**Relationships between physical activity level and psychosocial and socioeconomic factors and issues in children and adolescents with asthma: a scoping review**

Thomas Westergren1

Sveinung Berntsen1

Mette Spliid Ludvigsen2, 3

Hanne Aagaard4

Elisabeth O.C. Hall5

Yngvar Ommundsen1, 6

Lisbeth Uhrenfeldt7, 8

Liv Fegran1, 9

1. Faculty of Health and Sport Sciences, University of Agder, Kristiansand, Norway

2. Clinical Research Unit, Randers Regional Hospital, Randers, Denmark

3. Department of Clinical Medicine, Aarhus University, Denmark

4. Department of Paediatrics, Aarhus University Hospital, Aarhus, Denmark

5. Section of Nursing, Department of Public Health, Health, Aarhus University, Aarhus, Denmark

6. Department of Coaching and Psychology, Norwegian School of Sports Science, Oslo, Norway

7. Department of Health Science and Technology, and Danish Centre of Systematic Reviews: a Joanna Briggs Institute Center of Excellence, The Center of Clinical Guidelines – Clearing house, Aalborg University, Aalborg, Denmark

8. Faculty of Nursing and Health Sciences, Nord University, Bodø, Norway

9. Department of Paediatrics, Sørlandet Hospital, Kristiansand, Norway

**Corresponding author:**

Thomas Westergren

Email: thomas.westergren@uia.no

## Relationships between physical activity level and psychosocial and socioeconomic factors and issues in children and adolescents with asthma: a scoping review

## Executive summary

*Background:* Asthma is a heterogeneous chronic airway disease which may reduce capability for physical activity. In healthy peers, physical activity is influenced by psychosocial and socioeconomic factors. Knowledge about the role of these factors has not been mapped in children and adolescents with asthma.

*Objective:* The main objective of this scoping review was to identify psychosocial and socioeconomic factors associated with physical activity level in children and adolescents with asthma in the literature. The specific objectives were to map the instruments to measure these factors, report on the construction and validation of these instruments, map psychosocial and socioeconomic issues related to physical activity level reported in qualitative studies, and identify gaps in knowledge about the relationships between psychosocial and socioeconomic factors and physical activity level in children and adolescents with asthma.

*Inclusion criteria:*

*Types of participants:* Children and adolescents with asthma aged 6–18 years.

*Concept:* Psychosocial and socioeconomic factors related to physical activity level and participation.

*Context:* All physical activity contexts.

*Types of sources:* Quantitative and qualitative primary studies, in English, with no date limit.

*Search strategy:* The databases searched included nine major databases for health and sports science, and five databases for unpublished studies. After screening and identification of studies, the reference lists of all identified reports were searched, and forward citation searches were conducted using four databases.

*Extraction of the results:* The following data were extracted: (a) relevant study characteristics and assessment of physical activity level, (b) instruments used to assess psychosocial and socioeconomic factors, (c) associations between physical activity level and these factors, (d) construction and validation of instruments, and (e) psychosocial and socioeconomic issues related to physical activity participation.

*Presentation of the results:* Twenty-onequantitative and 13 qualitative studies were included. In cross-sectional studies, enjoyment, physical self-concept, self-efficacy, attitudes and beliefs about physical activity and health, psychological distress, health-related quality of life, and social support were more often reported as being correlated with physical activity level. In three studies, the construct validity was assessed by factor analysis and construct reliability tests for the study population. Qualitative studies report 10 issues related to physical activity participation, and capability and being like peers were most commonly reported. There was no direct evidence that qualitative research informed the development or adjustment of instruments in quantitative studies.

*Conclusions:* Seven psychosocial factors correlated with physical activity level; capability and being like peers were the most commonly reported issues. Reports of the construction and validation of instruments were sparse.

*Implications for research:* Longitudinal and/or experimental studies with objective recording of physical activity are needed to increase understanding of the correlates of physical activity in children and adolescents with asthma. Knowledge about the experiences of children and adolescents with asthma should inform the future development of instruments.

*Implications for practice:* Clinicians should address the correlates of physical activity and the capability and desire to be like their peers to encourage physical activity participation in children and adolescents with asthma.

Keywords: Asthma; asthmatic children and adolescents; physical activity; psychosocial factors; socioeconomic factors

## Background

Asthma is a chronic disease that ischaracterized by airway inflammation, which causes expiratory airflow limitation, shortness of breath, chest tightness, wheeze, and cough.1 In children and adolescents with asthma, the disease may reduce perceived capability for,2 and participation in, physical activity (PA).3 Physical activity is defined as any bodily movement, such as play, exercise, or daily activities produced by the contraction of skeletal muscles, that increases energy expenditure above the resting level.4

Physical activity level may be assessed in terms of the intensity, frequency, type, mode, and duration.5 Physical activity can be recorded by objective measures of energy expenditure or movement (e.g., steps per day, distance, accelerometer counts per minute, heart rate, or oxygen consumption); by subjective reports of exhaustion; or by descriptive measures of the activities.6 Objective measures of acute airflow limitation induced by vigorous PA (exercise-induced bronchoconstriction (EIB)) do not completely explain children’s and adolescents’ reports of exercise-induced symptoms.7,8 Nevertheless, exercise limitation and reduced PA are frequently reported to be associated with physiological mechanisms, respiratory symptoms,3,9-19 and psychosocial and socioeconomic factors in children and adolescents with asthma.2,9,10,14,18,20-26 Qualitative research has described barriers to PA such as fear of breathlessness and misinterpretation of symptoms,27 and these are influenced by gendered habits,28,29 social support,30-32 role models, and efforts to appear similar to peers.33,34

Participation in PA is considered feasible by children and adolescents with well-controlled asthma.35-38 Asthma control is defined as “the extent to which the manifestations of asthma have been reduced or removed by treatment.”39(p545) Increased PA is associated with increased cardiorespiratory fitness,36,38,40 psychological functioning,37 health-related quality of life (HRQoL),36-38,40,41 psychological well-being, self-esteem, and decreased morbidity.36,37,40 Increased fitness may also elevate the EIB threshold by reducing the ventilatory requirement for any PA involving play or exercise.36,42

There is no consensus in the literature about whether children and adolescents with asthma participate in less PA than their healthy peers.37,43 Some studies have reported similar fitness and PA levels in children with asthma compared with their peers.44-47 By contrast, lower PA and fitness levels have been identified2,3,10,14,15,19 in children who are newly diagnosed or have poor asthma control.3,19

Asthma symptoms and lung function may change rapidly in response to the environment and/or treatment, whereas airway wall remodeling and responsiveness tend to adapt slowly.39 Thus, the clinical manifestations and the underlying disease mechanisms of asthma do not always correspond.39 An asthma diagnosis may include four domains: symptoms, variable airway obstruction, inflammation, and hyperresponsiveness.39 Various combinations of one or more of these four domains and other features are included when defining asthma in different study populations. Study populations also vary with respect to the level of asthma control and severity in participating children. Asthma severity is defined by the treatment intensity required to obtain asthma control.39 Deficient asthma control may also occur through poor compliance, poor inhaler technique, under-prescribing, environmental factors, severe disease, and/or resistance to therapy.39 Hence, the associations between PA and asthma, asthma control, and asthma severity are complex and involve both psychosocial and socioeconomic issues.20

Asthma and PA from childhood into adolescence

The disease,48 level of PA,49-51 and management of both asthma and PA change throughout childhood and adolescence.48,52 Asthma is more common in boys than girls during childhood 53 but is more common in girls during adolescence.48,54 Parents are responsible for the everyday management of their child’s asthma, whereas shared responsibility by the adolescent and parents is desired to enhance the adolescent’s growing responsibility for managing his/her disease.55

In healthy children, PA level varies between boys and girls49-51 and according to social support.50 Peer support positively influences PA across gender,50 age, and location.56,57 The influences of social support from parents and teachers, and relating to the physical environment, may change with time and location (at school or at home, during school or leisure time, and during the week or weekend), and age.56,57 Such changes may be related to major shifts in autonomy, parental license, and movement to different schools during childhood and adolescence.56 Eighty percent of school-age adolescents worldwide do not reach the international recommendations of 60 min/day of moderate-to-vigorous intensity PA (MVPA).58,59

***Psychosocial and socioeconomic correlates of PA***

Correlates of PA and their interaction have been derived from several theories and models.60 A variety of factors ranging from individual to global may influence PA during the life-course, and such factors may be theoretically integrated in ecological models to guide improved understanding of combination and interaction of factors.60 According to Bauman et al.60 there is a need for more knowledge about why some young people are active and others are not, in particular the psychosocial and socioeconomic correlates and determinants of differences in PA levels.60 Correlates are derived from associations identified in cross-sectional studies, and determinants are derived from associations identified in longitudinal observational or experimental studies.60

In this review, and with reference to Bauman et al.,60 psychosocial factors are defined and sorted as individually measured perceived intrapersonal factors (motivation, beliefs, and cognition); interpersonal factors (support from others and cultural norms and practices); and environmental factors (social, built, and natural environment). The variety of theoretical frameworks underpinning the construction of psychosocial factors60,61 makes a more exhaustive description of the origins of the concept challenging, which is also beyond the scope of the present review.

Socioeconomic factors are defined as a multidimensional concept comprising resources, power, and/or prestige, and include educational level, income, and occupation at the individual, household, or neighborhood level.62 Different measures of socioeconomic factors are not interchangeable62 and, in children and adolescents, indicative measures are often used, such as car ownership, internet access, and unshared bedrooms.63,64 Such indicative measures must be refined according to economic, technological, and societal changes in a given society.64

Hence, transparency in the development of instruments to measure psychosocial and/or socioeconomic factors, and reporting of in-study reliability and validity is needed when mapping knowledge about the associations between these factors and PA in given populations. In addition, mapping of psychosocial and socioeconomic issues in relation to PA by qualitative research may strengthen the evidence derived using quantitative instruments.

Rationale for the review

As outlined above, there is a need for more detailed knowledge about the psychosocial and socioeconomic influences on PA level60 in children and adolescents with asthma, especially among those with specific challenges to PA participation because of airflow limitation. To our knowledge, there is no consensus about the best instruments to assess the psychosocial and socioeconomic factors that may influence PA in children and adolescents with asthma. A scoping review on this topic is needed before further studies or synthesis of research findings can be conducted to identify the factors that may be feasible, appropriate, meaningful, and effective for inclusion in interventions aimed at increasing PA level in children and adolescents with asthma. This scoping review follows the methodology of Peters et al.65 An initial search in the JBI Database of Systematic Reviews and Implementation Reports, PROSPERO, Cochrane Library, PEDro, Embase, CINAHL, Medline, SPORTDiscus, SocINDEX, Academic Search Complete, PsycINFO, and ISI Web of Science was performed. To our knowledge, no systematic or scoping review on this specific topic has been published or is currently underway. The objectives, inclusion criteria, and methods of analysis for this review were specified in advance and documented in a protocol.66

## Objectives

The objective of this scoping review was to identify psychosocial and socioeconomic factors associated with PA level in children and adolescents with asthma reported in the literature. Specific objectives were to map the instruments to measure these factors, to report on the construction and validation of these instruments, to map psychosocial and socioeconomic issues related to PA level reported in the qualitative studies, and to identify gaps in the evidence about the relationships between psychosocial and socioeconomic factors and PA level in children and adolescents with asthma. The review questions were as follows:

* Which instruments have been used to assess the association between psychosocial and socioeconomic factors and PA level in children and adolescents with asthma in quantitative primary studies, and how has information about the construction, validity and reliability of these instruments been reported?
* Which psychosocial and socioeconomic issues related to PA level in children and adolescents with asthma have been explored in qualitative primary studies?

