Rogulj et al. World Allergy Organization Journal (2023) 16:100733
http://doi.org/10.1016/j.waojou.2022.100733

WORLD ALLERGY ORGANIZATION JOURNAL

Open Access

Anxiety among pediatric asthma patients and their parents and quick-reliever medication use: The role of physical activity parenting behaviours

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ABSTRACT

Background: Clinical guidelines recommend the identification of asthma comorbidities, especially treatable problems such as parental behaviours and child and parent anxiety.

Purpose: We aimed to (1) explore associations of asthma severity with child and parent state anxiety, trait anxiety, and asthma-related anxiety as well as with caregiver behaviours around physical activity and (2) explore if caregiver behaviours around physical activity were associated with use of inhaled β-Agonists when symptomatic, and with child and parent anxiety.

Patients and methods: Patients ages 3–17 years with asthma (n = 72) and their parents were recruited from the Pulmonology-Allergology Pediatric clinic University Hospital Centre Split in Split, Croatia during 2021. During a clinical visit, the pharmacological regimen was assessed and spirometry was performed. Children completed the State-Trait Anxiety Inventory for Children (STAI-C) and the Youth Asthma-Related Anxiety Scale (YASS). Parents completed the State-Trait Anxiety Inventory (STAI), the Parent Asthma-Related Anxiety Scale (PASS), and the Physical Activity Parenting Practices – Short Form (PAPP).

Results: Most patients had mild asthma (69.4%). Children with moderate to severe asthma had increased asthma-related anxiety (mean = 11.94 ± 6.1) compared with children with mild asthma (mean = 5.97 ± 6.39, p = 0.003). Parents of children with mild asthma reported behaviours allowing unsupervised physical activity outside more often when compared to parents of children with moderate or severe asthma. Physical activity facilitation parenting behaviour reduced the odds of a child's need for quick-reliever medication when symptomatic (OR = 0.376,95% CI = −1.885 to −0.072; p = 0.034); more coercive parenting increased the odds of a child's additional use of such medications (OR = 2.602; 95% CI = 0.005 to 1.908; p = 0.049). Parents of children in the highest quartile of trait anxiety showed less non-directive support (1.97 ± 1.01 vs. 2.89 ± 1.19, p = 0.031) and less autonomy support (3.14 ± 1.32 vs. 4.11 ± 1.23, p = 0.037) of physical activity in their children than those with less trait anxiety.

Conclusion: Asthma-related anxiety was an important construct in this sample of children, associated with their disease severity as well as their parent's behaviours around the child's

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http://doi.org/10.1016/j.waojou.2022.100733

Received 30 June 2022; Received in revised from 1 November 2022; Accepted 28 November 2022
Online publication date xxx

physical activities. Current research, conducted during the COVID-19 pandemic, recognised the tangible ways that parents support or avoid the asthmatic children's physical activity participation. Child anxiety and recognised parental physical activity behaviours are potentially important factors to assess and target for intervention.

Keywords: Anxiety, Asthma, Physical activity, Parental behaviour, Parental practice

INTRODUCTION

Asthma, an inflammatory disease of the lungs, is the most common pediatric chronic illness worldwide.[1,2] While asthma prevalence varies by geographic location, it has significant levels of morbidity and mortality among children worldwide.[3] In Croatia, the setting of this study, asthma prevalence among youth is as high as 9.7%,[4,5] and in some areas of Croatia an increasing trend in the prevalence of asthma symptoms has been reported.[6] An overall increase in asthma prevalence is expected worldwide,[7] which warrants scientific attention.

