensory modulation deficiencies of children with atopic dermatitis

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ABSTRACT

Aim: To examine whether the complexity of atopic dermatitis (AD) symptoms and the sensory modulation deficiencies (SMD) that accompany it may limit child's preference to participate in leisure activities.

Methods: Thirty-seven children diagnosed with AD and 104 healthy peers aged 6–11 years participated in this study. Disease severity was assessed using SCORAD scores. Both groups were compared in regard to their sensory modulation abilities measured by the 'Short Sensory Profile' (SSP) and in regard to their activity preference measured by the 'Preference for Activities of Children' (PAC).

Results: Children with AD showed lower preference to participate in leisure activities as compared with healthy peers ($F = 4.63$, $p < 0.0001$). Among children with AD, significant correlations were found between SMD in several modalities and preference to participate in specific leisure activities. No significant correlations were found between AD severity and the child's preferred activities.

Conclusions: Children with AD may show lower preference to participate in activities in comparison with their typical peers. This lower preference may be impacted by their SMD. Multidisciplinary intervention may be beneficial for children with AD. This intervention should refer to AD symptoms and considers the child's sensory profile and participation in daily living.

INTRODUCTION

The complexity of atopic dermatitis (AD) symptoms, combined with the chronic nature of the disease, greatly impacts the child's functioning and may result in a limited participation in daily living. While most studies on AD focus on the physiological aspects of the disease, there is a lack of information regarding the participation patterns of children with this condition (1–3).

The concept of participation is becoming increasingly important in the field of childhood disability (4). The World Health Organization's (5) International Classification of Functioning, Disability and Health defines participation as 'involvement in life situations'. Participation leads to life satisfaction, health, well-being and to a sense of competence. Thus, it is essential for child's psychological, emotional and skill development (6–9). One of the major determinants of participation in leisure and recreation activities is individual preferences or interests (10,11).

Recently, Engel-Yeger et al. reported that one of the characteristics of children with AD is their sensory modulation dysfunction, mainly expressed in sensory hypersensitivity. Sensory modulation dysfunction (SMD) is a disorder of the ability to regulate and organize the degree, intensity and

nature of response to sensory input in a graded and adaptive manner (12). Hypersensitivity, which results from a low threshold to sensory stimuli, is expressed in 'fight or flight' responses to input that would typically be considered harmless or non-noxious (13–15).

Parham and Mailloux (16) claim that impairments in sensory modulation may lead to deficits in daily life skills, in play, decrease social skills, lead to impaired self-confidence and thus, may limit participation. This underscores the necessity to elaborate the knowledge about the relationship between SMD and domains of participation, as the preference to participate in activities (17).

The prevalence of AD in children and the resulting functional difficulties in a range of environments such as home

Key notes

- AD may limit child's participation in leisure activities.
- Sensory modulation deficiencies may contribute to the limited participation.
- Intervention should refer to the child's sensory profile and participation.

and school strengthens the need to examine the way AD impacts child's participation in daily leisure activities. This knowledge, especially when based on child's self-report, may encourage the use of appropriate interventions, directed to the child's needs and interests and thus enhance child's optimal participation in daily environments and elevate his/her well-being.

This study aims to (i) examine whether differences in preference to participate in leisure activities exist between children with AD and typical peers (ii) provide an additional perspective to the previous report by Engel-Yeger et al. by examining whether the preference to participate in certain activities among children with AD is influenced by their SMD and AD severity.

METHODS

Participants

Power analysis was calculated according to medium-large size effect, probability of 0.05 and power of 0.8. This calculation revealed a total sample size of 66 participants (33 participants for each group). One hundred and forty-one children, aged 6–11 years, participated in this study. The study group consisted of 37 children (14 boys and 23 girls) with AD without asthma or allergic rhinitis. Their mean age was 7.52 ± 1.61 years. The study group was recruited from the Pediatric Dermatology Clinic at Haemeq Hospital in Afula or the Allergy Clinic of Bnai-Zion Hospital, Israel. The control group included 104 healthy children, 48 boys and 56 girls. This large sample size of the control group resulted from the need to characterize the sensory modulation abilities and the features of preference to participate in leisure activities of typical healthy children. The mean age of the control group was 7.75 ± 1.28 years. None of the children in the control group suffered from AD, other allergies or other chronic diseases. The controls were recruited through an advertisement that was posted in several neighbourhoods in the north of Israel. The advertisement invited children and parents to participate in a study about sensations and preference to participate in leisure activities.

