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Maternal and paternal beliefs, support and parenting as determinants of sport participation of adolescents with asthma

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Abstract

Rationale—Few studies have examined determinants of physical activity in patients with chronic illnesses, like asthma. The aim of the present study was to examine whether baseline maternal and paternal beliefs, support and parenting were associated with changes in sport participation of adolescents with asthma, and investigate the moderating effect of sex.

Methods—In a population-based cohort study 253 adolescents completed a questionnaire assessing their sport participation during home visits in 2012 and 2013. Both parents reported their sport-specific parenting (support, general and asthma-specific beliefs, self-efficacy to encourage sport participation). The collected data were described using descriptive statistics. Path and multi-group analyses were used to examine whether baseline parental factors predicted change in adolescent sport participation, multi-group analyses examined the moderating effect of sex. For all analyses probability p value less than the accepted level of significance $\alpha = 0.05$ ($p < 0.05$) were taken as significant effects.

Results—Few parental factors associated with changes in sport participation of the adolescents, sex did not moderate the associations. In the fully adjusted models, only maternal asthma-specific beliefs about sport participation was significantly positively associated with change in adolescent sport participation.

Conclusion—Sport-specific parenting does not appear to be a determinant of sport participation in adolescents with asthma. Future research should consider other individual, social and environmental determinants to inform intervention development.

Conflict of interest
There is no conflict of interest.

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Keywords

asthma; exercise-induced asthma; family; physical activity; psychology; youth

Introduction

Sport participation has been shown to be associated with adolescents' psychosocial, physical, and motor development [1,2]. Despite the importance for sport participation, a substantial proportion (78-81%) of Dutch adolescents does not meet the Dutch national guidelines for physical activity participation. These guidelines recommend that adolescents engage in at least one hour of daily activity of at least moderate intensity, such as aerobics or skateboarding [3]. Sport participation is a subset of physical activity, and is generally characterized by a higher level of intensity, shown to be more strongly associated with health outcomes than activities performed at lower intensities [4, 5]. Examining factors associated with changes in sport participation will aid the development of interventions to increase sport participation among adolescents. Health behaviors are influenced by factors operating at different levels of influence, such as individual, social or environmental. Parents have been shown to play an important role in shaping young people's physical activity behavior [6–8]. For example, more parental sport-specific support has been shown to predict increased moderate-to-vigorous physical activity in adolescents [9, 10], and parental beliefs about sport participation of their adolescents have been shown to be positively related with their child's sport participation [11]. Furthermore, higher maternal self-efficacy to encourage sport participation was associated with increased participation in moderate-to-vigorous physical activity in adolescent girls [12]. Overall, parental factors, particularly sport-specific parenting (e.g., sport-specific support), appear to be important for general adolescents' sport participation.

Despite the importance of sport participation for adolescents with chronic illnesses [13, 14], little research has been conducted on the determinants of sport participation in these populations. In adolescents with asthma, limited sport participation has been shown to be related not only to the more commonly reported health problems (e.g., obesity), but also to deteriorated pulmonary functioning [13,14] and decreased quality of life [13]. It is unlikely that the results of studies on determinants of physical activity conducted in healthy adolescents could be generalized to adolescents with asthma, as both adolescents with asthma and their parents experience asthma as a barrier to sport participation [15]. Population-specific research is therefore needed. Few studies have examined the parental influences in adolescents with asthma, all of them cross-sectional. These showed that greater parental support was associated with higher physical activity levels of adolescents with asthma [16,17]. Moreover, both maternal general beliefs about sport participation and maternal self-efficacy to encourage sport participation were associated with higher adolescent sport club participation [17, 18], whereas positive parental asthma-specific beliefs were associated with higher levels of adolescent physical activity [15, 16, 19, 20].

With the limited available evidence being cross-sectional, longitudinal studies are needed to examine determinants of changes in sport participation of adolescents with asthma in order

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to inform the development of effective interventions. Moreover, with most studies focusing on parental or maternal influences, the influence of paternal factors is largely unknown. Therefore, the aim of the present study was to examine the influence of maternal and paternal factors on 1-year changes in sport participation of adolescents with asthma. It was hypothesized that for both parents, sport-specific parenting would be positively associated with change in sport participation. As studies conducted with healthy adolescent have shown sex differences in the effects of sport-specific parenting of fathers and mothers [e.g., 20], the secondary aim was to examine the moderating effect of sex. Based on evidence from healthy populations, it was hypothesized that paternal and maternal sport-specific parenting would have a stronger relationship with sport participation of boys [e.g., 21] and girls [e.g., 22, 23], respectively.