Clinical guidelines recommend the identification of asthma comorbidities as they may impact disease management and asthma outcomes.[8] This is especially true when the comorbidities are clinically important "treatable traits"[9] as these treatable problems may allow for the personalization of treatment plan.[10] Anxiety is recognised as a comorbid, treatable condition in the youth with asthma[11] that contributes to poorly controlled asthma.[12,13] Most recently, asthma-related anxiety – fears or worry about asthma, including symptoms, treatment, and consequence[14] – has been shown in youth from the United States to be associated with asthma self-management.[15]

Similarly, maternal anxiety has also been emphasized in asthma management, with large meta-analytic studies confirming an increased overall anxiety in parents of children diagnosed with asthma.[16] In pediatric asthma patients, increased parental anxiety has been associated with poor treatment adherence to inhaled corticosteroids in pediatric asthma patients and increased asthma severity.[17,18] Parental asthma-related anxiety has been associated with the child's asthma self-management,[19] suggesting a role of parental behaviours in the adherence to treatment. The association of anxiety to asthma severity has yet to be studied in Croatian youth or their caregivers, representing a significant gap in the literature given the prevalence and morbidity of asthma in Croatian youth.

Pediatric asthma patients also have decreased physical activity,[20] even though decreased physical activity as a therapeutic or a coping strategy is not recommended, with the exception of exercise induced asthma (EIA).[21] In contrast, exercise in children with bronchial asthma has been shown to improve pulmonary function recovery and exercise capacity,[22] and it has been underscored that clinicians providing care for youth with asthma should assess physical activity and promote an active lifestyle.[20] One possible reason for decreased physical activity in children with asthma is their co-morbid anxiety symptoms; these children are prone to interpreting exercise-related sensations as asthma symptoms,[23] and therefore stop exercising to avoid the asthma symptoms.

Parents may also play a role in decreased physical activity among their children with asthma. They sometimes fear asthma symptoms will worsen following exercise and this has been recognised as a possible barrier to physical activity in the child.[24,25] Specific parenting behaviours around physical activity have been found to be associated with levels of physical activity in children in general.[26] To date, no studies have examined associations of specific parenting behaviours around physical activity in children with asthma.

This study addresses these important gaps. We examine associations between youth and parent anxiety, asthma severity and caregiver behaviours around physical activity in 72 children with asthma,

3 to 17 years old from Croatia. Specifically, we explored: if asthma severity was associated: 1) with child and parent state anxiety, trait anxiety, and asthma-related anxiety; 2) with caregiver behaviours around physical activity; 3) if caregiver behaviours around physical activity were associated with use of inhaled β-Agonists when symptomatic; and 4) if caregiver behaviours around physical activity were associated with anxiety. This study, which was conducted during the COVID-19 pandemic, is especially timely. People with asthma are at a higher risk for developing severe asthma symptoms following a COVID-19 infection, and there has been an increase anxiety among children with asthma and their parents.[27,28] Additionally, physical activity during the pandemic has declined.[29]

MATERIAL AND METHODS

Participants and setting

This cross-sectional study consisted of 72 youth with asthma ages 3- to 17-years and their parents recruited from the Pulmonology-Allergology clinic for outpatients, the Pediatric clinic, University Hospital Centre Split in Split, Croatia, between May and November 2021. Families with a child ages 3–18 years with a diagnosis of recurrent obstructive bronchitis or asthma were eligible to participate in this study, except those who had EIA or were under medical treatment for a comorbid chronic disease, including anxiety. The pediatric pulmonology-allergology specialist informed consecutive families who presented to the clinic for a routine asthma-related visit about the study (n = 75) and invited them to participate; 96% (n = 72) of the parents provided informed consent and children ages 12 and older provided verbal assent. Exclusion criteria were comorbidities with other chronic diseases under medical treatment, children whose parents or legal guardians have refused to sign informed consent, and EIA. The study protocol was approved by the Institutional Review Board of the University Hospital Centre Split, Split, Croatia (protocol #500-03/21-01-127).

Materials and measures

Demographic and clinical characteristics

Following the clinical visit, parents completed a survey which included demographic factors (ie, age, gender). They also reported if the child used inhaled short-acting β2-agonists (SABA; yes/no) in the past 2 months when symptomatic, if the child had an asthma-related emergency room visit in the past month, and if the child was ever diagnosed with COVID-19.