## Inclusion criteria

Types of participants

In this review, we considered studies that included children and adolescents with asthma aged 6–18 years. This age range included participants who were more likely to participate autonomously in physical education and organized sports than were preschool children and, therefore, were more likely to report autonomously about their participation in PA and associated factors. No uniform definition of asthma was required for inclusion. The definitions of asthma and descriptions of participants with regard to asthma control, severity, comorbidities, and other conditions given in the primary studies were mapped and reported. Studies that included children with other chronic conditions were included if the findings for the children with asthma could be isolated and extracted. We included studies of children or adolescents that reported intrapersonal, interpersonal, environmental, and socioeconomic factors and issues, and studies that included caregivers’ reports of interpersonal, environmental, and socioeconomic factors and issues relating to their child’s PA participation. The distinctions regarding children’s/adolescents’ own reports and caregivers’ reports were also mapped and reported.

Concept

In this review, we considered studies that had investigated or explored psychosocial and socioeconomic factors and issues in relation to the level of and participation in PA.

Context

In this review, we considered studies including all contexts of PA such as school time, leisure time, time at home, and organized exercise time performed in all countries.

Types of sources

We considered only primary research studies in accordance with the aim of the review to avoid double-reports from primary and review studies.

The quantitative component of the review considered for inclusion both experimental and epidemiological study designs, including randomized controlled trials, nonrandomized controlled trials, quasi-experimental studies, before-and-after studies, prospective and retrospective cohort studies, case–control studies, analytical and descriptive cross-sectional studies, case series, and individual case reports.

The qualitative component of the review considered studies that focused on qualitative data including, but not limited to, designs such as phenomenology, grounded theory, ethnography, action research, and feminist research, and in which children and adolescents with asthma were interviewed and/or observed.

## Methods

Search strategy

The search strategy aimed to trace both published and unpublished studies. A three-step search strategy was used. An initial limited search of MEDLINE and SPORTDiscus was undertaken and was followed by an analysis of the words contained in the title and abstract and index terms used to describe each article. An interim database search including each possible term for psychosocial or socioeconomic factor identified from initially identified articles did not delimit search results and those search terms were thus excluded. Hence, exclusion or inclusion of records concerning psychosocial and/or socioeconomic factors in relation to PA were handled in the screening process. A second search using all identified keywords and index terms was then undertaken across all included databases; the second search included the title, abstract, and index terms within each database. The test search resulted in about 4000 results from MEDLINE, which included several irrelevant studies related to the terms ‘moderate’ and ‘participate’ that are used to assess the level of PA. The search terms for ‘physical activity’ and ‘physical activity level’ were then linked in the search by the positional operator to retrieve studies using these terms (in any order) within four words of each other.

The databases searched included:

Medline (OVID), Embase (OVID), PsycINFO (OVID), CINAHL (EBSCHOhost), SPORTDiscus (EBSCHOhost), Academic Search Complete (EBSCHOhost), SocINDEX (EBSCHOhost), Social Science Index, and ISI Web of Science.

The search for unpublished studies included:

Primo Central Index, ProQuest Nursing & Allied Health Source, ProQuest Health Management, ProQuest Psychology Journals, and ProQuest Health & Medical Complete.

After screening and identifying the studies, the reference lists of all identified reports were searched, and forward citation searches in ISI Web of Science, CINAHL, Scopus, and Google Scholar were performed. Studies published in English and unrestricted by the year of publication were considered for inclusion in this review.

The detailed search strategy for the three major databases (Medline, SPORTDiscus, and CINAHL) is appended (Appendix 1). Database searches were conducted January 4–6, 2016, and were followed by forward citation searches and reference searches from the included sources.

Extraction of the results

For this review, relevant descriptive information and qualitative and quantitative data were extracted and charted from papers included in the review using a template developed specifically for this review and presented in the protocol.66 Extracted data included specific details about (a) author(s), year of publication, and origin/country of the study; (b) aim of the study; (c) study population (recruitment strategy, gender, age, asthma status, and asthma definition); (d) design; (e) outcome assessment (PA level); (f) instrument used to assess psychosocial or socioeconomic factors; (g) associations between PA level and psychosocial and socioeconomic factors; (h) construction and validation of the instruments used to assess the associations between PA level and psychosocial and socioeconomic factors; and (i) psychosocial and socioeconomic issues related to participation in PA. Because the objective was to map the reported information, there was no attempt to contact authors to obtain information not reported in the papers.

***Analysis of qualitative data***

Psychosocial and socioeconomic issues related to participation in PA from qualitative studies were analyzed by two authors (TW and LF) using steps from qualitative content analysis.67 Extracted wording from primary studies (Appendix 3) were first separated into meaning units and sorted by intra-, interpersonal, and environmental issues. Meaning units were then condensed close to original wording, and grouped by similar issues reported. Finally, issues were categorized into ten distinctive psychosocial issues related to participation in PA.

## Results

Inclusion of studies

Through database searches, 3624 records were identified including 1314 duplicates, which were removed. Five studies52,68-71 were identified through reference and forward citation searches, and four qualitative studies28,29,33,72 were identified by experts in the field. Records that were screened by title and abstract included 2319 studies, 2271 of which were excluded. Studies without any reference to objective of the review in the title and abstract were excluded in the screening process. Any study of doubt was assessed for full-text eligibility. The full text for 48 studies were assessed for eligibility and another 1410,52,73-84 were excluded for various reasons (Figure 1). Thirty-four studies were included in the review.

The study by Rhee et al.70 was identified in the references of the paper by Fereday et al.30 and was initially excluded because there was no reference to the objective of the review in the title and abstract. However, the study by Fereday et al.30 included an outline of the findings of Rhee et al.,70 which were related to the objective. The study by Rhee et al.70 was assessed for full-text eligibility and thereafter included in the review despite the lack of reference to the objective of the review in the title and abstract. Figure 1 presents a PRISMA flow diagram from search to inclusion of the studies according to Moher et al.85

Characteristics of the identified sources

Twenty-one sources were quantitative primary studies that covered the participant age range of 6–19 years. Twenty studies included psychosocial measures associated with PA level,2,14,15,18,21,22,26,69,86-97 and four sources included socioeconomic measures associated with PA level.15,22,25,90 The oldest study was published in 198986 and the most recent in 2015.69,94,95 PA level was measured using a step counter in two studies25,89 and by activity monitor-based accelerometry and heat production in one study.95 In the other 18 sources, PA level was assessed by different self-report instruments, and the International Physical Activity Questionnaire was used in four studies.22,91,92,96 Only two studies included longitudinal measures to identify the factors that predict PA level.89,94 In 19 studies, associations between psychosocial/socioeconomic factors and PA level were investigated cross-sectionally.2,14,15,18,21,22,25,26,69,86-88,90-93,95-97

We identified 13 primary qualitative studies published between 200029 and 201471,80 that described psychosocial issues in relation to PA level reported by children and adolescents aged 4–18 years with asthma.27-30,33,34,68,70-72,98-100 No description of socioeconomic issues in relation to PA level was identified in qualitative studies. Three studies included participants with another chronic condition in addition to asthma,29,30,100 two studies included healthy children in comparison with children with asthma,34,98 three studies included parents,27,30,68 and one study included school staff (teachers, school nurses, activity coordinators) in addition to children and/or adolescents with asthma.27 Detailed characteristics of each of the 34 included studies are given in the extraction charts (Appendix 2 and 3), while a brief overview of included studies are given in table 1.

Narrative summaries of key findings

Psychosocial correlates and determinants of PA level

Table 2 provides an overview of the psychosocial factors associated with PA level, which were classified as intrapersonal, interpersonal, and environmental. The following psychosocial factors were identified as being correlated with PA level: enjoyment (5/5 studies), 2,69,86,93,95 physical self-concept/competence (4/5 studies),2,86,88,91,95 self-efficacy (2/3 studies),18,26,89 attitudes and beliefs about PA and health (4/7 studies),2,15,26,86,88,89,97 psychological distress (3/4 studies),15,21,86,87 HRQoL (2/3 studies),21,96,97 and social support (5/7 studies).14,22,26,89,94,95,97 Body perception87 and health support90 were reported to be correlated with PA level in one study each, while parents’ self-efficacy in stimulating their child’s PA participation26,94 were reported to be correlated twice from the same cohort. Parents’ anxiety and depression91 were assessed in one study but were not reported as being correlated with PA level. Adult restriction of PA was more often reported as not correlating to PA level (1/3 studies).91,92,97 Environmental factors were similarly often reported to correlate and not correlate with PA level (2/4 studies),14,88,90,95 while parents’ attitudes and beliefs about PA and health did not correlate with PA level in three studies,15,89,91 did correlate in two,14,26 and was a determinant of PA level in one study.94 Among those measures of parents’ attitudes and beliefs, the instrument developed by Lang et al.14 was used in four studies. Parents’ attitudes measured using this instrument correlated with PA level in two studies,14,26 did not correlate in one study,91 and were a determinant of PA level in a third study94 (Table 2).

Description of instruments to measure psychosocial correlates

Most measures were based on several items and a Likert-scale type response format. Body perception was measured by participants’ coloring of a body-figure (Color-a-Person Dissatisfaction test, Children´s Version),87 and social support and restriction of PA measured by Lang et al.14 and Dantas et al.92 were categorical measures. Glazebrook et al.15 did not report information about the construction and validation of an exercise beliefs measure. Cheng et al.97 did not report information about the construction and validation of a questionnaire for children with asthma about health and PA beliefs, and support and restriction of PA, and Hsu et al.88 did not report such information about the measure of perceived environment.

One measure of enjoyment (Children´s Attitudes Toward Physical Activity questionnaire),2 three measures of physical self-concept based on Harter’s perceived competence scale, 2,86,91 and three measures of attitudes and beliefs (Children´s Attitudes Toward Physical Activity questionnaire,2 Lang´s Health beliefs,14,91 and Perceived Health Status scale88) involved scales, but the in-study reliability and construct validity of these scales were not reported. The in-study reliability and construct validity were also not reported for measures of anxiety (Sport Competition Anxiety Test or Multidimensional Anxiety Scale for Children),86,87 depression (Children´s Depression Inventory),87 panic and fear (Children´s Asthma Symptoms Checklist),87 the Paediatric Asthma Quality of Life Questionnaire,96,97 and one measure each of mothers´ anxiety and depression (Hospital Anxiety and Depression scale),91 and the Neighborhood environment.90 Stevens et al.90 conducted a factor analysis of the health support measure (Medical Home Total Score) applied in their study, but apparently did not build upon the findings from the factor analysis.

