

Sport Club Participation of Adolescents With Asthma: Maternal Factors and Adolescent Cognitions

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Summary. Rationale: Sport participation is especially important for patients with asthma in that it decreases psychosocial and physiological problems associated with inactivity. However, adolescents with asthma seem to participate less in sports compared to their non-asthmatic peers. The current study tested the direct associations between maternal sport-specific factors and sport club participation of early adolescents with asthma and the indirect effect through adolescent's sport-specific cognitions. Methods: During home visits, 261 adolescents (aged 10–15) completed questionnaires about self-efficacy, beliefs regarding sport participation, and their actual sport club participation. Their mothers reported their sport-specific support, beliefs about offspring's and own sport participation, their own levels of physical activity, and their self-efficacy to stimulate offspring to participate in sports. Path analyses were used to examine the direct and indirect associations of maternal sport-specific factors with adolescents sport club participation via adolescent sport-specific cognitions. Results: Analyses showed that maternal sport-specific support ($\beta = 0.20$, $P = 0.007$) and self-efficacy to stimulate offspring to participate in sports ($\beta = 0.20$, $P = 0.027$) related positively to adolescents' sport club participation. Adolescents' self-efficacy (indirect effect = 0.09, SE = 3.01, $P < 0.001$) mediated the positive relation between maternal self-efficacy to stimulate offspring to participate in sport and adolescents' participation in sport clubs. Conclusion: Maternal sport-specific factors related to adolescents' sport club participation directly and indirectly through adolescents' sport-specific cognitions. Intervention programs should focus on maternal sport-specific support and self-efficacy and adolescents' self-efficacy to increase sport participation of adolescents with asthma. **Pediatr Pulmonol.**

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INTRODUCTION STATEMENT

The aim of the present study was to examine the direct associations between maternal sport-specific factors and sport club participation of early adolescents with asthma and the indirect effect through adolescents' sport-specific cognitions. We found that maternal sport-specific support and self-efficacy to stimulate offspring to participate in sports did relate positively to adolescents' participation in sport clubs and that adolescents' self-efficacy mediated the positive relation between maternal self-efficacy to

stimulate offspring to participate in sport and adolescents' sport clubs participation.

INTRODUCTION

Asthma is the most common chronic disease in childhood.¹ It is characterized by inflammation of the airways that causes recurrent attacks of breathlessness and wheezing. Although many psychosocial (e.g., disrupted family lives, lower quality of life) and physiological problems (e.g., overweight, breathlessness)

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are associated with asthma in adolescence, one important problem is a relatively low level of physical activity.^{2,3} This inability to participate in physical activities is negatively associated not only with reduced pulmonary functioning,^{4,5} but also with reduced quality of life.⁴ Thus, participation in physical activities is pivotal for adolescents with asthma. In the present study, we will focus on sport club participation because regular and vigorous activities (such as in sport clubs) are associated with better physiological functioning and wellbeing in adolescents.^{6,7}

Studies with healthy early adolescents have shown that parents have a profound influence on sport and physical activity of their offspring. Supportive factors, such as more encouragement, facilitation, and transportation,^{8–12} as well as more positive parental beliefs about sport participation and physical activities for their offspring^{11,12} are associated with more adolescents' physical activity and sport participation. Other parental factors that might relate to healthy early adolescents' sport activity are parental beliefs about their offspring's and their own sport activity. It has been shown that parental beliefs regarding their offspring's sport activity, especially perceptions of competence and task orientation, related significantly to the amount of healthy early adolescents' moderate-to-vigorous physical activity.¹³ Current research provides mixed results on the role of parental own physical activity on healthy adolescents' physical activity. Another possible factor associated with adolescents' sport activity could be parental self-efficacy to stimulate their offspring to participate in sport. When parents feel more able to stimulate their offspring to be active in sports, adolescents are more active in sports.¹⁴