Asthma severity

The Global Initiative for Asthma (GINA) guidelines[2] use 5 factors to classify asthma control – daytime symptoms, night awakening, need for relievers when symptomatic, physical activity limitations, and spirometry parameters. During the scheduled clinical visit, the first author asked the parent questions to assess the first 4 factors as well as the pharmacological regimen needed (types of medicine, dosages, and frequencies of administration); she also performed spirometry using the Schiller SpiroScout LF8 collecting the following parameters: Vcmax; FVC; FEV1; FEF50; and PEF. This information was used to classify the child asthma into one of 5 therapeutic steps and asthma severity as follows: mild asthma (steps 1 and 2); moderate asthma (steps 3 and 4); and severe asthma (step 5).[2]

Anxiety

Children ages 9 and older, and all parents, completed the State-Trait Anxiety Inventory for Children (STAI-C)[30] and the State-Trait Anxiety Inventory (STAI),[31] respectively. Both measures are validated in the Croatian language[32] and have subscales assessing state anxiety (ie, fears and worries around situations) and trait anxiety (ie, fears and worries felt daily). Participants answer 20 questions on each subscale where they indicate on a 4-point scale how they feel at this moment (state anxiety; 1 = Not at all; 4 = Very much so) and how they feel in general (trait anxiety; 1 = Almost never; 4 = Almost always). Scores can range from 20 to 80 with higher scores reflecting increased anxiety. Children younger than 9 years were also assessed if the parent reported satisfying reading skills of a child as young as 6 years.

Participants also completed a measure to assess asthma-related anxiety. Children completed the Youth Asthma-Related Anxiety Scale (YASS) and parents the Parent Asthma-Related Anxiety Scale (PASS).[14] The YAAS assesses how often over the last 2 weeks the children worried about their

asthma, using 9 items on a 6-point Likert scale (0 = never, 5 = always). The PAAS is an 11-item parallel parent version for the assessment of parents' anxiety regarding their child's asthma. Both measures were translated from English to Croatian and back translated to English while consulting guidelines for translation,[33] by 3 bilingual translators in each step. Independent translations were performed from English to Croatian by 3 translators. Consequently, Croatian versions of the questionnaires were back-translated to the source language by translators being blinded for the original version. The content analysis of the translations was performed following that, and if differences in meaning were recognised, the translators and the investigators adapted them in order to achieve an optimally worded translation. Following that, the Croatian version was back translated to English by 3 new translators, after which the final assessment by investigators and translators was performed. No changes were made after that. Psychometric properties were assessed for both questionnaires, yielding internal consistency of 0.82 for YAAS and 0.89 Cronbach α for PAAS scale in Croatian.

Parent behaviours around physical activity

Parents completed the 31-item Physical Activity Parenting Practices – Short Form (PAPP),[34] which assesses parental behaviours regarding their children's physical activities. The PAPP assess parenting physical activity practices across nine domains: coercive parenting; nondirective support; supportive expectations; facilitation; restrictions in physical activity inside; allowing unsupervised physical activity outside; autonomy support; guided choice; and rewards. The PAPP questionnaire translation procedure to Croatian was performed in the same manner as for the asthma-related anxiety questionnaires. Following back translation to English in a blinded manner, the content analysis was performed, and in cases when differences in meaning were recognised, the adaptation was performed. Final translation from Croatian back to English language was performed by newly included translators. Psychometric properties of the subscales were explored, yielding good internal consistency for all subscales, as follows: coercive parenting (α = 0.91); nondirective support (α = 0.82); supportive expectations (α = 0.91); facilitation (α = 0.75); restrictions in physical activity inside (α = 0.75); allowing unsupervised physical activity outside (α = 0.79); autonomy support (α = 0.97); guided choice (α = 0.075); and rewards (α = 0.93).