Hsu et al. (Physical self-concept, Perceived health status),88 Kitsantas and Zimmermann (Lung self-efficacy),18 Walders-Abramson et al. (Psychosocial Correlates of Physical Activity Interview),89 Teng et al.(Family Support),22 and Tiggelman et al. (Maternal/paternal support, beliefs, self-efficacy, physical activity, adolescents´ beliefs and self-efficacy, Hospital Anxiety and Depression Scale, Adolescent Asthma Quality of Life Questionnaire and Perceived Stress Scale 10) 21,26,94 reported on the construction of scales and validation by reliability testing of consistency between the response items that contributed to each factor/concept in their measures of physical self-concept,88 self-efficacy,18 children’s/adolescents’ attitudes and beliefs,26,88,89 stress,21 HRQoL,21 social support,26,89,94 and parents’ self-efficacy,26,89,94 attitudes, and beliefs.26,89,94 None of these reports contained in-study factor analysis. Kelsay et al.87 reported a high interrater reliability between different researchers’ coding of the measure of body-perception.

Three measures of enjoyment (Physical Activity Enjoyment Scale, Self-perceived personal, social and environmental factors and partly from Children´s Attitudes Toward Physical Activity inventory),86,93,95 one of which included two factors, enjoyment and boredom,93 and one of which included a combined measure of enjoyment and competence,95 were reported as theoretically derived scales that had been constructed and validated by in-study factor analysis and reliability tests of consistency between the responses for items that contributed to each factor. Similarly, two measures of attitudes and beliefs, motivation and deterrence,86 and one measure each of peer support, teacher support, parental practical support, parental emotional support, safe environment, and physical-social opportunity (Self-perceived personal, social and environmental factors)95 were reported and included in factor analysis and reliability tests. These measures are shown in bold in Table 2.

No measures with an in-study assessment of content or face validity by participants were reported, and there were no cross-citations between qualitative and quantitative reports. Kitsantas and Zimmerman18 reported the assessment of content validity based on suggestions from pulmonologists in their Lung self-efficacy scale. Table 3 provides the reported in-study, or previously established construction and validation of measures used in each study.

Socioeconomic correlates of PA level and description of instruments

Among the four studies that included measures of socioeconomic factors, there was no consistent pattern in the correlation between PA level and socioeconomic factors.15,22,25,90 Three of the four studies included parental occupation.15,22,90 PA did not correlate significantly with a parent having a professional/managerial occupation vs other occupations15 or with social class (with occupation and educational level as contributors).22 By contrast, having a parent employed for >50 weeks in the preceding year correlated with PA level.90 In the study by Stevens et al.,90 household income relative to the federal poverty level correlated with PA level. Three studies included reports of educational level.22,25,90 Vangeepuram et al.25 reported that PA correlated positively with having a parent with a bachelor’s degree but not with having a parent who had graduated from high school. Stevens et al.90 reported a positive correlation between PA level and having a caregiver who had graduated from high school. The social class measure used by Teng et al.22 included both parental education and occupation, and had no correlation with PA level.

Socioeconomic measures reported by Glazebrook et al.,15 Stevens et al.,90 and Vangeepuram et al.25 were based on dichotomization of parental occupation, education, and household income. Two of these studies included having a parent who had graduated high school as a measure for comparison.25,90

The social class measure in the study by Teng et al.22 was based on the Five Social Classes instrument developed by Hollingshead and Redlich (1958),22 which was reduced to three levels (low, medium, and high). Table 4 provides a detailed description of the socioeconomic measures and associations between these factors and PA level.

Psychosocial and socioeconomic issues covered in the qualitative literature

Thirteen qualitative studies reported on the psychosocial issues related to PA level (Table 5).27-30,33,34,68,70-72,98-100 By contrast, none of the qualitative studies described the relationship between socioeconomic issues and PA level. We did not choose to define any distinct boundary between intra- and interpersonal issues, or between interpersonal and environmental issues, because these issues were reported as interrelated, and we did not want to distort the integrated experiences reported. Nevertheless, we found 10 categories of issues concerning participation in PA described in the studies. These were ordered logically from intrapersonal to interpersonal to environmental as follows: ‘enjoyment’, ‘negative feelings’, ‘self-esteem’, ‘capability’, ‘toughen up and downplay asthma’, ‘modification’, ‘being like peers’, ‘belonging’, ‘social support’, and ‘gendered roles’. ‘Capability’ and ‘being like peers’ were reported in 10 (77%) and 11 (85%) of the studies, respectively, which included participants in the age range of 4–18 years. ‘Self-esteem’ was reported only in the study by Williams et al.27 of participants aged 6–14 years. ‘Enjoyment’ was reported in three (23%) studies27,33,72 of participants aged 8–14 years, and ‘social support’ was reported in four (31%) studies27,30,68,99 of participants aged 4–16 years. The remaining issues were reported in five to seven (38–54%) studies each of participants aged from 4, 6, 8 or 9 up to 17 or 18 years. Table 5 provides an overview of the reported issues and ages of participants.

## Discussion

Enjoyment, physical self-concept, self-efficacy, attitudes and beliefs about PA and health, psychological distress, HRQoL, and social support were more often reported as being correlated with PA level than not. Only two of 21 studies included longitudinal analysis, and one determinant of PA level was identified: parents’ specific beliefs about their asthmatic child’s participation in PA.94 In three of 21 studies only, the construct validity of psychosocial factors was assessed and reported by factor analysis and construct reliability tests for the study population.86,93,95 Qualitative studies reported 10 issues related to participation in PA; in these studies, perceived capability and being like peers in relation to PA participation were the two most commonly reported. There was no direct evidence that qualitative studies identified in the review had informed quantitative studies and instruments. The study by Fereday et al.30 was cited in the background and/or discussion section for four studies,26,91,92,94 and this study might have informed the choice of instruments used to measure parental support in those studies.

The findings in our review support the concept that intra- and interpersonal factors are related to PA level in children and adolescents with asthma and that environmental and socioeconomic factors seemed to be less important or may need further investigation. We note that the constructs for these factors were heterogeneous or lacked sufficient information to allow for a more systematic analysis across studies. Quality assessment of the studies was not conducted. Interpretations of strengths and weight of psychosocial and socioeconomic correlates of PA between studies should hence be conducted with care. Further investigation of correlates of PA in children and adolescents with asthma, in particular with use of objective recordings of PA to establish more reliable and valid measures, is needed.

Studies to understand the factors that influence PA level may benefit from an ecological approach by integrating individual psychological, biological, interpersonal, and environmental factors into regional, national, and global policies and structures.60 Factors may influence PA in combination and through interactions with each other.60 It has been suggested that there should be a stronger focus on determinants research as opposed to correlates research, and multidimensional approaches.60,101 Among children and adolescents in general, the consistent psychosocial correlates of PA are self-efficacy, perceived behavioral control, previous PA, and support for PA.60 A different umbrella review found that correlates of PA included perceived competence, self-efficacy, goal orientation/motivation, outcome expectations, fewer perceived barriers, participation in community sports, parental support, support from significant others, access to sport/recreational facilities, time outdoors, parental education, family income, and socioeconomic status.101 Compared with children in general, children with asthma may have specific challenges to being physically active.20 The findings of our review suggest that the ecological approach may also be suitable for assessing the influences on PA in children with asthma. The more consistent pattern of evidence for the intra- and interpersonal correlates of PA than for the environmental and socioeconomic correlates in children with asthma was similar to that in the general population.60,101 To increase knowledge about determinants of PA, the combination and interaction of determinants, and how to manipulate such factors in children and adolescents with asthma, there is also a similar need for longitudinal, experimental, and multidimensional study designs as in the general population.60,101

One important aspect of research instruments is whether they are valid measures of the higher-order constructs they are intended to conceptualize, which is referred to as construct validity.102 Face validity concerns how the instrument or items in the questionnaire are perceived to represent what is measured, and content validity concerns whether the appropriate items represent the higher-order constructs or concepts as judged by experts, previous knowledge, and qualitative inquiries. Criterion-related validity is established according to an external (known) criterion and the association with the measure, either predictive or concurrent.102 The validity of instruments to measure correlates of PA relies on established knowledge, theories, and models;60,61 on in-study reports of the validation and reliability of instruments; and on associations between constructs and recorded PA level. Factor analysis is used to identify clusters of items on a scale, to assess the attributes or dimensions of items empirically, and to group and distinguish these attributes.102,103 Reliability and internal consistency are a property of the instruments used to study a specific population. According to Tavakol and Dennick,103 these measures of reliability should be obtained simultaneously with the use of a specific instrument.

In this review, we found no direct evidence that the results of qualitative studies have been coupled to quantitative studies; that is, quantitative studies do not seem to be informed by the knowledge gained from qualitative studies. Instruments developed previously, both asthma specific and generic, may have included an exploration of the face and content validity in qualitative studies, although we were not able to trace such research. The lack of information about how theory and empirical data informed the face validity, content validity, and construct validity also made interpretation of the constructs challenging. Correlation research, even when the evidence has been obtained in longitudinal studies or summarized in systematic reviews, may contain reduced overall construct validity. By leaning on single constructs isolated from a full theoretical framework from which it stems, patterns of relationships between variables in the theoretical framework may be overlooked.60,61,104 The influence of single constructs (correlates) within a model of PA may appear to differ in importance to PA compared with what might have been the case had the particular correlate been examined as part of a full theoretical framework. Consequently, future research may benefit from considering the relative importance of correlates of PA by testing these as ingredients that may operate as direct influences, mediators, or moderators within the particular full theoretical model from which they originate rather than as isolated sets of correlates originating from different models.

Generic concepts and constructs, such as enjoyment, physical self-concept, self-efficacy, body perception, health and PA beliefs, psychological distress, social support, parental self-efficacy, belief, anxiety and depression, health support, and environmental factors, may be appropriate for assessing the factors that influence PA in both children with asthma and healthy peers. However, some of these factors may also need adjustment when applied to young people with asthma. Several of the instruments used in the studies reviewed here included adjustments or asthma-specific constructs such as lung self-efficacy for PA,18 asthma-specific PA and health beliefs,14,15,91,94,97 asthma-specific panic and fear,87 asthma-specific HRQoL,21,96,97 social support for PA in children and adolescents with asthma,14,97 and restrictions on PA related to asthma.91,92 One may assume that such adjustments or construction of instruments for use with children with asthma have been informed by knowledge about children with asthma. Measures of HRQoL reported in the present review are previously validated in children and adolescents with asthma,105-107 and HRQoL have been used as an outcome of exercise interventions in asthma.36,38,40,41 To our knowledge, the other asthma-specific measures have not been validated or used elsewhere, and knowledge about these instruments comes only from the studies included in the present review.