Thus, in healthy early adolescent populations, there is an indication that parental sport-specific support, parental beliefs about their offspring's sport activity, beliefs about parents' own sport activity, parental physical activity, and parental self-efficacy relate to adolescents' sport and physical activity. Surprisingly, given the increased importance of sport participation of asthma patients, only few studies have examined the role of parents in physical activity and sport participation of adolescents with asthma. For adolescents with asthma, more sport-specific parental support, like encouragement and facilitation,^{15,16} as well as more positive parental beliefs about the relevance of physical activity for early adolescents^{17,18} were associated with more physical activity of adolescents with asthma. However, little is known about the effect of other parental sport-specific factors on the participation of adolescents with asthma in sport clubs. Because both adolescents with asthma and their parents see asthma as a barrier to exercise,¹⁹ the results obtained with healthy adolescents cannot be generalized to adolescents with asthma. In addition, to better understand the mechanisms underlying the relation

between parental sport-specific factors and sport club participation of early adolescents with asthma, it is relevant to examine factors which could (partly) explain this relation. Welk et al.¹² introduced a model where parental factors influence the healthy offspring's physical activity not only directly but also indirectly through early adolescents' attraction to physical activity (e.g., liking exercise, importance of exercise) or perceived competence. Accordingly, adolescents' beliefs about physical activity and self-efficacy could mediate the relation between parental factors and sport club participation of early adolescents with asthma. In the present study, we aimed to test the direct role of maternal sport-specific factors (i.e., sport-specific support, maternal beliefs about their offspring's and their own sport activity, mothers' own physical activity, and maternal self-efficacy to stimulate their offspring to participate in sport clubs) in sport club participation of early adolescents with asthma as well as the indirect effect via early adolescents' sport-specific cognitions (adolescents' beliefs about participation in sports and adolescents' self-efficacy to participate in sport clubs). We proposed that adolescents with asthma would participate in sport clubs more if their mothers supported them more, if the mothers had more positive beliefs about sport participation of adolescents with asthma as well as of themselves, if mothers participated more in physical activities themselves, and if mothers had high levels of self-efficacy to motivate their adolescent with asthma to participate in sport clubs. Furthermore, we expected that higher levels of adolescent self-efficacy and more positive beliefs about sport activity would explain these positive relations at least partially.

MATERIALS AND METHODS

Procedure

The protocol of the study was approved by the ethics committee of the Faculty of Social Sciences of the Radboud University Nijmegen. A sample of primary ($n=334$) and secondary schools ($n=159$) in the Netherlands received a letter explaining the purpose and procedure of this study. Two weeks later, we contacted schools via telephone. A total of 213 (63.8%) primary schools and 73 (45.9%) secondary schools agreed to participate in this study. The main reason for schools to refuse participation was their involvement in other studies. Next, research assistants distributed letters ($n=41,000$), which provided information about asthma in general, the purpose and procedure of the study, the incentive families would get, and how to sign up, to the interested schools, which subsequently circulated these letters to seventh and eighth graders in primary schools or first graders in secondary schools. Pupils were asked to give the letter to their parents. In addition to approaching schools, an announcement of the study was published in

the magazine of the Lung Foundation Netherlands to recruit participants.

Interested adolescents and their parents were able to register using a digital or paper application form. The families were included if the adolescent met the following criteria: (1) diagnosed with asthma by a physician (2) using asthma medication or experiencing asthma-related symptoms at least once in the last 12 months, and (3) having adequate Dutch language skills. Of the 311 families that signed up, four families applied via the magazine of the Lung Foundation Netherlands. In total, 261 families (83.9%) met the inclusion criteria, 4 families (1.2%) cancelled for different reasons, and 46 families (14.8%) did not meet the criteria. Of those 46 families that did not meet the inclusion criteria, 45 (98%) were excluded because the adolescent did not have current (diagnosed) asthma, 1 family was excluded because the adolescent's age was an outlier (18 years).

All participating families were visited at home where, after brief instructions and the guarantee of anonymity, adolescents and their mothers filled out informed consent forms and completed questionnaires. During the questionnaire administration, they could ask questions if something was unclear. Additionally, mother's and adolescent's weight and height were objectively measured. The visits took between 1 and 1.5 hr. Participating families received a 20 voucher for participating.

Measures

Maternal Sport-Specific Support. Four items from the Dutch Sport-Specific Parental Support Scale (e.g., "How often do you watch your child participate in sports?")²⁰ and two items from Davison et al.⁹ ("How often does your family use sport/physical activity as a form of familial recreation, e.g., going on bike rides together, hiking, ice skating?" and "How much do you use your own behavior to encourage your offspring to be physically active/participate in sports?") were used to assess maternal support. Mothers were asked to report on a 5-point Likert scale ranging from (1) never, almost never to (5) every day, almost every day. Cronbach's α of the six items was 0.63.