Statistical analyses

Data analyses were performed using SPSS (IBM Corp. Released 2020. IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp). Descriptive statistics summarized the data: frequencies and percentages for categorical data, means and standard deviations for normally distributed continuous data and median and interquartile range (IQR) for skewed data where a heterogeneity of variances was confirmed. Relationships between asthma severity and anxiety and parenting behaviours around physical activity were explored by modelling anxiety and parenting behaviour scores as a function of asthma severity. Age was controlled for in the group comparison analysis due to its possible mediating role in the investigated relationship. Next, logistic regression model was used to examine associations between parenting behaviours around physical activity and the child needing to use SABA as a quick-relief medication when symptomatic (binary answer – YES/NO), while also controlling for age and asthma severity. The differences in parenting practices were assessed for children in the highest quartile of trait anxiety (as a stable assessment of anxiety, not affected with the current situation in which a child is being assessed by a physician) and asthma-related anxiety, in order to assess children in the high anxiety symptom group of children.

RESULTS

The study included 72 parents of children diagnosed with asthma or broncho-obstruction. Table 1 details the child demographic characteristics and clinical status. The children's mean age was 10.7 and nearly 70% were male. Most patients had mild asthma (69.4%), and only 4.2% of patients had severe asthma. In the prior 2 months, more than half needed to use quick-reliever medication when symptomatic and nearly 14% had an asthma-related emergency department visit. Only 11% of the children were ever diagnosed with COVID-19. Clinically assessed lung

functioning as measured by spirometry parameters are reported in Table 1, indicating that for the current sample of pediatric patients average Vcmax was 86.7 ± 14.5. Parents reported a child's need for quick-reliever medication when symptomatic in 58.3% of patients.

Associations between asthma severity and anxiety and parenting behaviours

As listed in Table 2, asthma severity significantly associated with child asthma-related anxiety: those with moderate to severe asthma had increased asthma-related anxiety (mean = 11.94 ± 6.1) compared with children with mild asthma (mean = 5.97 ± 6.39). Asthma severity was not significantly associated with child nor parent state and trait anxiety; nor was it associated with parent asthma-related anxiety.

Asthma severity was not significantly associated with the overall PAPP score and all but one subscale. Parents of children with mild asthma reported behaviours allowing unsupervised physical activity outside more often when compared to parents of children with moderate or severe asthma (p = 0.008).

	N (%)
Age (Mean ± SD, years)	10.7 ± 3.9
Male	50 (69.4)
Asthma severity	
Mild asthma	50 (69.4)
Moderate and severe asthma	22 (30.6)
Use of quick-reliever medication in past 2 months when symptomatic	42 (58.3)
Asthma-related emergency room visit in past 2 months	10 (13.9)
Ever diagnosed with COVID-19	8 (11.1)
Lung functioning as measured by spirometry (Mean ± SD)	
Vcmax	86.7 ± 14.5
FVC	88.3 ± 10.5
FEV1	94.2 ± 11.7
FEF50	88.6 ± 19.8
PEF	88.9 ± 12.9

Table 1. Child demographic and clinical status (N = 72)
Abbreviations: FEF50 Forced expiratory flow at 50% of vital capacity; FEV1 Forced expiratory volume during the first second; FVC Forced vital capacity; GINA Global Initiative for Asthma; PEF Peak expiratory flow; SABA inhaled short-acting β2-agonists; VCmax Vital capacity; FEV1 Forced expiratory volume during the first second.

Associations between use of reliever medication when symptomatic and parenting behaviours

The contribution of different physical activity parenting practices to the additional use of such medications was investigated and reported in Table 3. Controlling for age and asthma severity, both physical activity facilitation parenting behaviour and coercive parenting were significantly associated with the need to use quick-relief medication when symptomatic, suggesting less physical activity facilitation and more coercive parenting when there was a need for quick relief medication in children diagnosed with asthma (R^2 = 44,4%; p = 0.008). Specifically, a one-point decrease in the PAPP facilitation subscale score reduced the odds of a child's need for quick-reliever medication when symptomatic (OR = 0.376, p = 0.034), whereas a one-point increase in the PAPP coercive parenting subscale score increased the odds of a child's additional use of such medications (OR = 2.602; p = 0.049). Hosmer and Lemeshow Test (P = 0.380) indicated a good-fit model.