Most studies lack factor analysis to test for construct validity in the asthma population. There is also a lack of transparency about the source of knowledge about experiences reported by children with asthma informing development of instruments, which suggests that there could be several sources of bias in the evidence concerning the psychosocial correlates of PA in children with asthma. Moreover, if the experiences of children with asthma were not included in the development of instruments adjusted to the asthma population, the conceptualization of the psychosocial factors may have failed to capture the individual perceptions of children with asthma in favor of expert perspectives. With some exceptions,56,108,109 construct validation studies of the correlates of PA, in particular psychosocial factors, have been based on statistical approaches to examine these correlates as observed variables usually in the format of composite scores of items.56 This approach is not able to account for the error variance following any measurement of empirical conceptualizations of theoretical constructs. To deal with this, correlation research on PA among populations of children with asthma (and children in general) may benefit from using a latent variable approach, in which the error variance of each indicator underlying the latent construct can be controlled.110

The gaps in knowledge identified in our scoping review were (a) the lack of longitudinal and/or experimental designs to assess the casual relationships, (b) the lack of objective recording of PA in most studies, (c) the small number of studies and inconsistent knowledge about environmental and socioeconomic correlates of PA, and (d) the questionable validity and large heterogeneity of constructs including lack of transparency about the source of knowledge about the experiences of children and adolescents with asthma, lack of transparent and theory- or evidence-informed adjustment of generic measures for children and adolescents with asthma, and lack of an ecological framework of asthma-specific and generic influences on PA level.

Strengths and limitations

The main strength of the present review is the comprehensive database search without a date limit. We are confident that no study about the concept in scope published in the English language was excluded. Another strength of this review is its mapping of measures of PA level in each study (Appendix 2). The PA level may be a valid criterion to measure the correlates of PA, and the gaps of knowledge about the correlates of PA level in children and adolescents with asthma were accentuated by the heterogeneity of measures applied to assess PA level. The quantitative and qualitative studies included in our review contained reports from both children/adolescents and their parents; this is a strength because it strengthens understanding of interpersonal, environmental, and socioeconomic perspectives of the influences on PA level in young people with asthma. By contrast, inclusion of data obtained from people other than the young person may bias the understanding of how the children’s and adolescents’ own perceptions, motivation, cognition, and beliefs can influence their PA level. To avoid bias in studies in which these perceptions were captured by instruments, reports from people other than children and adolescents are indicated in tables and identified appropriately in the text. Similarly, when participants with other chronic diseases were included in the qualitative studies or when the analyses were conducted separately for boys and girls, we have noted this in the tables. One quantitative study91 included participants up to the age of 19 years, and one qualitative study30 included children from 4 years of age. Despite the inclusion criterion of participants aged 6–18 years, these two studies were included because they involved few children outside the defined age range, and the average ages were 13 and 9.5 years, respectively.

The first author screened the records with assistance from two co-authors. Each study assessed for eligibility was evaluated by at least two additional co-authors, and the data were extracted by the first author in collaboration with at least two co-authors. Two of the included studies28,95 were authored by one and four of the authors of the review, respectively. Data extraction from those studies was conducted by other co-authors to ensure an unbiased interpretation for all studies. Any disagreement was discussed between authors until a common interpretation was achieved.

## Conclusions

Instruments used to assess PA level and psychosocial and socioeconomic factors in more than one study cohort were International Physical Activity Questionnaire,22,91,92,96 different versions of Harter´s physical self-concept scale,2,86,91 Children´s Attitudes Toward Physical Activity,2,86, Pediatric Asthma Quality of Life Questionnaire,96,97 and Lang´s Health beliefs questionnaire.14,26,91,94 Enjoyment, physical self-concept, self-efficacy, attitudes and beliefs about PA and health, psychological distress, HRQoL, and social support were more commonly reported as correlated with PA level than not. Reports of the construction and validation of instruments were sparse, and validation and reliability tests of instruments in the study population were reported in three studies only. Ten issues related to participation in PA were reported in qualitative studies, and capability and being like peers were the two most frequently reported. There was no direct evidence that qualitative studies included in this review had informed the quantitative studies and instruments. The gaps in the present knowledge identified in this review were lack of designs to assess causal relationships, lack of objective recording of PA, and sparse evidence for the environmental and socioeconomic correlates of PA.

## Implications for research

To assess the influences on PA in children and adolescents with asthma, future research should include longitudinal and experimental designs and objective recording of PA. Transparency is needed when reporting the evidence that informs the construction and validation of instruments. Instruments to assess the influences on PA may need to be adjusted or developed for use with children and adolescents with asthma, and these should be informed by knowledge about the experiences of these children and adolescents. Future research may also benefit from being theoretically grounded in an ecological approach. Further meta-analysis of psychosocial factors in relation to PA level based on present findings may not be appropriate or meaningful. Such synthesis may violate the assumptions of a full theoretical framework or ecologic approaches, as well as the homogeneity needed for reliable comparison of complex constructs. A systematic review of qualitative findings may; however, inform appropriate design and development of psychometric measures and contribute to close the gap between experiences of children and adolescents with asthma assessed in qualitative research and the quantifiable measures used in future primary studies.

## Implications for practice

According to the qualitative studies included in the present review and consistent with the correlates of PA reported, participation in PA by children and adolescents with asthma is influenced by intra- and interpersonal factors and issues. Despite sparse knowledge about how to effectively and positively manipulate psychosocial factors to encourage PA participation by children and adolescents with asthma, clinicians, teachers, sport coaches, and parents should consider enjoyment, physical self-concept, self-efficacy, capability, downplaying of asthma, modification of activities, attitudes and beliefs about PA and health, psychological distress, negative feelings, HRQoL, desire to be like peers, belonging, social support, and gendered roles while advising and supporting those patients. Present findings support a JBI Grade B recommendation for such consideration of intra- and interpersonal factors while encouraging PA participation in children and adolescents with asthma.

## Conflicts of interest

The authors report no conflict of interest. The authors alone are responsible for the writing of the review study.

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**Figure 1**: PRISMA Flow Diagram for the scoping review.

Additional records identified through other sources  
(n = 9)

Records identified through database searching  
(n = 3624)

## Identification

Records after duplicates removed  
(n = 2319)

Records excluded  
(n = 2271)

Full-text articles excluded, with reasons (n = 14)

Qualitative studies (n = 4);

no qualitative data of psychosocial or socioeconomic issues related to PA level (n = 4)

Quantitative studies (n = 10);

opposite relationship of scope; influence of PA on psychosocial factors (n = 1)

participants not in age 6-18 years (n = 1)

no statistical analysis of association between PA level and psychosocial or socioeconomic factors (n = 6)

no assessment of PA level (n = 2)

Records screened  
(n = 2319)

Full-text articles assessed for eligibility  
(n = 48)

Studies included in review  
(n = 34)

## Screening

## Eligibility

## Included

**Table 1** Brief overview of included studies (n=34) in the scoping review.

|  |  |  |  |
| --- | --- | --- | --- |
| *Author(s), year of publication*ref, Origin/country of study | Design | Study population | Assessment of physical activity level |
| *Weston et al. 1989*86, New Zealand | Cross-sectional population based study | 408 children aged 11-13, 65 (15.9%) with asthma | Daily frequency of school activity, participation in PA and sports (beside school) from a list of 22 physical activities and sports. Perceived activity (more, same, less than peers) |
| *Kitsantas & Zimmermann, 2000*18, New York City, USA | Cross-sectional population based study | 135 girls aged 14-18, 37 (22%) with asthma, 26 (15%) with breathing problems, and 72 healthy | An activity logof participation in 25 physical activities during a week |
| *Williams 2000*29, London, UK | Qualitative | 20 (10 males, 10 females) adolescents with asthma aged 15-18 and their main carer | N.A. |
| *Callery et al. 2003*68, Manchester, UK | Qualitative | 25 children with asthma aged 9-16 and their main carers | N.A. |
| *Lang et al. 2004*14, Baltimore, Maryland, USA | Case-control study | 137 children with asthma aged 6-12 and 106 controls | Yesterday Activity Checklist |
| *Pianosi & Davis, 2004*2, Nova Scotia, Canada | Cross sectional study | 58 children with asthma aged 8-12 | Hay Activity Evaluation Scale |
| *Kelsay et al. 2005*87, USA | Cross-sectional study | 63 girls with asthma aged 8-18 | A 4-point scale for none to 4 hour or more per week |
| *Glazebrook et al. 2006*15, East Midlands, UK | Case-control study | 56 children with asthma and 61 controls aged 7-14 | Children were asked to rate a range of activities, both active and sedentary, (55 items) in a 3-point scale at 3 time points |
| *Hsu et al. 2006*87, Taiwan | Cross-sectional survey | 152 children with asthma aged 8-11 | Three day physical activity log |
| *Rhee et al. 2007*70, Central Virginia, USA | Qualitative | 19 adolescents with asthma aged 12-18 | N.A. |
| *Walsh et al. 2008*98, Chapel Hill, North Carolina and Temple, Texas, USA | Qualitative | 20 children with asthma and 21 without aged 8-17 | N.A. |
| *de Borba et al. 2009*99, Sao Paolo, Brazil | Qualitative case study | 3 children with asthma aged 9-10 | N.A. |
| *Fereday et al. 2009*30, South Australia | Qualitative | 14 children with asthma aged 4-16 | N.A. |
| *Protudjer et al. 2009*33, Manitoba, Canada | Qualitative | 22 (11 girls, 11 boys) with asthma aged 11 | N.A. |
| *Walders-Abramson et al. 2009*89, Denver, Colorado, USA | Case-control intervention design | 59 children with asthma and 59 controls aged 10-16 years | Pedometer (Omron HJ-112) |
| *Cheng et al. 2010*97, Chongqing, China | Case-control study | 123 children with asthma and 109 controls aged 7-14 | Participation in PA; frequency and duration of PA. (days per week and minutes per day). |
| *Shaw 2010*72, Arizona, USA | Qualitative | 10 children (5 females, 5 males) aged 8-12 years | N.A. |
| *Spencer-Cavaliere & Watkinson 2010*100, Alberta and Manitoba, Canada | Qualitative | 1 child with asthma aged 9 | N.A. |
| *Stevens et al. 2010*90, USA | Cross-sectional population-based study | 6357 with asthma and 57719 without asthma aged 6-17 | After School Activity Participation |
| *Williams et al. 2010*27, Tayside, Scotland | Qualitative | 30 children (15 females, 15 males) aged 6-14, 38 parents, 22 teachers, 2 school nurses, 2 activity coordinators | N.A. |
| *Correia et al. 2012*91, Recife, Brasil | Cross-sectional study | 134 adolescents with asthma aged 10-19 | International Physical Activity Questionnaire |
| *Protudjer et al. 2012*34, Winnipeg, Manitoba, Canada | Qualitative | 12 adolescents with asthma and 10 without | N.A. |
| *Westergren & Lilleaas 2012*28, Norway | Qualitative | 5 male adolescents with asthma aged 13-15 | N.A. |
| *Basso et al. 2013*96, Sao Carlos, Brazil | Cross-sectional study | 19 adolescents with asthma aged 11-15 | International Physical Activity Questionnaire |
| *Dantas et al. 2014*92, Pernambuco, Brazil | Cross-sectional study | 115 children with asthma (mean age 13 years) and 115 mothers | International Physical Activity Questionnaire |
| *Hamer 2014*71, Christchurch, New Zealand | Qualitative | 15 male adolescents with asthma aged 12-17 | N.A. |
| *Latorre-Román et al. 2014*93, Andalusia, Spain | Case-control design | 107 children with asthma and 78 controls aged 10-15 | Physical Activity Questionnaire for Children |
| *Teng et al. 2014*22, Taiwan | Cross-sectional population based study | 286 adolescent with asthma and 588 without aged 12-16 | International Physical Activity Questionnaire |
| *Tiggelman et al. 2014a*26, Netherlands | Cross-sectional population-based study | 261 adolescents with asthma (mean age 11.9) | Adolescent participation in sport clubs assigned MET-scores |
| *Tiggelman et al. 2014b*21, Netherlands | Longitudinal population-based study | 253 adolescents (mean age 13.9) with asthma and their parents | Adolescents’ habitual activities assigned MET-scores |
| *Vangeepuram et al. 2014*25, New York, California and Ohio, USA | Cross-sectional population-based study | 1182 girls aged 6-8 years (16% with athma) | Pedometer; Yamax SW-200 Digi-walker and questionnaire with assignment of MET-scores |
| *Latorre-Román et al. 2015*69, Andalusia, Spain | Quasi-experimental study | 105 children (mean age 11.5); 58 intervention, 47 control | Physical Activity Questionnaire for Children |
| *Westergren et al. 2015*95, Oslo, Norway | Nested case–control study | 95 adolescents with asthma and 79 controls (mean age 13.6) | Activity monitor; SenseWear Pro2 Armband |
| *Tiggelman et al. 2015*94, Netherlands | Population-based longitudinal study | 253 adolescents (mean age 13.9) with asthma and their parents | Adolescents’ sport participation assigned MET-scores |