Methods

Procedure

The ethics committee of the Faculty of Social Sciences of the Radboud University Nijmegen approved the study protocol. To enable participant recruitment, primary (n = 334) and secondary (n = 159) schools in the Netherlands were approached with a letter explaining the study purpose and procedures. In total, 213 (63.8%) primary schools and 73 (45.9%) secondary schools agreed to hand out invitation letters to students. Schools that were involved in other studies were excluded. Invitation letters (n = 41,000) were distributed to all seventh and eighth graders in primary schools and first graders in secondary schools (aged between 11 and 15 years); students were asked to give the letter to their parent(s). The invitation letter included general information about asthma, described the purpose and procedure of the study and provided details on how to participate. In addition to recruitment through schools, a study announcement and invitation to participate was published in the magazine of the Lung Foundation Netherlands.

Families with an adolescent diagnosed with asthma were invited to respond using a digital or paper application form. Families were eligible to participate if a) the adolescent was diagnosed with asthma by a physician, b) the adolescent used asthma medication or experienced asthma-related symptoms at least once in the last twelve months, and c) the participating family members had adequate Dutch language skills. A total of 311 families registered for the study in 2011 (T1), four of them through the magazine advertisements. Of these, 46 families (14.8%) did not meet the inclusion criteria and four families (1.2%) cancelled for different reasons, leaving 261 families (83.9%) to participate.. One year later, in 2012 (T2), 257 families (98.5%) were re-assessed and in 2013 (T3), 253 families (96.9%) participated. As limited data on adolescent sport participation was assessed at T1, the present study only uses data collected at T2 and T3.

Data collection took place during yearly home visits, in which families were informed about the study procedures, guaranteed anonymity, and asked to complete the informed consent forms. Assessment procedures were anonymous, parents and the adolescents were not able to see the answers of each other. Subsequently, mothers, fathers and adolescents completed questionnaires, the adolescent performed a lung function test, and parental and adolescent weight (in kg, to the nearest decimal) and height (in meters, to the nearest cm) were

objectively measured. The lung function tests were performed in the afternoon or evening following abstinence (4-6 hours) from inhaled bronchodilators. None of the adolescents had an asthma exacerbation on the day of the study. As explained in advance, participating families received a 20 Euro voucher for participating at T1 and T2 and a voucher of 35 Euros for participating at T3.

Measures

Adolescent' sport participation was assessed using a self-report instrument enabling participants to report all physical activity in which they usually participated during the week. Adolescents could report up to five physical activities (as free text) and the minutes/week of they participated in the activity. For the outcome measure used in the current analysis, only sports activities (i.e., physical activities aimed at maintaining or improving physical fitness and skills) were included and were assigned MET-scores [27]. These MET-scores were then multiplied by the duration of participation in hours (METhr). Scores were summed to obtain a measure of total sport participation.

Maternal/paternal sport-specific support was measured using two items from Davison and associates [24] ('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?') and 4 items of the Dutch Sport-Specific Parental Support Scale (e.g., 'How often do you watch your child participate in sports?') [25]. All items were measured on a 5-point Likert scale ranging from 1) never, almost never to 5) every day, almost every day. An average was taken with higher scores representing higher sport-specific support. Cronbach's alphas of the 6 items at T2 were .84 for mothers and .89 for fathers.

Maternal/paternal general beliefs about their child's sport participation was assessed using 13 items of the Attitude towards Sports Scale [25] (e.g., 'When your child participates in sports, he/she has fun with his/her friends'). Responses could be given on a 5-point Likert scale ranging from 1) I do not agree at all to 5) I completely agree. An average was calculated with higher scores representing more positive beliefs (Mothers T2 α = .80; Fathers T2 α = .76).

Maternal/paternal asthma-specific beliefs about their child's sport participation was measured using 7 items (e.g., When your child participates in sports, his/her asthma gets worse) derived from Lang and associates [26]. The items were measured on a 5-point Likert scale ranging from 1) I do not agree at all to 5) I completely agree; an average across the 7 items was calculated (Mothers T2 α = .75; Fathers T2 α = .70).