Associations between asthma-related anxiety and parenting behaviours

Following the finding of increased asthma-related anxiety in children with more severe asthma diagnosis seen in Table 2, we examined differences in parenting practices of children in the highest quartile of trait anxiety and asthma-related anxiety. As reported in Table 4, parents of children in the highest quartile of trait anxiety show less non-directive support (1.97 ± 1.01 vs. 2.89 ± 1.19, p = 0.031) and less autonomy support (3.14 ± 1.32 vs. 4.11 ± 1.23, p = 0.037) of physical activity in their children than those with less trait anxiety. Coercive parenting around physical activity scores were higher among children with the highest levels of asthma-related anxiety compared to those with less anxiety (2.58 ± 1.16 vs. 1.77 ± 0.81, p = 0.011, Table 4).

DISCUSSION

To our knowledge, this is the first study assessing anxiety in Croatian children with asthma and

	Mild asthma (Mean ± SD)	Moderate and severe asthma (Mean ± SD)	p-value
Children			
Anxiety as a state in children	49.75 ± 4.75	47.5 ± 5.29	0.205
Anxiety as a trait in children	34 ± 6.19	32.14 ± 6.87	0.098
YASS score	5.97 ± 6.39	11.94 ± 6.1	0.003*
Parent			
Anxiety as a state in parents	36.54 ± 11.08	36.5 ± 8.83	0.791
Anxiety as a trait in parents	36.9 ± 10.83	37.23 ± 8.43	0.700
PAAS score	13.08 ± 9.56	16.36 ± 7.59	0.091
PAPP scores			
Coercive	1.86 ± 0.87	1.97 ± 0.87	0.751
Nondirective support	2.83 ± 1.15	3.02 ± 1.07	0.233
Supportive expectations	4.27 ± 0.8	4.33 ± 0.94	0.740
Facilitation	2.03 ± 0.97	1.92 ± 0.88	0.643
Restrict inside physical activity	2.05 ± 0.8	2.13 ± 0.76	0.511
Allow unsupervised physical activity outside	2.63 ± 0.94	2.38 ± 0.52	0.008*
Autonomy support	3.9 ± 1.15	3.66 ± 1.42	0.646
Guided choice	3.02 ± 0.83	3.09 ± 1	0.753
Reward	1.94 ± 1.03	1.98 ± 0.97	0.764

Table 2. Associations of Asthma Severity and Anxiety and Parenting Physical Activity Behaviours Controlling for age by Type of Study Participant * *Significant difference following analysis of covariance including age as a covariate.*

	Nagelkerke R^2	P	Wald	SE	p-value	OR	95% C·I.	
	0.453	0.010						
Coercive			3.881	0.485	0.049[a]	2.602	0.005	1.908
Nondirective support			0.003	0.446	0.959	1.023	−0.852	0.897
Supportive expectations			0.365	0.525	0.545	0.728	−1.345	0.711
Facilitation			4.472	0.463	0.034[a]	0.376	−1.885	−0.072
Restrict inside physical activity				1.103	0.577	0.294	1.833	−0.525
Allow unsupervised physical activity				2.948	0.660	0.086	0.322	−2.427
Autonomy support			0.163	0.365	0.686	0.863	−0.863	0.568
Guided choice			3.393	0.610	0.065	3.074	−0.072	2.318
Reward			3.596	0.429	0.058	0.444	−1.653	0.027
Asthma severity			0.583	0.668	0.445	0.601	−1.819	0.799