Instruments

- 1 Severity of AD was assessed using the objective Severity Scoring of Atopic Dermatitis (SCORAD), a validated tool assessing the extent and intensity of clinical signs with subjective symptoms (18).
- 2 The sensory modulation abilities were assessed using the Short Sensory Profile (SSP), which is a reliable and valid parent-report measure of functional behaviours associated with abnormal responses to sensory stimuli (19). The SSP contains seven sections that evaluate sensory function with regard to a range of sensory modalities including tactile sensitivity (for example: 'prefers long sleeved clothing'), taste/smell sensitivity (for example: 'avoids certain tastes'), sensitivity to movement (for example: 'fears falling or heights'), visual/auditory sensitivity (for example:

'holds hands over ears to protect ears from sound') and auditory filtering (for example: 'can't work with background noise'). The consequences of sensory function as they are expressed in low energy (for example: 'poor endurance/tires easily') or sensation seeking behaviours (for example: 'seeks all kinds of movement and this interferes with daily routines') are also assessed. The possible range of raw scores on the total scale is 38 to 190, with higher scores (155–190) reflecting normal performance. This range indicates that the child performs better than the lower 16% of the research sample of children (19). A score between 142 and 154 reflects a probable difference in performance. This range indicates the child's performance is between the 2nd and 16th percentile (19). A score between 38 and 141 reflects a definite difference in performance. This range indicates the child's performance is in the lowest 2nd percentile (19,20).

- 3 Preference to participate in leisure activities was assessed by the 'Preference for Activities of Children' (PAC) (21). This instrument evaluates the preference for participating in activities outside mandated school activities. The PAC evaluates which activities the child/youth prefers to perform, regardless of whether the activities are actually performed. Each activity is presented on a card with a drawing of the activity and a phrase (in words) describing it. The version used in this study contains 49 items. There are scores for five activity types, derived through factor analysis of participation preference data: recreational, active physical, social, skill-based and self-improvement/educational scales. In addition, there are two evaluated domains that include formal and informal activities – 14 items are included in the formal domain which consists of structured activities that involve rules or goals and that have a formally designated coach, leader or instructor (e.g. taking art lessons, learning to dance, swimming, getting extra help for schoolwork from a tutor). Thirty-five items are included in the informal domain, which includes activities that have little or no planning and are often initiated by oneself (e.g. reading, hanging out, going to a party). The PAC cards are sorted into three piles according to how much the child prefers to do the activity, as follows: (i) really likes to do; (ii) sort of likes to do; and (iii) does not like to do the activity. Mean scores ranging from 1 to 3 are calculated for each activity type, each domain and for the PAC total score. Preliminary assessments of the PAC have demonstrated sufficient internal consistency, test-retest reliability and validity (21).

Procedure

After receiving approval from the ethics committee of Haemeq Medical Center, the parents of all children filled out a consent form approving their child's participation in the study. Each participant of the study group underwent a general physical examination as well as a dermatological

examination. Parents were asked to fill out the SSP. The children reported their PAC answers to an occupational therapist while sitting in a quiet room. A home meeting was arranged with the parents of the control participants. The health status of the control participants was based on parent report. Parents of children who met the inclusion criteria were asked to complete the SSP. At the same time, the controls reported their PAC answers to an occupational therapist while sitting in another room.

Data analysis

A multivariate analysis of variance (MANOVA) with a General Linear Model was used to test the significance of differences between the groups in regard to each section of the SSP and each scale of the PAC (mean scores of each activity type, two mean scores of the formal and informal domains). *T*-tests were performed to examine the differences between the groups in the total PAC score and total SSP score. Pearson correlation tests were used to evaluate the correlations between PAC scores and sensory scores as well as between PAC scores and SCORAD scores.

Probabilities below 0.05 were considered significant.

RESULTS

Verifying differences in sensory modulation abilities between groups:

Significant difference was found between the groups in general ($F_{7, 131} = 3.89$, $p = 0.001$). Children with AD showed sensory modulation disorders, as expressed in their lower SSP total score (mean = 150.29 ± 28.91 vs. mean of controls = 166.2 ± 16.52) ($t = 3.17$, $p = 0.003$) and lower scores in most SSP sections (Table 1).

Comparison of daily activity preferences between groups

A significant difference was found between the groups in their preference to participate in leisure activities ($F_{7, 100} = 4.63$, $p < 0.0001$). Based on PAC scales, children with AD showed a significantly lower preference to participate in active physical activities, skill-based activities as well as in the formal domain than the controls (Table 2). No significant difference was found between the groups in the PAC total mean score.

Table 1 Comparison of SSP sum-scores in both groups

SSP sections	AD (n = 37)		Controls (n = 104)		F
	Mean	SD	Mean	SD	
Tactile sensitivity	27.13	6.99	31.02	4.03	17.76***
Taste/smell sensitivity	14.19	5.54	16.52	3.48	12.44**
Movement sensitivity	13.41	2.45	13.72	1.71	0.875
Under-responsive/seek sensation	26.16	6.64	29.24	4.38	11.41**
Auditory filtering	23.21	5.17	25.36	3.57	9.74**
Low energy/weak	26.43	4.27	27.69	3.12	4.76*
Visual/auditory sensitivity	19.75	5.46	22.64	2.8	19.36***

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

AD, atopic dermatitis.