Maternal/paternal self-efficacy to encourage child's sport participation was assessed with 7 questions (e.g., 'Do you find it easy or difficult to encourage your child to participate in sports when you do not have much time?') [25] measured on a 5-point Likert scale ranging from 1) very hard to 5) very easy. An average was taken with higher scores indicating higher levels of self-efficacy (Mothers T2 α = .88; Fathers T2 α = .92).

Confounding variables

Variables considered as confounders were adolescents' BMI (in kg/m2 from measured height and weight), sex, age, and asthma control, measured with the Asthma Control Questionnaire (ACQ) [28]. The ACQ was used as a numerical variable from 0 ('uncontrolled asthma') to 6 ('good controlled asthma').

Statistical analyses

Means, standard deviations, and Pearson's correlations between the model variables were calculated using SPSS21 (Armonk, NY). Subsequently, independent and paired T-test were performed where appropriate to examine whether: a) families where both parents completed the questionnaires (n = 186) differed on demographic variables from families where only the mother completed the questionnaire (n = 67), b) mothers and fathers differed in their sport-specific parenting, c) boys and girls differed in sport participation, and d) sport participation differed from T2 to T3. Next, a series of path analyses, all controlled for the hypothesized confounders, were conducted in Mplus6 (Los Angeles, Calif) to examine whether parental factors predicted changes in adolescents' sport participation over time separately for fathers and mothers. Multi-group analyses were used to examine the moderating effects of sex. In the multi-group analyses, all paths in the model were constrained initially to create the baseline model. Subsequently, paths of interest were unconstrained consecutively and chi-squared difference tests were used to compare the model with the unconstrained path to the baseline model to examine whether the paths differed significantly between boys and girls [29].

The outcome variable of interest, adolescent sport participation, was skewed. Therefore the maximum likelihood estimator (MLR) with robust errors was used as this estimator deals adequately with skewed data. Model fit was evaluated by examining root-mean square error of approximation (RMSEA) and comparative fit index (CFI). Preferably, RMSEA values should be ≤ .05 and CFI values should be .90 or higher [30]. Additionally, we examined the chi-square value, degrees of freedom, and the p-value of the model. Associations were evaluated based on standardized regression weights (Beta) and p-values ($p < .05$ defined as statistically significant). Full Information Maximum Likelihood (FIML) estimation was applied to make use of all available data.

Results

Sample characteristics

At T3, adolescents' mean age was 13.9 (SD = 1.1) (Table 1), 59.7% were male and most adolescents were at secondary school (98.4%). The lung function test showed that at T2 238 adolescents had mild lung obstructions (FEV1 % predicted > 60%), 5 adolescent had moderate obstructions (40% < FEV1 % predicted > 60%), and none of the adolescents had severe obstructions (FEV1% predicted < 40%) regarding the BTS Guidelines for the management of chronic obstructive pulmonary disease [32]. At T2 185 adolescents were prescribed daily preventive asthma medication, 16 were prescribed preventive asthma medication, however, they did not need to use it daily (e.g. only when having a cold) , 38 used short reliever medication only, and 29 did not report to be prescribed medication. A

total of 184 fathers and 253 mothers participated at T2 and T3. Fathers (95.7%) and mothers (91.0%) were predominantly born in the Netherlands. Comparison of families where both parents completed the questionnaires with families where only mothers completed the questionnaires showed no differences were found in terms of age (t = .11, p= .916), adolescent BMI (t = -.03, p= .979), and asthma control (t = -1.13, p= .259).

Intercorrelations and means

Pearson's correlations showed that almost all parental factors at T2 correlated positively with adolescent sport participation at T2 and T3, except for maternal support (Table 2). T-tests showed that compared to fathers, mothers scored higher on support (t (181) = -2.22, p = .028), general beliefs (t (181) = -2.96, p = .003), and self-efficacy to encourage sport participation (t (181) = -2.47, p = .014). Fathers and mothers did not differ significantly in asthma-specific beliefs (t (181) = -1.62, p = .108). Boys' sport participation was higher than that of girls at both T2 (t (257) = 3.18, p = .002) and T3 (t (253) = 2.86, p = .005). On average, sport participation decreased significantly from T2 to T3 (t (257) = -4.25, p <.001).