Maternal Beliefs About Offspring's Participation in Sport. Maternal beliefs were assessed using 12 items from the Attitude towards Sport Scale.²⁰ Mothers completed questions about their beliefs about sport for their offspring (e.g., "When your child participates in sports, he/she has fun with his/her friends"). The responses were measured on a 5-point Likert scale ranging from (1) I do not agree at all to (5) I completely agree (Cronbach's $\alpha = 0.75$).

Maternal Beliefs About Own Participation in Sport. Thirteen items on the Beliefs about Sport Scale²⁰ assessed maternal beliefs (e.g., "When I participate in sports, I become stronger"), and answers were measured on a 5-point Likert scale ranging from (1) I do not agree at all to (5) I completely agree (Cronbach's $\alpha = 0.78$).

Maternal Physical Activity. One item assessed participation in physical activities in daily life (i.e., "I participate in physical activities like running, cycling (not in a sport club)") and one item assessed participation in sport clubs (i.e., "Do you participate in a sport club?").²⁰ These questions were combined. Mothers who neither participated in physical activity nor participated in sport clubs were categorized as non-active (0) and parents who were either active in daily life or in sport clubs were categorized as active (1).

Maternal Self-Efficacy to Stimulate to Participate in Sport. Maternal self-efficacy was assessed with seven questions (e.g., "Do you find it easy or difficult to stimulate your child to participate in sports when you do not have much time?").²⁰ The responses were measured on a 5-point Likert scale ranging from (1) very hard to (5) very easy. Higher scores indicated higher levels of self-efficacy (Cronbach's $\alpha = 0.92$).

Adolescents' Self-Efficacy. Self-efficacy was measured with eight items (e.g., "Do you find it difficult or easy to participate in sport when there is a nice program on television?") from the Self-Efficacy Scale,²⁰ and the responses were measured on a 5-point Likert scale ranging from (1) very hard to (5) very easy (Cronbach's $\alpha = 0.78$).

Adolescent's Beliefs About Sport Participation. The beliefs of the adolescents were assessed with 14 items (e.g., "When I participate in sports, I have fun with my friends"), from the Attitude Towards Sport Scale.²⁰ The responses were measured on a 5-point Likert scale ranging from (1) I do not agree at all to (5) I completely agree (Cronbach's $\alpha = 0.74$).

Adolescent' Participation in Sport Clubs. To administer adolescents sport club participation, the adolescents with asthma could write down three sports in which they participated at a sport club and indicate the frequency with which they engaged in these activities weekly. To calculate adolescents' sport club participation, MET-scores, from the Compendium of Physical Activities,²¹ for each sport, which were then multiplied by the frequency with which the adolescents participated in this sport.

Control Variables. Control variables were mothers' educational level and country of birth (the Netherlands vs. elsewhere), and adolescents' gender, age, body mass index (BMI), and asthma severity. Mothers reported asthma severity using the Functional Severity Scale²² (Cronbach's $\alpha = 0.78$). BMI of the mothers was not included as covariates, because low correlations, and non-significant relations with the study variables in the initial model.

Statistical Analyses

SPSS for Windows 19 was used to calculate the descriptive statistics (means and standard deviations) and Pearson correlations. Subsequently, path analysis in

MPLUS version 5 was conducted to examine the direct and indirect relations between maternal sport-specific factors and adolescent's participation in sport clubs. Structural equation modeling (SEM) was used, because SEM allows multiple mediators and it can handle skewed data. All path analyses were controlled for adolescent gender, age, BMI, and asthma severity, mother's country of birth, and mothers' educational level. First, a model with direct paths between maternal sport-specific factors and adolescents' participation in sport clubs was examined. Next, the mediating effect of adolescents' self-efficacy and beliefs about sport participation in the relation between maternal sport-specific factors and adolescent's participation in sport clubs were tested using bootstrapped (5000) standard errors. Model fit was evaluated by examining: (a) root-mean square error of approximation (RMSEA), (b) comparative fit index (CFI). Preferably, RMSEA values should be ≤ 0.05 and CFI values should be 0.90 or higher.²³ Additionally, the chi-squared value, degrees of freedom, and the *P*-value of the model are reported. Associations between variables were evaluated based on standardized regression weights (β 's) and *P*-values ($P < 0.05$). Missing values for predictor variables were substituted in MPLUS using full information maximum-likelihood estimation (FIML).