Table 2 Comparison of PAC scores in both groups

PAC scales	AD (n = 37)		Controls (n = 104)		F
	Mean	SD	Mean	SD	
Formal domain	1.93	0.51	1.75	0.36	4.59*
Informal domain	1.51	0.3	1.51	0.23	0.006
Recreational activities	1.45	0.32	1.46	0.28	0.023
Active physical activities	1.75	0.51	1.56	0.38	4.51*
Social activities	1.41	0.43	1.34	0.25	0.905
Skill-based activities	1.91	0.54	1.69	0.41	6.44*
Self-improvement activities	1.78	0.43	1.83	0.4	0.314

* $p \leq 0.05$.

AD, atopic dermatitis; PAC, preference for activities of children.

Correlations between sensory abilities and preference to participate in leisure activities among children with AD

Within the study group, significant positive correlations were found between the following SSP scores and preference to participate in recreational activities: under-responsive/sensory seeking ($r = 0.433$; $p = 0.021$) (Fig. 1); auditory filtering ($r = 0.418$; $p = 0.027$) (Fig. 2);

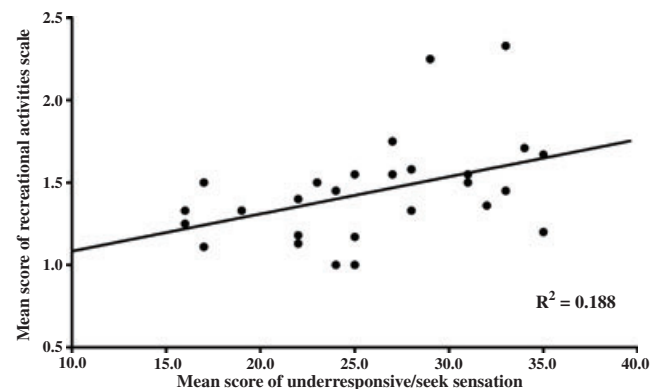


Figure 1 The correlation between mean score of under responsive/seek sensation and preference of children with atopic dermatitis to participate in recreational activities.

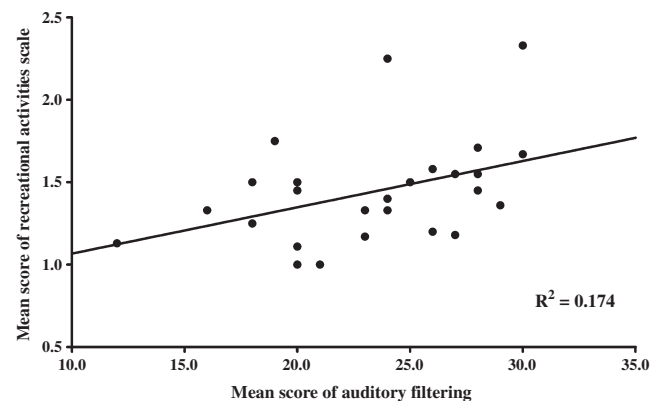


Figure 2 The correlation between mean score of auditory filtering and preference of children with atopic dermatitis to participate in recreational activities.

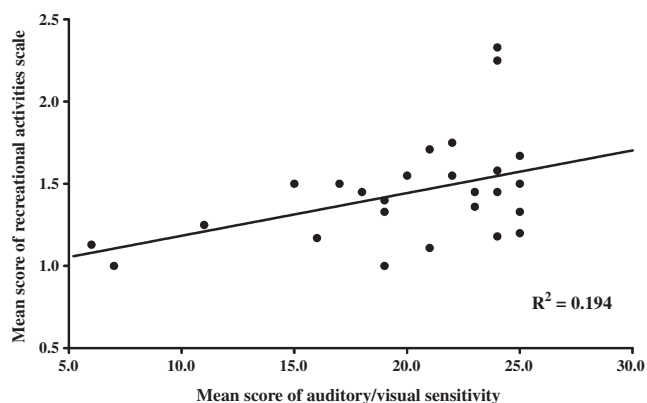


Figure 3 The correlation between mean score of auditory/visual sensitivity and preference of children with atopic dermatitis to participate in recreational activities.

visual/auditory sensitivity ($r = 0.44$; $p = 0.019$) (see Fig. 3); and total SSP score ($r = 0.381$, $p = 0.046$). This means that children with more sensory modulation disorders showed greater preference for participating in recreational activities.

Correlations between AD severity and the PAC scale scores among children with AD

Within the study group, no significant correlations were found between AD severity as measured by SCORAD and the PAC scale scores.