Path and Multi-group analyses

Path analyses for fathers (model fit indices: CFI = .912; RMSEA = .171) showed that none of the sport-specific parenting variables predicted changes in adolescent sport participation over time (Table 3). For mothers (CFI = .932; RMSEA = .153), positive asthma-specific beliefs about sport participation predicted an increase in sport participation of adolescents with asthma over time. Multi-group analyses showed that the associations did not significantly differ by sex.

Discussion

The results of the present study indicate a limited role of parental beliefs, parenting and support in changing sport participation of adolescents with asthma. Moreover, sex did not moderate the associations. Only maternal asthma-specific beliefs about sport participation for adolescent was found to be a significant determinant of changes in sport participation of adolescents with asthma.

In contrast to our hypotheses, paternal and maternal sport-specific support and self-efficacy to encourage sport participation did not predict changes in sport participation of the adolescents with asthma. The hypotheses were based on previous cross-sectional studies in adolescents with asthma [16–18], potentially indicating that the temporal relations are contrary to what we expected. It may therefore indicate that if adolescents with asthma participate more in sports, their parents are more motivated to support them, bring them to sport clubs, and participate sports together. Moreover, parents of adolescents who participate more in sports tend to have higher levels of self-efficacy to encourage sport participation. It is important to note that not only parents may influence adolescent sports' participation, but also friends and other adults (such as coaches and teachers) [33]. Peers might even exert greater influence on adolescent sport participation compared to parents [34], and peers have been shown be influential in increasing motivation in sport participation [34]. We were unable to investigate the role of peer influences in this study, but this may explain the limited

role of parents in adolescent sport participation observed here. An alternative explanation may lie in the reasonable amount of reported sport participation at baseline, making it difficult to find significant effects of determinants on increasing participation.

In this study, we observed that maternal positive asthma-specific beliefs about sport participation (e.g., sport makes the asthma of my child better) predicted increased adolescent sport participation. For fathers we found that positive beliefs was associated with sport participation of girls only. Although we did not find this relations for boys, there was no significant difference between boys and girls. The association between asthma-specific beliefs and adolescent sport participation is in line with previous cross-sectional studies on adolescents with asthma [16,19]. This effect could be mediated through parental support and adolescent attitudes, although we were unable to assess that here. Parental positive beliefs about sport participation of their child with asthma are likely to positively influence adolescent beliefs, and with that increased sport participation.

In this study, no evidence was observed of sex-specific effects of maternal and paternal influences. This is in contradiction to our expectation that paternal sport-specific parenting would have a more profound effect on boys [21] and maternal sport-specific parenting would have a more profound effect on girls [22, 23]. To our knowledge, no study has investigated the differences in sport-specific parenting of fathers and mothers of adolescents with asthma nor the effect of adolescents' sex on the relation between sport-specific parenting and sport participation of adolescents with asthma. It is possible that parental perception of sport participation and its effects depend more on severity of asthma of the adolescent than on the sex of the adolescent. If asthma is more severe or less controlled, parents should be more careful with letting their child participate in sports and may therefore use different sport-specific parenting techniques. This also highlights the importance of studying influences on behavior in populations with specific chronic conditions, as these moderating effects are less relevant in healthy populations.

In line with previous studies, girls in the current study participated less in sports compared to their male counterparts [35]. Furthermore, sport participation of both boys and girls decreased over the 1-year follow-up [36]. To develop interventions to enhance sport participation of adolescents, it is important to understand the factors that could affect this decrease. Parents are often included in interventions aimed at increasing sport participation of healthy adolescents [37]. However, how to most effectively involve parents in these interventions remains unclear [38]. One promising techniques is educational training for parents [38], and an education-based training program may therefore focus on enhancing maternal asthma-specific beliefs to increase sport participation of the adolescents with asthma.

Despite the strengths of the present study, including its longitudinal nature, relatively large data set, inclusion of fathers, and the investigation of the moderating effect of sex, this study has several limitations. A self-report measure of sport participation was used, and we acknowledge that an objective measure could offer more reliable insights into the level of adolescent physical activity [39]. However, using MET-scores for sport participation has been used in previous studies [27]. To control for the effects of self-report in a future study a

'lie scale' could be included. Furthermore, independent assessment of the exposures (parent reported) and outcome (adolescent reported) reduces the likelihood of correlated error explaining the finding. Finally, the generalizability of the results is another limitation. In this study, the level of sport participation was relatively high, whereas in the general population only 16 to 22 percent of all adolescents participate in physical activities [3]. Translating the results of this study to other samples of adolescents with asthma should therefore be done with caution. Moreover, most adolescents in the present study had mild asthma. The results of the study could therefore not be generalized to adolescents with moderate or severe asthma. Future research could aim to examine the study associations in a more heterogeneous population of adolescents with more severe asthma.