RESULTS

Sample Characteristics

A total of 261 mother–adolescent dyads were included in this study. Our data included also one family where no mother was available and only the father participated, but this family was excluded from the analyses. Of the 261 families that were included in this study, 72% of the fathers also completed the questionnaires. Because only 72% of the fathers participated we focused on mothers in the analyses of the current study. There were slightly more male adolescents. Adolescent mean age was 11.9 and they suffered from asthma for 7.3 years on average. Most participants were born in the Netherlands and 41 adolescents did not participate in a sport club, where 220 adolescents did participate in one or more sport clubs. More than half of the adolescents had partly controlled asthma, which was based on the Global Initiative for Asthma (GINA) guidelines.²⁴ Most mothers were of Dutch origin and the mean age of the mothers was 44.2. Most mothers received higher education (Table 1).

Intercorrelations

Table 2 represents the intercorrelations, means and standard deviations of the model variables. Bivariate associations showed that adolescents' participation in sport clubs related to maternal sport-specific support, beliefs about offspring's sport participation, maternal self-efficacy to stimulate her offspring to participate in

TABLE 1—Demographic Characteristics of Adolescents and Their Mothers (n = 261)

	Adolescent	Mother
Mean age ^a	11.9 (1.0)	44.2 (4.4)
BMI ^a	18.7 (2.9)	25.7 (4.5)
Mean years asthma ^a	7.3 (3.9)	
Gender ^b		
Male	155 (59.4%)	
Female	106 (40.6%)	
Sport club participation ^b		
No sport club	41 (15.7%)	
One sport club	166 (63.6%)	
Two sport clubs	39 (14.9%)	
Three sport clubs	15 (5.8%)	
Country of birth ^b		
The Netherlands	246 (98.0%)	238 (91.2%)
Other	5 (2.0%)	23 (8.8%)
School adolescent ^b		
Primary	122 (48.0%)	
Secondary	132 (52.0%)	
Education parent ^{b,*}		
Lower		26 (10.0%)
Intermediate		103 (39.8%)
Higher		130 (50.2%)
Asthma control ^{b,c}		
Controlled	45 (17.2%)	
Partly controlled	150 (57.5%)	
Uncontrolled	66 (25.3%)	

Lower = elementary, lower vocational; intermediate = intermediate general, intermediate vocational; higher = higher general, higher vocational, university.

^aThe mean and standard deviation.

^bNumbers and percentage.

^cAccording to the GINA.²⁴

*Parental education.

sport, and adolescents' self-efficacy and beliefs about participation in sports.

Path Analyses

Path analyses were used to evaluate direct and indirect associations among study variables. Both the direct and indirect model were saturated, thus the chi-squared test of model fit, as well as the CFI, RMSEA, all showed perfect fit. The direct model (Table 3) showed significant paths of maternal support ($\beta = 0.21$, $P < 0.001$) and her self-efficacy to stimulate offspring to participate in sport ($\beta = 0.26$, $P < 0.001$) with adolescents' participation in sport clubs. This indicated that more maternal support and self-efficacy to stimulate offspring to participate in sport related with more adolescent participation in sport clubs. This model accounted for 19.5% of the variance in sport club participation.

The indirect model (Table 4) accounted for 25.2% of the variance in participation in sport clubs of the adolescents with asthma. Higher maternal support, higher self-efficacy in being able to stimulate offspring to

TABLE 2—Descriptive Statistics and Intercorrelations Among Model Variables

	1	2	3	4	5	6	7	8
Mother variables								
1. Sport-specific support	—							
2. Belief about offspring's sport participation	0.08	—						
3. Beliefs about own sport participation	0.20**	0.46***	—					
4. Own physical activity	0.15*	0.06	0.31***	—				
5. Self-efficacy to stimulate offspring to participate in sport	0.18**	0.44***	0.24***	0.04	—			
Adolescent variables								
6. Beliefs about sport participation	0.11	0.25***	0.09	0.04	0.21**	—		
7. Self-efficacy	0.14*	0.23***	0.04	0.00	0.38***	0.28***	—	
8. Sport club participation	0.25***	0.21**	0.09	−0.04	0.36***	0.13*	0.38***	—
Mean	2.12	4.23	3.94	0.87	4.00	3.98	3.17	17.16
Standard deviation	0.68	0.43	0.47	0.33	0.79	0.47	0.73	14.67

* $P < 0.05$.** $P < 0.01$.*** $P < 0.001$.

participate in sport, and higher adolescent self-efficacy were associated with adolescents' increased participation in sport clubs. Moreover, maternal self-efficacy in being able to stimulate her offspring to participate in sport related significantly to higher adolescent's self-efficacy.