**Table 2** Psychosocial factors associated with PA level from included studies (n=20). The concept ‘correlate’ is used in assessment of association from one point of measure and the concept ‘determinant’ is used in longitudinal assessment. Empty fields (-) means not measured/not reported. Measures are reported by child/adolescent unless otherwise stated. Factors in bold were reported as theoretically founded scales constructed and validated by in-study factor analysis and reliability tests.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | ***Intrapersonal factors*** | | | | | | | ***Interpersonal factors*** | | | | | ***Environmental factors*** | |
| ***Authors and year of publicationref Age of participants*** | ***Enjoyment of PA*** | ***Physical  self-concept*** | ***Self-efficacy*** | ***Body perception*** | ***Attitudes and beliefs about PA and health*** | ***Psycho-logical distress*** | ***Health-related quality of life*** | ***Social support/ approval of PA*** | ***Restriction of PA*** | ***Parents´ self-efficacy to stimulate their child´s PA‡*** | ***Parents´ attitudes and beliefs about PA and health‡*** | ***Parents´ anxiety and depression‡*** | ***Health support*** | ***Environ- mental factors*** |
| *Weston et al. 1989*86*, CS 11-13 years* | **Correlated†** | Correlated† | - | - | **Correlated** | Correlated† | - | - | - | - | - | - | - | - |
| *Kitsantas & Zimmermann, 2000*18*, CS 14-18 years*§ | - | - | Correlated† | - | - | - | - | - | - | - | - | - | - | - |
| *Lang et al.  2004*14*, CC 6-12 years* | - | - | - | - | - | - | - | Not Correlated‡ | - | - | Correlated† | - | - | Not Correlated |
| *Pianosi & Davis, 2004*2*, CS 8-12 years* | Correlated | Correlated | - | - | Correlated | - | - | - | - | - | - | - | - | - |
| *Kelsay et al.  2005*87*, CS 8-18 years*§ | - | - | - | Correlated | - | Correlated | - | - | - | - | - | - | - | - |
| *Glazebrook et al. 2006*15*, CC 7-14 years* | - | - | - | - | Not Correlated | Correlated | - | - | - | - | Not Correlated | - | - | - |
| *Hsu et al.  2006*88*, CS 8-11 years* | - | Not Correlated | - | - | Not Correlated | - | - | - | - | - | - | - | - | Correlated† |
| *Walders-Abramson et al. 2009*89*, CC int. 10-16 years* | - | - | Not Correlated‡ | - | Not Correlated | - | - | Not Correlated‡ | - | - | Not Correlated | - | - | - |
| *Cheng et al.  2010*97*, CC 7-14 years* | - | - | - | - | Correlated | - | Correlate | Correlated | Correlated | - | - | - | - | - |
| *Stevens et al. 2010*90*, CS 6-17 years* | - | - | - | - | - | - | - | - | - | - | - | - | Correlated†‡ | Correlated†‡ |
| *Correia et al. 2012*91*, CS 10-19 years* | - | Correlated | - | - | - | - | - | - | Not Correlated‡ | - | Not  Correlated | Not  Correlated | - | - |
| *Basso et al.  2013*96*, CS 11-15 years* | - | - | - | - | - | - | Correlated | - | - | - | - | - | - | - |
| *Dantas et al.  2014*92*, CS mean 13.1 years* | - | - | - | - | - | - | - | - | Not Correlated‡ | - | - | - | - | - |
| *Latorre-Roman et al. 2014*93*, CC 10-15 years* | **Correlated** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *Teng et al.  2014*22*, CS 12-16 years* | - | - | - | - | - | - | - | Correlated† | - | - | - | - | - | - |
| *Tiggelman et al. 2014a*26*, CS mean 11.9 years* | - | - | Correlated† | - | Correlated | - | - | Correlated† | - | Correlated† | Correlated | - | - | - |
| *Tiggelman et al. 2014b*21*, long. mean 13.9 years* | - | - | - | - | - | Not  Correlated | Not Correlated | - | - | - | - | - | - | - |
| *Latorre-Roman et al. 2015*69*, QE mean 11.5 years* | Correlated | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *Westergren et al. 2015*95*, NCC 12-14 years* | **Correlated†** | **Correlated†** | - | - | - | - | - | **Correlated†** | - | - | - | - | - | **Not Correlated** |
| *Tiggelman et al. 2015*94*, long. mean 13.9 years* | - | - | - | - | - | - | - | Correlated‡ | - | Correlated | Determinant† | - | - | - |

† Covariance/multiple regression analysis  
‡ Reported by parents (alone or in addition to children/adolescents)  
§ Analysis of female participants only  
Abbreviations; PA; physical activity, n; numbers, CS; cross-sectional design, CC; case-control design, CC int.; case-control intervention design, long.; longitudinal design, QE; Quasi-experimental design, NCC; nested case-control design.

**Table 3** Reported information about instruments to measure psychosocial factors, and reported information about construction, validity and reliability of instruments from included quantitative studies (n=20).