Table 3. Physical activity parenting practices contribution to additional use of inhaled short-acting β2-agonists (SABA) when symptomatic in children with asthma *The explained variation in the dependent variable (Nagelkerke R2); Probability value (p-value); the Wald test value (Wald): Standard Error for the unstandardized beta (SE); Odds Ratio (OR); Confidence Interval (CI).* [a]*Significant predictors in the logistic regression model where the additional use of inhaled short-acting β2-agonists (SABA) was included as a dependent variable. Age of the child was controlled for in the current model.*

	Anxiety as a trait in children			Asthma related anxiety in children		
	STAI-C < 75th centile	STAI-C > 75th centile	*p*-value	YAAS < 75th centile	YAAS > 75th centile	*p*-value
Coercive	1.98 ± 0.97	1.92 ± 0.94	0.860	1.77 ± 0.81	2.58 ± 1.16	0.011[a]
Nondirective support	2.89 ± 1.19	1.97 ± 1.01	0.031[a]	2.66 ± 1.06	2.61 ± 1.46	0.921
Supportive expectations	4.38 ± 0.71	3.91 ± 1.09	0.121	4.35 ± 0.65	4.06 ± 1.17	0.297
Facilitation	2.07 ± 0.88	1.91 ± 1.11	0.631	2.08 ± 0.94	1.75 ± 0.85	0.296
Restrict inside PA	1.87 ± 0.58	2.2 ± 0.86	0.191	1.84 ± 0.55	2.09 ± 0.92	0.406
Allow unsupervised PA outside	2.74 ± 0.69	2.67 ± 0.72	0.777	2.91 ± 0.72	2.73 ± 0.77	0.464
Autonomy support	4.11 ± 1.23	3.14 ± 1.32	0.037[a]	3.93 ± 1.17	3.46 ± 1.45	0.265
Guided choice	3.13 ± 0.75	3.39 ± 0.7	0.337	3.22 ± 0.73	2.88 ± 0.71	0.161
Reward	2 ± 1.11	1.8 ± 1.03	0.627	1.81 ± 0.96	2.14 ± 1.12	0.343

Table 4. Physical activity parenting practices in parents of children reporting highest level of anxiety assessed with STAI-T scale and asthma related anxiety assessed with YAAS [a]*Significant differences following parametric analysis, t-test. Data presented as mean ± SD.*

their parents. While parent's anxiety was not associated with the children's asthma severity, different types of anxiety among the children had different relationships to asthma severity. This study is also the first to examine associations between parenting behaviours around physical activity and children's need for quick-relievers and children's anxiety.

Consistent with prior research,[14] children's asthma-related anxiety increased with an increase in asthma severity. It has been proposed that anxiety can be considered 2 separate types of anxiety – fear-related and distress-related.[35,36] Therefore, children may interpret their asthma symptoms as threatening, thus increasing the fear or worry about their asthma.[15] In contrast, fears and worries around stressful situations more generally (ie, state anxiety) and stable fears that are part of one's personality (ie, trait anxiety) may be less relevant to asthma severity. In contrast to prior studies, this study did not find children's state and trait anxiety,[13] nor parent's anxiety was associated with the child's asthma severity. It is plausible that the study findings may be due to the time in which the study was conducted, namely during the COVID-19 pandemic where there was an increase in anxiety overall.[37]

A few parental behaviors around physical activity were associated with the children's use of quick-reliefe medication when symptomatic or the children's anxiety. The tangible ways that parents supported the children's physical activity participation (eg, enrolling the child in sports, taking children to places to be active) were reduced when the children needed to use quick-relief medication when symptomatic, a finding that is consistent with a study that assessed the children's clinical status using spirometry.[38] Also, when the children's anxiety was increased, parents tended to be more involved in managing the child's physical activity in negative ways. When children had an increase in trait anxiety, parents tended to provide less non-directive and autonomous support (eg, encouragement, praises/rewards for their child's physical activity), and with an increase in the child's asthma-related anxiety parents used coercive parenting around physical activity (eg, nagging, criticizing). It appears that parents may be using a reactive asthma management style and controlling the child's asthma by avoiding potential triggers; that is, they may be limiting physical activity as a means of managing the children's asthma. Given the study finding of an increase in children's asthma-related anxiety with an increase in their asthma severity, such parent behaviours

may in turn also reduce their child's asthma-related anxiety. Even though the current study revealed that parent's anxiety was not associated with the children's asthma severity, prior research has found that maternal anxiety, including prenatal anxiety, are associated with their child's asthma outcomes.[39,40]