The results showed that adolescent's self-efficacy significantly mediated the effect of maternal self-efficacy on adolescents' participation in sport clubs (indirect effect = 0.09, SE = 3.01, $P < 0.001$). Adolescent's self-efficacy can explain, at least partly, the relation between mother's self-efficacy in being able to stimulate offspring to participate in sport and adolescent's engagement in sport clubs. Adolescents' beliefs about sport activity did not mediate the relations between sport-specific maternal factors and adolescents' participation in sport clubs.

DISCUSSION

The aim of the present study was to examine the relations between maternal sport-specific factors and sport club participation of early adolescents with asthma, the mediating effect of adolescents' beliefs on sport participation, and their self-efficacy to participate in sports. Path analyses showed that mother's support and

TABLE 4—Standardized Regression Weights (β 's) and Significance of the Paths in the Indirect Model Testing the Relation Between Maternal Sport-Specific Factors and Sport Club Participation of Adolescents With Asthma, via Adolescents Self-Efficacy and Beliefs About Sport Participation

	β	P
Sport club participation adolescent ^a		
Maternal sport-specific support	0.20	0.009
Maternal beliefs about offspring's participation in sport	0.05	0.515
Maternal beliefs about own participation in sport	−0.01	0.929
Maternal physical activity	−0.09	0.177
Maternal self-efficacy	0.17	0.049
Adolescents' self-efficacy	0.28	<0.001
Adolescents' beliefs about sport participation	−0.03	0.639
Self-efficacy adolescent ^b		
Maternal sport-specific support	0.11	0.121
Maternal beliefs about offspring's participation in sport	−0.08	0.303
Maternal beliefs about own participation in sport	−0.08	0.262
Maternal physical activity	−0.01	0.946
Maternal self-efficacy	0.35	<0.001
Beliefs adolescent ^c		
Maternal sport-specific support	0.11	0.082
Maternal beliefs about offspring's participation in sport	0.21	0.006
Maternal beliefs about own participation in sport	−0.07	0.311
Maternal physical activity	0.04	0.629
Maternal self-efficacy	0.12	0.116

This table shows the relations between superscript "a" maternal sport-specific parenting variables and adolescent variables with sport club participation of the adolescents with asthma, superscript "b" maternal sport-specific parenting variables with adolescents' self-efficacy, and superscript "c" maternal sport-specific parenting variables with adolescents' beliefs about sport participation.

TABLE 3—Direct Relations Between Maternal Sport-Specific Factors and Sport Club Participation of Adolescents With Asthma

Relation	β	P
Maternal sport-specific support	0.21	<0.001
Maternal beliefs about offspring's participation in sport	0.06	0.380
Maternal beliefs about own participation in sport	−0.03	0.713
Maternal physical activity	−0.10	0.133
Maternal self-efficacy	0.26	<0.001

self-efficacy to stimulate her offspring to participate in sport related positively to adolescents' sport club participation. Moreover, the results revealed a mediating effect of adolescents' self-efficacy on the positive relation between mothers' self-efficacy to stimulate their offspring to participate in sports and adolescents' participation in sport clubs.

Consistent with previous studies conducted with healthy adolescents and adolescents with asthma,^{8–12,15,16} our study showed that maternal sport-specific support related positively with sport club participation of adolescents with asthma. When mothers frequently supported their offspring's participation in sport, their children reported a more frequent participation in sport clubs. The relation between mothers' support and adolescents' sport club participation was expected to be mediated by adolescents' beliefs about sport participation and their self-efficacy. However, adolescents' beliefs and self-efficacy did not explain the relation between maternal support and adolescents' sport participation. Parental support often involves background planning and managing that occurs outside the awareness of adolescents themselves.¹⁵ Thus, maternal support may not affect adolescents' beliefs about sport participation and self-efficacy.