|  |  |  |  |
| --- | --- | --- | --- |
| *Authors and year of publication*ref | Measurement of psychosocial and/or socioeconomic factor | In-study reports of previously established validity and reliability of instruments | Reports of in-study construction, validation and reliability of instruments |
| *Weston et al. 1989*86 | **Anxiety** (Sport Competition Anxiety Test (Martens, 1977))  **Physical self-concept** (seven items from Harter´s (1982) perceived competence scale).  **Enjoyment**; partly from Children´s attitudes towards PA (CATPA) inventory (Schutz et al 1985) in six dimensions; social interaction, fitness and health, competence, competition, asceticism and enjoyment per se.  **Deterrence**, 11 items in 5-point scale  **Motivation** (Gill et al. 1983) 13 items. |  | Questionnaires completed by children themselves in their classrooms by supervision of their teachers and one investigator.  **Factor analysis** *Enjoyment*: fitness-health (“keeping yourself physically fit”, “keeping yourself healthy as well”, “being physically active”, “moving around a lot” ; competition-asceticism (“seeing if you´re better than others”, “doing long and hard training”, competing against others”, “pushing yourself hard”); mastery (“being good at it”, doing it well”) *Deterrence*: overall dislike of exercise (“it´s too much effort”, “I don´t like exercise or sport”, I don´t have enough energy”); asthma/asthma symptoms (“asthma”, “feeling short of breath”, “coughing”) *Motivation*: fitness-health (“to keep fit”, “It´s good for me”, “to keep myself healthy”); competition (“I like the competition”, “it gives me something to do”, “to get better at it”); compulsion (“I have to do it at school”, “my parents say I should”); social (“to make new friends”, “to have fun”, “to be with my friends”) **Reliability** Re-administration of questionnaires to 15% (n=61) students. ICC of enjoyment, deterrence and motivation dimensions ranged from 0.53 (modest) to 0.93 (excellent) except from mastery which was excluded (ICC=0.40). |
| *Kitsantas & Zimmermann, 2000*18 | **Lung self-efficacy;** response of self-beliefs related to 25 physical activities. |  | *Lung self-efficacy***;** items developed from activities commonly used in quality of life questionnaires and from suggestions from pulmonologists. Question stated: “How sure are you that you can engage in the following activities *without* experiencing breathing problems?” with response alternatives in a 5-point Likert scale (5 (completely sure), 4 (slightly sure), **3** (undecided), 2 (slightly unsure), 1 (completely unsure)). **Reliability** The interitem reliability Cronbach’s **ɑ** of the self-efficacy scale was 0.94. |
| *Lang et al. 2004*14 | **Categorical (yes /no):** *-Neighborhood safety -Walking distance to recreation center -Adult exercise with child -Recall of physician advice regarding exercise.*  **Scale: *Health beliefs;*** *benefits of exercise, appropriateness of exercise, feelings about exercise* |  | Scale of health beliefs constructed as answer of questions/statements only (5-point Likert scale ranging from “strongly disagree” to “strongly agree”. No factor analysis or reliability tests.  Other factors were categorical; yes/no. Parents were responders and were asked to have their child present during interviews so children also could be asked the similar questions. |
| *Pianosi & Davis, 2004*2 | **Perceived Competence Scale for Children** (Harter 1982), modified version.  **Children’s Attitudes Toward Physical Activity (CATPA) questionnaire** (Schutz et al 1985). |  | No in-study information provided. |
| *Kelsay et al. 2005*87 | **Body perception** Color-a-Person Dissatisfaction test, Children´s Version. (CAPT-C) (Breitenoder-Wehrung et al, 1998)  **Psychological status** Multidimensional Anxiety Scale for Children. (MASC) (March et al, 1997) Children´s Depression Inventory (CDI) (Kovacs, 1985)  **Asthma perception** Children´s Asthma Symptoms Checklist (CASCL), panic and fear subscale (Fritz & Overholser, 1989) | *Anxiety*; Excellent internal reliability, good convergent validity and divergent validity (March et al 1997)  *Depression*; Test-retest reliability between 0.74 and 0.77 and internal consistency estimated by coefficient alpha of 0.84 (Smucker et al 1986) | *Body perception*; coloring of frontal and side view of body figure (male or female) corresponding to very happy, happy, neutral or okay, unhappy and very unhappy. Child color the figure based on how they feel about their body. Score of 60 areas between 1 and 5 (1 indicating the greatest satisfaction. Coded by a student  **Reliability** CAPT-C was coded by a student and 10% was double coded by researcher, inter-reliability of double coded 10% were; 0.98. *Anxiety*; 39 items, 4-point scale from “never true about me” to “often true about me *Depression*; 27 items where participant pick one out of three sentences that best describes them over the past 2 weeks including affective, social, attitudinal and vegetative symptoms of depression. |
| *Glazebrook et al. 2006*15 | **Exercise beliefs Questionnaire**  **Mental health** (Strengths and Difficulties Questionnaire (SDQ), Parent Version, Goodman, 1997) | *Mental health (SDQ)*; Internal consistency; Cronbach´s α 0.73 (Goodman, 2001). The instrument has been reported to discriminate child mental health clinic attendees from community controls. | *Exercise beliefs;* asthma as a barrier and increased control as a facilitator reported. No information regarding construction of factors or questionnaire. Responses from both parents and children. *Mental health (SDQ)*; 25 items divided into 5 subscales each of 5 items; conduct problems, hyper-reactivity/inattention, emotional symptoms, peer problems and prosocial behaviors. |
| *Hsu et al. 2006*88 | **Contemplation stage changing exercise behavior;** Five stages ofTranstheoretical Theory (Prochaska et al. 1997, Walton et al. 1999)  **Perceived health status;** 4 items, from Perceived Health Status scale (Hunt et al 1980, Yoos et al 1997)  **Physical self-concept;** 29 items (Fox et al 1989, Marsh 1993, Chung 1996)  **Environmental factors** (no information provided) |  | *Perceived health status*;4 items, 5 point Likert scale from Perceived Health Status scale (Hunt et al 1980, Yoos et al 1997). **Reliability** Cronbach´s α 0.71.  *Physical self-concept;* 29 items with a 6-point Likert scale, high score represents positive self-concept. Items cover flexibility, endurance, appearance, agility, obesity and strength.  **Reliability** Cronbach´s α 0.89. |
| *Walders-Abramson et al. 2009*89 | **Psychosocial Correlates of Physical Activity interview -** parent and child psychosocial correlates composite score; (Saunders et al 1997; Motl et al 2000) |  | *Psychosocial Correlates of Physical Activity interview*; (Saunders et al 1997; Motl et al 2000) with strong psychometric properties and extensive previous use in literature. Motl et al 2000; Dishman et al 2002; Sallis et al, 2000)  One parent from each family and the identified child were asked to respond to a set of items using Likert-type scales, with interviews lasting approximately 45 min. A sample item included asking the youth to respond to the following question along a five-point Likert-type scale of how much they agree with the statement: ‘‘I can be physically active during my free time on most days.’’ **Reliability** A parent and child psychosocial correlates composite score was generated to compile responses across domains of health beliefs, activity attitudes, self-efficacy, and social support for physical activity. Cronbach’s α for all measures ranged between 0.70 and 0.87 in the present study. |
| *Cheng et al. 2010*97 | **The pediatric asthma quality-of-life questionnaire** (PAQLQ, Juniper et al, 1996)  **Questionnaire for children with asthma**: -Views about the relationship between asthma and exercise  -Parents' and teachers' attitudes towards asthmatic children taking part in sports and whether these adults had restricted children's exercise. -Doctors' attitudes towards asthmatic children exercising and whether they had discussed physical activity with the children. |  | No further information provided. |
| *Stevens et al. 2010*90 | **Medical Home Total Score** (perceived, including five features;access, continuity, comprehensiveness, family-centered care and coordination of care.  **Neighborhood environment;** availability of parks/playgrounds and recreation or community center; neighborhood safety (Likert scale of 2 items including safety of school and safety of community). |  | Medical Home Total Score based on American Academy of Pediatrics seven features previously used (Bethell et al, 2004, Shi et al, 2004, Stevens et al, 2009).  Each question was assigned a score of 0-12 (12 correspond to the best score).  Factor analysis of Medical Home Total Score; indicating 4 features. 5 features still created.  Summary score of each feature divided on all non-missing questions.  Total score as average of the averages.  Neighborhood environment; no further information provided. |
| *Correia et al. 2012*91 | Athletic competence and self-worth domains of the **Self-Perception Profile for Children** (Harter, 1982)  Mothers´ anxiety levels with the **Hospital Anxiety and Depression Scale** (Botega et al 1995)  **Attitudes and Beliefs towards PA** (Lang et al, 2004) Additional questions towards mothers whether they could identify asthma or wheezing during or after PA and if they imposed restrictions. |  | No further information given. |
| *Basso et al. 2013*96 | **The pediatric asthma quality-of-life questionnaire** (PAQLQ, La Scala et al, 2005) |  | *PAQLQ*; 23 items in three domains (symptoms – 10 items, activity limitation – 5 items, emotional function – 8 items). Children report how they feel the previous week in a 7-point scale ranging from extremely bothered (1) to not bothered at all (7). Scores for each domain are summed and divided by number of questions, and total score by summing the individual domain scores. |
| *Dantas et al. 2014*92 | **Questionnaire towards mothers regarding PA prevention.** |  | *Questionnaire towards mothers regarding PA prevention*; “Do you prevent your child from taking part in sports or games because of asthma in the period when he/she is not having an attack?” |
| *Latorre-Roman et al. 2014*93 | **Physical Activity Enjoyment Scale (PACES)** (Motl et al, 2001; Moreno et al, 2008). |  | *PACES*; 16 items, preceded by the sentence “When I am active…” evaluating the enjoyment from the highest level to the lowest. Answers are given in a 5-point Likert scale. **Factor analysis** reveal 2 factors; PA enjoyment and PA boredom. Confirmatory factor analysis results show an acceptable goodness of fit confirming the factorial structure of the scale of enjoyment. Further, the scale revealed convergent validity with PA. **Reliability** Cronbach´s α in the study was 0.907. |
| *Teng et al. 2014*22 | **Family support** (Lee´s social support for PA scale (2000). |  | *Family support;* high score indicates stronger family support. **Reliability** Cronbach´s α 0.83 and test-retest reliability 0.89. Then classified into two groups by 50th percentile; below and above 50th. |
| *Tiggelman et al. 2014a*26 | **Maternal Sport-Specific Support** (4 items from the Dutch Sport-Specific Parental Support Scale (Jurg et al 2005) and 2 items from Davison et al (2003)  **Maternal Beliefs About Offspring’s Participation in Sport**. 12 items from the Attitude towards Sport Scale (Jurg et al 2005).  **Maternal Beliefs About Own Participation in Sport**. 13 items on the Beliefs about Sport Scale (Jurg et al 2005)  **Maternal Physical Activity**. One item (Jurg et al 2005)  **Maternal Self-Efficacy to Stimulate to Participate in Sport**. 7 items (Jurg et al 2005)  **Adolescents´ Self-Efficacy**, 8 items from the Self-Efficacy Scale (Jurg et al 2005)  **Adolescent’s Beliefs About Sport Participation**, 14 items from the Attitude towards Sport scale (Jurg et al 2005). |  | *Maternal Sport-Specific Support;*(4 items from the Dutch Sport-Specific Parental Support Scale (Jurg et al 2005); (e.g. “How often do you watch your child participate in sports?”) and 2 items from Davidson et al (2003) (“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?”) Reports on a 5-point Likert scale ranging from never/almost never (1) to every day (5). **Reliability** Cronbach´s α of the six items was 0.63.  *Maternal Beliefs About Offspring’s Participation in Sport*; 12 items from the Attitude towards Sport Scale (Jurg et al 2005). (e.g., “When your child participates in sports, he/she has fun with his/her friends”). Responses on a 5-point Likert scale ranging from (1) I do not agree at all to (5) I completely agree. **Reliability** Cronbach’s α 0.75.  *Maternal Beliefs About Own Participation in Sport*; 13 items on the Beliefs about Sport Scale (Jurg et al 2005) (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. **Reliability** Cronbach’s α 0.78  *Maternal Physical Activity;* One item (Jurg et al 2005) (“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?”) 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*; 7 items (Jurg et al 2005) (e.g., “Do you find it easy or difficult to stimulate your child to participate in sports when you do not have much time?”). Responses measured on a 5-point Likert scale ranging from (1) very hard to (5) very easy. Higher scores indicated higher levels of self-efficacy. **Reliability** Cronbach’s α 0.92  *Adolescents´ Self-Efficacy*, 8 items from the Self-Efficacy Scale (Jurg et al 2005) (e.g., “Do you find it difficult or easy to participate in sport when there is a nice program on television?”) Responses measured on a 5-point Likert scale ranging from (1) very hard to (5) very easy. **Reliability** Cronbach’s α 0.78.  *Adolescent’s Beliefs About Sport Participation,* 14 items from the Attitude towards Sport scale (Jurg et al 2005). (e.g., “When I participate in sports, I have fun with my friends”). Responses were measured on a 5-point Likert scale ranging from (1) I do not agree at all to (5) I completely agree. **Reliability** Cronbach’s α 0.74. |
| *Tiggelman et al. 2014b*21 | **Hospital Anxiety and Depression Scale (HADS**, Dutch version, Sigmond & Snaith, 1983)  **Adolescent Asthma Quality of Life Questionnaire (AAQOL)** (Rutishauser et al 2001; dutch version; Ven van de MOM et al 2007)  **Perceived Stress Scale-10** (Dutch version, Cohen et al 1983) |  | *HADS;* Dutch version, Sigmond & Snaith, 1983) Symptoms of anxiety (e.g. I feel tense or wound up) and depression (e.g. I look forward with enjoyment to things) were assessed with seven items measured on a four-point scale, with higher scores indicating more symptoms. For this study, anxiety and depression were combined into one scale (Spinhoven et al 1997) **Reliability** Cronbach’s α 0.76 (2012), and 0.74 (2013).  *AAQOL;* developed uniquely for adolescents with asthma. 6 subscales: symptoms (six items, e.g. ‘‘How bothered have you been by wheezing?’’ 2012 α=0.87, 2013 α =0.88); medication (five items, e.g. ‘‘How bothered or concerned have you been about taking medication for your asthma?’’ 2012 α =0.71, 2013 α =0.76); physical activities (six items, e.g. ‘‘How often did running make you cough or wheeze?’’ 2012 α =0.80, 2013 α =0.83); emotions (five items, e.g. ‘‘How often did you feel worried or concerned because of your asthma?’’ 2012 α =0.86, 2013 α =0.85); social interaction (five items, e.g. ‘‘How often did you feel worried or embarrassed when taking asthma medication in front of other people?’’ 2012 α =0.64, 2013 α=0.61); and positive effects (five items, e.g. ‘‘With regard to your asthma, how often have your friends been helpful and understanding?’’ 2012 α =0.78, 2013 α=0.80).  Measured on a seven-point Likert scale from 1 to 7. An overall measure of QOL (total QOL; α =0.91) was created without the positive effects domain because it could not be meaningfully added to the total score and without the symptom domain, because this domain had too much content overlap with asthma control.  *Perceived Stress Scale-10;* 10 items (e.g. In the last month, how often have you felt confident about your ability to handle your personal problems?) were measured on a five-point Likert scale ranging from 0 (never) to 4 (very often)  **Reliability** Cronbach´s α=0.82. |
| *Latorre-Roman et al. 2015*69 | **Physical Activity Enjoyment Scale** (PACES) (Motl *et al.*, 2001), Spanish version (Moreno, González-Cutre, Martínez, Nestor, & López, 2008). |  | *Physical Activity Enjoyment Scale;* (Motl *et al.*, 2001), Spanish version (Moreno, González-Cutre, Martínez, Nestor, & López, 2008). Consists of 16 items, preceded by the sentence “When I am active...,” and evaluates the enjoyment from the highest level (e.g., “I enjoy,” “It is very exciting,” “I find it enjoyable”) to the lowest (e.g. “I am bored,” “I do not like it,” “It frustrates me”). The answers were collected in a Likert scale whose punctuation ranks oscillate from 1 (totally disagree) to 5 (totally agree).  **Reliability** Cronbach’s alpha in this study was 0.907. |
| *Westergren et al. 2015*95 | **Self-perceived personal, social and environmental factors** were assessed by a paper-based validated self-report questionnaire. |  | *Self-perceived personal, social and environmental factors* were assessed by a paper-based validated self-report questionnaire (Ommundsen et al 2006; Ommundsen et al 2008; Bergh et al 2001) designed to capture theoretically derived relevant perceived personal, social and environmental factors shown to influence PA in children. To test the construct validity for the instrument exploratory **factor analysis** with varimax rotation was conducted.  Cronbach’s α was used to assess the internal reliability of the instrument. In the parental practical support, teacher support and physical-social opportunity scales one item each with poor loading were removed to increase internal reliability.  Social support questions (emanated from Bandura´s social cognitive theory); Response format 1–4; 1=never or hardly ever, 2=once or twice a week, 3=almost every day and 4=every day  *Parental practical support* (2 items; e.g. “How often does your mother or father take you to exercise or play sports?”)  **Reliability** Cronbach´s α=0.59  *Parental emotional support* (2 items; e.g. “How often does your mother or father encourage you to play, exercise or do sports?”) **Reliability** Cronbach´s α=0.68  Peer support (3 items; e.g. “How often do your friends exercise or play sports with you?”)  **Reliability** Cronbach´s α= 0.82  *Teacher support* (2 items; e.g. “How often does your teacher talk about exercise in lessons?”)  **Reliability** Cronbach´s α= 0.60  Competence, enjoyment (emanated from Harter´s competence motivation theory) and environment questions; response format 1–5; 1=does not suit for me, 5=suits for me.  *Competence-enjoyment* (5items; e.g. “I wish I could play more games and sports than I get chance to.”) **Reliability** Cronbach´s α= 0.73  *Safe environment* (4 items; e.g. “It is safe to walk or play alone in my neighborhood during the day.”)  **Reliability** Cronbach´s α= 0.75  *Physical-social opportunity* (2 items; e.g. “There are other children nearby home to go out and play with.”)  **Reliability** Cronbach´s α= 0.48 |
| *Tiggelman et al. 2015*94 | **Maternal/paternal Sport-Specific Support** (4 items from the Dutch Sport-Specific Parental Support Scale (Jurg et al 2005) and 2 items from Davison et al (2003)  **Maternal/paternal general beliefs about their child’s sport participation** 13 items of the Attitude towards Sports Scale (Jurg et al 2005)  **Maternal/paternal asthma-specific beliefs about their child’s sport participation** 7 items (Lang et al 2004).  **Maternal/paternal self-efficacy to encourage child’s sport participation** 7 items (Jurg et al 2005) |  | *Maternal/paternal Sport-Specific Support;*(4 items from the Dutch Sport-Specific Parental Support Scale (Jurg et al 2005); (e.g. “How often do you watch your child participate in sports?”) and 2 items from Davidson et al (2003) (“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?”) Reports on a 5-point Likert scale ranging from never/almost never (1) to every day (5). **Reliability** Cronbach´s α of the six items was 0.84 for mothers and 0.89 for fathers.  *Maternal/paternal general beliefs about their child’s sport participation*; 13 items of the Attitude towards Sports Scale (Jurg et al 2005) (e.g. When your child participates in sports, he/she has fun with his/her friends). Responses 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. **Reliability** Cronbach´s α=0.80 (mothers) =0.76 (fathers).  *Maternal/paternal asthma-specific beliefs about their child’s sport participation;* 7 items (e.g. When your child participates in sports, his/her asthma gets worse) (Lang et al 2004). Items 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 seven items was calculated. **Reliability** Cronbach´s α=0.75 (mothers) =0.70 (fathers).  *Maternal/paternal self-efficacy to encourage child’s sport participation;* 7 items (e.g. Do you find it easy or difficult to encourage your child to participate in sports when you do not have much time?) (Jurg et al 2005) 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. **Reliability** Cronbach´s α =0.88 (mothers) =0.92 (fathers). |