In conclusion, this study provides insight into the limited role of parental beliefs, parenting and support on the sport participation of adolescents with asthma. Few assocations were observed, with only positive maternal asthma-specific beliefs about sport participation of her child predicting an increase in adolescent sport participation over time. Future research should consider influences in the wider family environment (such as siblings and the home environment), as well as other social, individual and environmental influences in order to inform intervention development.

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Table 1

Demographic Characteristics of Adolescents with Asthma at T3

		Adolescents	Fathers	Mothers
Mean age [a]		13.9 (1.1)		
Mean years asthma[a]		9.3 (3.9)		
BMI[a]		19.8 (2.7)		
Gender[b]	Male	153 (58.8%)		
	Female	107 (41.2%)		
School[b]	Primary	60 (76.7%)		
	Secondary	197 (23.3%)		
Asthma control[b,c]	Controlled	65 (25.0%)		
	Partly controlled	136 (52.3%)		
	Uncontrolled	59 (22.7%)		
Country of birth	Netherlands	247 (98.0%)	232 (91.0%)	176 (95.7%)
	Other	5 (2.0%)	21 (9.0%)	8 (4.3%)
Sport participation	No sport	13 (5.1%)		
	One sport	88 (34.8%)		
	Two sports	101 (39.9%)		
	Three sports	39 (15.4%)		
	Four sports	10 (3.9%)		
	Five sports	2 (0.8%)		

[a]Values represent the mean and standard deviation

[b]Values represent numbers and percentage

[c]Asthma control is based in the Global Initiative for Asthma (GINA) guidelines [27]

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Table 2

Descriptive Statistics and Intercorrelations Among Model Variables

	1	2	3	4	5	6	7	8	9	10
1. Support father	-									
2. Support mother	.45***	-								
3. General beliefs father	.27***	.19**	-							
4. General beliefs mother	.10	.16*	.51***	-						
5. Asthma-specific beliefs father	.14	.01	.71***	.37***	-					
6. Asthma-specific beliefs mother	.14	.17**	.46***	.73***	.43***	-				
7. Self-efficacy father	.32***	.13	.55***	.31***	.43***	.28***	-			
8. Self-efficacy mother	.22**	.17**	.34***	.51***	.25**	.47***	.50***	-		
9. Sport T2 adolescent	.17*	.07	.27***	.29***	.26**	.27***	.36***	.27***	-	
10. Sport T3 adolescent	.15*	.05	.19*	.18**	.19*	.26***	.21**	.21*	.44***	-
Mean	2.46	3.00	4.25	4.30	4.03	4.05	3.90	4.00	2251.10	1765.00
SD	0.74	0.72	0.44	0.47	0.55	0.58	0.77	0.72	1690.82	1633.22
N	185	253	185	523	185	253	185	252	253	253

N = 253;

* < .05,

** < .01,

*** < .001

Table 3

Relations of sport-specific parenting of fathers and mothers with adolescent sport participation

	Father				Mother			
	β(*p*)[a]	β(*p*)[b]	β(*p*)[c]	χ	β(*p*)[a]	β(*p*)[b]	β(*p*)[c]	χ
Support	.04 (.602)	.04 (.683)	.09 (.380)	0.04	.00 (.975)	-.04 (.620)	.09 (.342)	1.09
General beliefs	.04 (.686)	-.01 (.893)	-.03 (.878)	0.00	-.16 (.109)	-.13 (.136)	-.31 (.035)	0.43
Asthma-specific beliefs	.06 (.568)	.01 (.954)	.25 (.025)	1.56	.22 (.016)	.21 (.027)	.36 (.002)	0.18
Self-efficacy	-.01 (.926)	.01 (.895)	-.02 (.841)	0.07	.09 (292)	.07 (.458)	.18 (.042)	0.25

[a] Total group

[b] male adolescents

[c] female adolescents