A study conducted with healthy adolescents indicated that adolescents were more active when parents had higher levels of self-efficacy to stimulate their offspring's participation in sport.¹⁴ To our knowledge, this is the first study that found the same pattern in population of adolescents with asthma. This seems to suggest that offspring's actual sport club participation increases when parents think it is easy to let their offspring participate in sports. Further, the results revealed that adolescents' self-efficacy mediated the relation between mothers' self-efficacy to stimulate her offspring to participate in sport and adolescent participation in sport clubs. Thus, if mothers' self-efficacy to stimulate offspring to participate in sport is high, adolescents are likely to participate in sport clubs more, and adolescents' confidence that they can participate in sport can partly explain this positive relation. This is in line with the model of Welk et al.¹²

We further expected positive relations of maternal beliefs about her offspring's and her own sport participation with sport club participation of the adolescent with asthma. Previous studies showed that parental beliefs about the relevance of physical activity for early adolescents with asthma were associated with physical activity of the adolescents.^{17,18} Although the results indicated a bivariate association between maternal beliefs about offspring's sport participation and adolescents' participation in sport clubs, this relation was not very strong and was no longer significant in the multivariate analyses. This might be due to the strong intercorrelations between parental sport-specific factors (e.g., $r = 0.44$

between maternal beliefs about her offspring's sport participation and maternal self-efficacy). Maternal beliefs about her own sport participation activity and her actual physical activity were not related to adolescent's sport club participation.

A limitation of this study is the cross-sectional design, which does not permit conclusions regarding the direction of the relationships examined. For example, it can be that adolescent's limited participation in sport clubs decreases mother's confidence to stimulate her offspring to participate in sports. Future longitudinal research should thus examine the direction of the relations. Although we avoided the shared-rater bias by collecting information about sport participation from the adolescents and information about parental factors from their mothers, future research could benefit from collecting data on parental factors from adolescents as well. Adolescents can experience parenting differently from parents. Adolescents' perception of parental factors could be a better predictor of adolescent behavior compared to the perception of parents themselves.²⁵ In addition, future studies could consider whether parents have asthma themselves, which could have moderating or confounding effects on the relationships examined in this study. Parents with asthma could have very different perspectives regarding the engagement in physical activities compared to parents without asthma. Another limitation is related to the generalizability of the results. In our sample, most mothers were highly educated and adolescents were mainly of Dutch origin. However, we do not expect these differences with regard to strongly socio-demographic characteristics to affect the relations between maternal factors, adolescent factors and adolescent sport club participation. Last, future research could examine both paternal and maternal factors. Sport-specific parenting of fathers may differ from mothers' parenting. It has been shown, for example, that fathers are more likely to provide support through explicit modeling, while mothers are more likely to provide logistic support.⁹ Thus, in future studies, it could be interesting to report data on paternal and maternal sport-specific factors and to examine differences in sport-specific parenting between fathers and mothers.

The results of this study can be used to develop an intervention program aimed at stimulating participation of adolescents with asthma in sport clubs. Compared to intervention programs that did not include parents, intervention programs that target both family members and adolescents showed more promising results in terms of increasing physical activity among healthy adolescents.²⁶ Parents could be taught how to increase their own sport-specific support and self-efficacy to stimulate their offspring to participate in sport. To achieve this, health practitioners could provide parents with information sessions with tips and tricks. Parents could be reminded of

the tips and tricks necessary to stay focused on their support as well as self-efficacy via text messages.²⁷ Another intervention, which would allow parents to practice, via fictive situations, to positively support their offspring to be active as well as to deal with the difficulties associated with letting their offspring participate in sport, could be conducted via online courses.²⁸ This would be a relatively inexpensive solution and could be easily accessible to a broad range of people.²⁹

Adolescents' self-efficacy to participate in sport clubs could be increased, for example, with a program like the lifestyle Education for Activity Program³⁰ adapter for adolescents with asthma. Trained professionals could provide a safe non-competitive environment as well as encouragement, adapt intensity of exercise to adolescents with asthma, and allow adolescents to have successful experiences with physical activity. During these sessions, the trained professionals could teach adolescents how to adopt physical activity in their daily routines adequately and safely to increase self-efficacy and in turn their sport participation.

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