Abbreviations: PA; physical activity, ICC; intra-class correlation coefficient

**Table 4** Socioeconomic factors associated with PA level, instrument used, and reported information about construction, validity and reliability of instruments from included quantitative studies (n=4).

|  |  |  |  |
| --- | --- | --- | --- |
| *Authors and year of publication*ref *design, age of subjects* | Association with PA level | Measurement of psychosocial and/or socioeconomic factor | Construction and validation of measurement |
| *Glazebrook et al. 2006*15*, CC 7-14 year*§†‡ | Professional/managerial occupation vs. other – not correlated | National Statistics Socio-economic Classification (UK, 2000) | *Occupation;* Professional/managerial, Intermediate, Routine or Student/unemployed. |
| *Stevens et al. 2010*90*, CS 6-17 years*†‡ | Poverty status, parent employment, and high school graduate – correlated | Poverty status (≥200% of federal poverty level). Parent education (high school graduate vs. less than high school). Parent employment (worked at least 50 weeks last year) | No further information provided. |
| *Teng et al.  2014*22*, CS 12-16 years* | High vs. low social class – Not correlated | Five Social Classes (Hollingshead & Redlich, 1958) ranging from high (1) to low (5), divided into low (4 and 5, medium (3) and high (1 and 2) (Oguma et al. 2002). | *Five social Classes*; based on occupation and education. No further information provided. |
| *Vangeepuram et al. 2014*25*, CS 6-8 years*§‡ | Caregiver education levels of bachelor’s degree or more – correlated  Caregiver education levels of high school degree or more – not correlated | Self-reported level of caregiver education (less than or greater than a high school degree and less than and greater than a Bachelor´s degree). | No further information provided. |

† Covariance/multiple regression analysis  
‡ Reported by parents  
§ Analysis of female participants only  
Abbreviations: PA; physical activity, n; numbers, CS; cross-sectional design, CC; case-control design

**Table 5** Psychosocial issues in relation to PA level reported in qualitative research studies (n=13).

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Authors and year of publication*ref *Age of participants* | Enjoyment | Negative feelings | Self-esteem | Capability | Toughen up and downplay asthma | Modification | Being like peers | Belonging | Social support | Gendered roles | Number of issues reported in each study |
| *Williams  2000*29 *15-18 years¶*‡ |  | X |  | X | X |  |  |  |  | X | 4 |
| *Callery et al.  2003*68 *9-16 years*‡ |  | X |  |  |  |  | X |  | X |  | 3 |
| *Rhee et al.  2007*69 *12-18 years* |  | X |  | X | X | X | X |  |  | X | 6 |
| *Walsh et al. 2008*98 *8-17 years* |  | X |  |  |  |  | X |  |  |  | 2 |
| *de Borba et al. 2009*99 *9-10 years*‡ |  |  |  | X | X | X | X | X | X |  | 6 |
| *Fereday et al. 2009*30 *4-16 years¶* |  |  |  | X |  | X | X |  | X |  | 4 |
| *Protudjer et al. 2009*33 *11 years* | X |  |  | X | X | X | X | X |  |  | 6 |
| *Shaw  2010*72 *8-12 years* | X |  |  | X |  | X | X | X |  |  | 5 |
| *Spencer-Cavaliere & Watkinson  2010*100 *9 years¶* |  |  |  |  |  |  | X | X |  |  | 2 |
| *Williams et al. 2010*27 *6-14 years* £ | X |  | X | X |  | X | X | X | X | X | 8 |
| *Protudjer et al. 2012*34 *15-16 years* |  |  |  | X |  | X | X | X |  |  | 4 |
| *Westergren & Lilleaas  2012*28 *13-15 years* β |  |  |  | X | X |  |  |  |  | X | 3 |
| *Hamer 2014*71 *12-17 years* β |  | X |  | X | X |  | X | X |  | X | 6 |
| *Range of number of issues reported* |  |  |  |  |  |  |  |  |  |  | 2-8 |
| *Age range covered* | **8-14** | **8-18** | **6-14** | **4-18** | **9-18** | **4-18** | **4-18** | **6-17** | **4-16** | **6-18** | **4-18** |
| *Number (%) of studies covered* | **3(23)** | **5(38)** | **1(8)** | **10(77)** | **6(46)** | **7(54)** | **11(85)** | **7(54)** | **4(31)** | **5(38)** |  |

‡ Parents participated in addition to children/adolescents  
¶ Participants with other chronic conditions included in addition to asthma  
£ Teachers/school staff participated in addition to children/adolescents and their parents  
β Male participants only  
Abbreviations; PA; physical activity, n; numbers

**Appendix 1** Detailed search strategy for three major databases

*Medline via Ovid interface:*

((adolescen\* OR child\* OR schoolchild\* OR teenage\* OR young OR youth\*) AND ((exercise\* OR inactiv\* OR motor activ\* OR physical activ\* OR play\* OR sport\* OR training\*) ADJ4 (amount\* OR daily\* OR dose\* OR duration\* OR energy expenditure\* OR frequen\* OR hour\* OR insufficient\* OR intens\* OR less\* OR level OR minute\* OR moderate\* OR more\* OR participat\* OR sufficient\* OR vigorous\* OR week\*)) AND asthma\*).ti,ab,hw.