DISCUSSION

Similarly to previous report, this study verified that SMD, mainly expressed by sensory hypersensitivity, may characterize children with AD (10). In this study, the standard deviations of SSP scores in the AD group were larger in comparison with the controls. It may express variability in the sensory profile of children with AD. Some may have typical sensory processing abilities, while others may have SMD, manifested in different severities.

This study also found that children with AD express different preferences to participate in leisure activities as compared with their healthy peers. The negative effects of AD on children's leisure activities were previously reported (22). This study adds to this information by referring to specific domains of children's leisure activities, as measured by the PAC. As was noted elsewhere, participation leads to life satisfaction. As it is important for physicians to understand the main factors influencing patient satisfaction, the aspect of participation should receive growing attention among physicians and other health professionals. Obtaining additional information about the impacts of AD on the activities that the child prefers to participate in, may improve compliance and contribute to better treatment outcomes of treatment (23,24).

The lower preference of children with AD to participate in specific activities may result from characteristics of AD. For example, skill-based activities include items such as art

lessons, doing gymnastics, playing a musical instrument. These activities involve intensive stimulation to the skin that may be uncomfortable to children with AD. Physical activities include items as follows: doing water sports, doing martial arts, racing or track and field. The discomfort that accompanies the skin inflammations of children with AD might cause them to less prefer activities, which may irritate their skin and enhance their pain (2). Children with AD may also show lower preference to participate in activities included in the formal domain, such as doing martial arts; doing gymnastics; doing team sports, because they have less control on these structured activities that involve rules and specific goals.

Finally, this study illuminated the relationships between SMD of children with AD and their preference to participate in leisure activities. The higher preference for participating in recreational activities was positively correlated with greater difficulties in filtering auditory input, higher visual/auditory sensitivity and higher sensory seeking scores. Recreational activities include items such as doing puzzles, doing crafts, drawing, playing computer or video games and watching TV. These relatively quiet activities do not provide intense auditory or visual sensory input. These activities do not necessarily involve other people, and they may be performed alone. Thus, the child may master the degree of sensory stimuli in these activities (the number of pieces in the puzzle, the kind of picture of the puzzle, the kind of video game to choose the loudness of this game, etc).

The findings of this study suggest that the SMD of children with AD may contribute to the impacts of AD itself on their participation patterns. This information strengthens the previous reports that emphasize that deficits in sensory modulation abilities may interfere with the ability to interact with objects and people and reflect the complicated outcomes of the relationship between sensory modulation abilities and participation in different environments (25). It is important to further examine the relationship between these factors in research and in practice. This examination should also relate to transitional stages such as when the child enters day care or a school environment, in which impacts of sensory modulation abilities on participation and activity preference may be enhanced (26). Evaluation of patterns of participation in leisure activities may contribute to the low quality of life that children with AD may experience (27–30). Using a self-report, as the PAC, specifically among children, may assist in intervention goal setting, in which the PAC may provide guidelines for selecting therapeutic activities that are more meaningful to the child and thus achieve better outcomes. Moreover, the medical treatments for AD that focuses mainly on symptom reduction, with its limited benefits and side effects, raise the pressing need to improve the quality of care that children with AD receive (3,31,32). As participation is considered to be a key outcome of rehabilitation with the aim of assisting children and families to adapt to the challenges they face, for children with AD and their families (33). The issue of participation urgently requires more attention in research and intervention with

children with AD. Elaborating the knowledge about the possible relationship between SMD and participation among children with AD may assist families understand why their children choose specific activities. This may also assist in developing intervention that will support the child and the family in understanding that participation in specific activities is acceptable.

Interestingly, AD severity, as measured by SCORAD, was not correlated with activity preference. In the study by Engel-Yeger et al. (12), no significant correlation was found between the SCORAD index scores and the level of sensory hypersensitivity. The authors noted that SCORAD was measured in a specific time period, which may not accurately reflect the nature of the disease. This explanation may also be also relevant for this study. In addition, it is possible that the existence of the AD impacts the child's participation patterns and not necessarily its severity. However, this correlation should be further examined in studies on larger samples. This study had some limitations: first, it is based on a relatively small size of participants with AD. These participants were not selected randomly but were recruited from specific clinics for allergies. These limitations should be considered when generalizing the results. Additional studies, with larger sizes of participants with AD, should be performed to strengthen the results.

This study highlights the need for multidisciplinary intervention programs for children with AD, focusing on treating AD symptoms and also consider possible factors that may influence child's function and participation in leisure activities, as child's sensory modulation abilities. Intervention should focus on removing barriers to active involvement and participation in leisure activities, for example by adjusting the optimal environment that would not be overloaded in sensory stimuli, and will enable the participation of children with AD in activities similarly to their friends.

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