Taken together, study findings suggest several treatable traits to target for intervention. Overall, teaching families preventive asthma management styles in order to reduce asthma severity may help to reduce the child's fears and worries about their asthma and reduce their need for quick-relief medication. Parents should be taught that limiting their child's physical activity is not the best way to manage the child's asthma. Instead, adhering to the healthcare provider's treatment plan to prevent the onset of symptoms is essential. Healthcare providers should educate parents about clinical guidelines which recommend that children with asthma be physically active,[41] and how this has the potential to improve their lung functioning.[42]

The findings of the current study should be considered in light of the study limitations. The sample size was relatively small and some of the non-significant findings may be due to a lack of power. Also, the age range of the children was wide and the sample size precluded an examination of difference by age. With the exception of the STAI and STAI-C,[32] the other study measures, while rigorously translated to Croatian and assessed for psychometric properties in the current study, were not previously validated in a Croatian sample. Thus, some of the non-significant findings may be due to the measures not adequately reflect the constructs among Croatian children and adults. It should also be noted that this study reported on data collected during the COVID-19 pandemic. The lack of comparable data prior to the pandemic, precludes analyses to examine the impact the pandemic had on investigated relationships. Since obesity prevalence in younger children has also increased during the pandemic,[43] and obesity itself might have a deleterious effect on the risk of asthma exacerbations,[44] it should also be considered as an important factor for physical inactivity in children with asthma in future studies.

CONCLUSION

This study examined associations between asthma severity, child and parent anxiety and parenting behaviours around the child's physical activity in children from Croatia with asthma. The data add to the growing literature on asthma co-morbidities, while recognising the tangible ways that parents support or avoid the asthmatic children's physical activity participation. Asthma-related anxiety was an important construct in this sample of children; their asthma-related anxiety was associated with their disease severity as well as their parent's behaviours around the child's physical activities. Child anxiety and parental physical activity behaviours are potentially important factors to assess and target for intervention.

Abbreviations

EIA; exercise induced asthma, SABA; short-acting β2-agonists, FEF50; Forced expiratory flow at 50% of vital capacity, FEV1; Forced expiratory volume during the first second, FVC; Forced vital capacity, GINA; Global Initiative for Asthma, PEF; Peak expiratory flow, VCmax; Vital capacity, STAI-C; State-Trait Anxiety Inventory for Children, STAI; State-Trait Anxiety Inventory, YASS; Youth Asthma-Related Anxiety Scale, PASS; Parent Asthma-Related Anxiety Scale, PAPP; Physical Activity Parenting Practices – Short Form.

Acknowledgements

N/A.

Funding

This project is funded through the institution individual research support for employees (School of Medicine University of Split, Split, Croatia).

Availability of data and materials

Derived data supporting the findings of this study are available from the corresponding author upon request.

Author contributions

All authors have met conditions and appropriate credit for each author's contribution, in accordance with ICMJE guidelines.

Ethics approval

The study protocol was approved by the Institutional Review Board of the University Hospital Split in Split, Croatia (protocol #500-03/21-01-127).

Consent to participate
All parents provided informed consent after receiving relevant information about the study (n = 72) and children ages 12 and older provided verbal assent along with parental written consent.

Consent for publication
All authors agree to submit the article to the World Allergy Organization Journal.

Submission declaration
The work described has not been published previously, it is not under consideration for publication elsewhere, the publication is approved by all authors. If accepted, it will not be published elsewhere.

Declaration of competing interest
The authors have no conflict of interest to declare.

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