*SPORTDiscus and CINAHL via EBSCHO Host interface:*

((adolescen\* OR child\* OR schoolchild\* OR teenage\* OR young OR youth\*) AND ((exercise\* OR inactiv\* OR motor activ\* OR physical activ\* OR play\* OR sport\* OR training\*) N4 (amount\* OR daily\* OR dose\* OR duration\* OR energy expenditure\* OR frequen\* OR hour\* OR insufficient\* OR intens\* OR less\* OR level OR minute\* OR moderate\* OR more\* OR participat\* OR sufficient\* OR vigorous\* OR week\*)) AND asthma\*)

**Appendix 2** Extraction chart for quantitative papers included in the review (n=21).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Author(s), year of publicationref, and origin/ country of study** | **Aim of the study** | **Study population (recruitment strategy, gender, age, asthma status and definition, socioeconomic characteristics)** | **Design** | **Outcome assessment (PA level)** | **Instrument used to assess (1) psychosocial or (2) socioeconomic factors** | **Key findings: associations between PA level and (1) psychosocial and (2) socioeconomic factors** | **Key findings: construction and validation of instruments used to assess associations between PA level and (1) psychosocial and (2) socioeconomic factors** |
| Weston et al. 198986  New Zealand | To determine the level of participation in PA of asthmatic schoolchildren and their peers. The attitudes of the children toward PA were also investigated to determine whether any differences in exercise behavior were a reflection of differences in motivation, physical self-concept, anxiety, or enjoyment. | Recruitment from five intermediate schools, randomly choosing 2-4 classrooms.  408 children 11-13 years old, 15.9% (n=65) asthmatics, 4.4% asthmatics in remission, 1.5% uncertain. 51% males.  Asthma; claimed by child based on parents` and/or doctors` opinion, use of medicine for asthma and days off school because of asthma during the last year (2 of 4 items fulfilled). Frequency of asthma attacks from not at all to once or twice a day. | Cross-sectional population based study | Daily frequency of school activity (modest reliability; ICC =0.52)  Daily frequency of participation in PA and sports (beside school) from a list of 22 physical activities and sports.  Perceived activity (more, same, less than peers)  Reliability of all activity; ICC=0.68. | 1. Psychosocial  **Anxiety** (Sport Competition Anxiety Test (Martens, 1977))  **Physical self-concept** (seven items from Harter´s (1982) perceived competence scale).  **Enjoyment**; partly from Children´s attitudes towards PA (CATPA ) inventory (Schutz et al 1985) in six dimensions; social interaction, fitness and health, competence, competition, asceticism and enjoyment per se.  **Deterrence**, 11 items in 5-point scale  **Motivation** (Gill et al. 1983) 13 items. | 1. Psychosocial  Asthmatic status, enjoyment, physical self-concept and anxiety were significantly associated with level of PA and explained 18% of the variance.  Indication that the relationship between psychometric variables and PA were not different in children with and without asthma. | 1. Psychosocial  **Questionnaires completed by children themselves** in their classrooms by supervision of their teachers and one investigator.  **Factor analysis**  *Enjoyment*: fitness-health (“keeping yourself physically fit”, “keeping yourself healthy as well”, “being physically active”, “moving around a lot”; competition-asceticism (“seeing if you´re better than others”, “doing long and hard training”, competing against others”, “pushing yourself hard”); mastery (“being good at it”, doing it well”)  *Deterrence*: overall dislike of exercise (“it´s too much effort”, “I don´t like exercise or sport”, I don´t have enough energy”); asthma/asthma symptoms (“asthma”, “feeling short of breath”, “coughing”)  *Motivation*: fitness-health (“to keep fit”, “It´s good for me”, “to keep myself healthy”); competition (“I like the competition”, “it gives me something to do”, “to get better at it”); compulsion (“I have to do it at school”, “my parents say I should”); social (“to make new friends”, “to have fun”, “to be with my friends”)  **Reliability**  Re-administration of questionnaires to 15% (n=61) students.  ICC of enjoyment, deterrence and motivation dimensions ranged from 0.53 (modest) to 0.93 (excellent) except from mastery which was excluded (ICC=0.40). |
| Kitsantas & Zimmermann, 200018  New York City, USA | To examine asthmatic and non-asthmatic girls’ lung self-efficacy perceptions regarding their directly recorded participation in strenuous activities and physical fitness. | Recruitment by inviting the entire student body of a parochial high school for girls serving multiethnic families.  Predominantly from middle class according to an index of occupations; 39% from families whose primary occupation were classified as professional, executive, and technical, 29% from other white-collar occupations, 8% from skilled blue-collar occupations, 18% from unskilled blue-collar jobs, and 6% receiving public service.  135 school-girls, aged 14-18 years (mean 15.92). 37 diagnosed with asthma (22%), 26 with incapacitating breathing problems (15%) and 72 without breathing problems.  3 girls with severe asthma, 30 with mild-to-moderate asthma and 4 unknown, | Cross-sectional population based study | An activity logdeveloped to measure the girls’ levels of participation during a week. The same list of 25 physical activities from self-efficacy instrument was used. Girls could rate their answers with a 6-point rating scale. The girls were asked, “Before bed each night, record the time you spent in each activity or group of activities in terms of one of following categories: 0 = no participation, 1 = participating up to but not including 5 min, 2 = 5-20 min, 3 = 20-40 min, 4 = 40-60 min, and 5 = 60 min or more.”  The internal consistency of the activity log was 0.81 according to Cronbach’s ɑ test. | 1. Psychosocial  **Lung self-efficacy;** response of self-beliefs related to 25 physical activities. | 1. Psychosocial  Self-efficacy was the most potent predictor of activity level (β=0.47) Self-efficacy add 7% explained variance in activity level and modified the strength of asthma as predictor of activity level. | 1. Psychosocial  *Lung self-efficacy***;** items developed from activities commonly used in quality of life questionnaires and from suggestions from pulmonologists. Question stated: “How sure are you that you can engage in the following activities *without* experiencing breathing problems?” with response alternatives in a 5-point Likert scale (5 (completely sure), 4 (slightly sure), **3** (undecided), 2 (slightly unsure), 1 (completely unsure)).  **Reliability**  The interitem reliability Cronbach’s **ɑ** of the self-efficacy scale was 0.94. |
| Lang et al. 200414  Baltimore, Maryland, USA. | To compare the activity levels of inner-city children with asthma to their peers and to evaluate the factors associated with the activity level of children with asthma. | Recruitment at an urban, hospital-based primary care pediatric clinic, using billing records to identify any clinic enrollee 6-12 years old who had made a visit to the primary care clinic in the preceding 2 years.  137 children with asthma (mean age 9.8, SD 1.7) and,106 controls (mean age 9.3, SD 1.7), similar in race, gender (58-63% males) and neighborhood attributes.  Asthma; medical diagnose and symptoms last 12 mon. according to Centers for Disease Control and Prevention in surveillance (*Morb Mortal Wkly Rep*. 1998).  Children with asthma; 28% mild intermittent, 26% mild persistent, 32% moderate persistent and 13% severe persistent by classification from the National Asthma Education and Prevention Program guidelines (Childhood Asthma Management Program Research Group, 1999). | Case-control study | Parental interview of minutes active/day; low PA= <30min, medium PA= 30-119min, high PA ≥120min based on the “Yesterday Activity Checklist” of the Physical Activity Checklist Interview Protocol (Sallis et al 1996).  Piloted on 22 volunteer parents; tested for same-day test-retest reliability with an ICC of 0.97 and variability of 55% for minutes of activity and ICC of 0.83 and variability of 31% for days per week active. | 1. Psychosocial  **Categorical (yes /no):**  *Neighborhood safety*  *Walking distance to recreation center*  *Adult exercise with child*  *Recall of physician concerning exercise.*  **Scale:**  ***Health beliefs;*** *benefits of exercise, appropriateness of exercise, feelings about exercise* | 1. Psychosocial  In children with asthma:  Parent`s belief that child got upset with strenuous activity were associated with low PA (OR 3.28 (95%CI1.32, 8.16)).  Belief that exercise will make child´s health better was associated with high PA (OR 2.50 (95%CI 1.17, 5.35)). | 1. Psychosocial  Scale of health beliefs constructed as answer of questions/statements only (5-point Likert scale ranging from “strongly disagree” to “strongly agree”.  No factor analysis or reliability tests.  Other factors were categorical; yes/no.  Parents were responders and were asked to have their child present during interviews so children also could be asked the similar questions. |
| Pianosi & Davis, 20042  Nova Scotia, Canada | To examine the relationships among weight, asthma severity, physical activity, and aerobic fitness in children with asthma. | Recruitment from a summer asthma camp.  58 (32 male) children with asthma (mild 34 (58%), moderate 20 (35%) and severe 4 (7%)) aged 8-12 years  Asthma; physician diagnosed with impairment of asthma above zero.  Asthma severity determined by spirometric indices, degree of bronchial hyper-responsiveness and amount of medications prescribed. | Cross sectional study | Habitual activity level was assessed by the Hay Activity Evaluation Scale (HAES), (Hay et al 1995) designed to categorize daily physical activity (hours spent inactive, somewhat inactive, somewhat active, and active). | 1. Psychosocial  **Perceived Competence Scale for Children** (Harter 1982), modified version.  **Children’s Attitudes Toward Physical Activity (CATPA) questionnaire** (Schutz et al 1985). | 1. Psychosocial  Perceived competence (*r*=0.39) and attitudes towards PA (summary score of CATPA) (*r*=0.42) correlated significantly with habitual PA. No differences related to asthma severity class. | 1. Psychosocial  No in-study information provided. |
| Kelsay et al. 200587  USA | To identify correlates of body dissatisfaction in youth with asthma. | Recruitment through a larger National Heart, Lung and Blood Institute funded study assessing asthma symptom perception.  63 females and 60 males between 8-18 years (mean 12) from grater Denver community  Asthma if documented treatment the previous 6 mon. and absence of other major chronic disease.  Asthma severity based on National Heart, Lung and Blood Institute guidelines including pulmonary function results, medication history and symptoms rating.  Among girls 2% had mild intermittent, 62% mild persistent and 21% moderate persistent. In boys, there were 2% mild intermittent, 58% mild persistent, 30% moderate persistent and 8% severe persistent.  Parents´ education level was high, with 68% of mothers and 64% of fathers having some education beyond high school. Mean Hollingshead occupational codes ranged from 0 to 9 for fathers (*M* = 4.71, *SD* = 2.63) and mothers (*M* = 4.16, *SD* = 2.88). | Cross-sectional study | PA level assessed based on a 4-piont scale from none to 4 hour or more per week. | 1. Psychosocial  **Body perception**  Color-a-Person Dissatisfaction test, Children´s Version. (CAPT-C) (Breitenoder-Wehrung et al, 1998)  **Psychological status**  Multidimensional Anxiety Scale for Children. (MASC) (March et al, 1997)  Children´s Depression Inventory (CDI) (Kovacs, 1985)  **Asthma perception**  Children´s Asthma Symptoms Checklist (CASCL), panic and fear subscale (Fritz & Overholser, 1989) | 1. Psychosocial  No significant correlation between level of PA (*analysis only in girls*) and CASCL panic and fear.  Negative significant Pearson´s r correlation between level of PA and Depression/CDI (*r*= -0.39), Anxiety/MASC (-0.34) and Body perception/CAPT-C (*r*= -0.51) in girls. | 1. Psychosocial  *Body perception*; coloring of frontal and side view of body figure (male or female) corresponding to very happy, happy, neutral or okay, unhappy and very unhappy. Child color the figure based on how they feel about their body. Score of 60 areas between 1 and 5 (1 indicating the greatest satisfaction. Coded by a student  **Reliability**  10% double coded by researcher, inter-reliability; 0.98.  *Anxiety*; 39 items, 4-point scale from “never true about me” to “often true about me”. Excellent internal reliability, good convergent validity and divergent validity (in other study; March et al 1997)  *Depression*; 27 items where participant pick one out of three sentences that best describes them over the past 2 weeks including affective, social, attitudinal and vegetative symptoms of depression. Test-retest reliability between 0.74 and 0.77 and internal consistency estimated by coefficient alpha of 0.84 (in other study; Smucker et al 1986) |
| Glazebrook et al. 200615  East Midlands, UK | To identify barriers to physical activity in children with asthma and to compare their customary activity levels, BMI and emotional well-being with that of children with other medical conditions. | Recruitment among children aged 7-14 years attending outpatient appointments at 2 hospitals.  56 children with asthma (mean age 10.67) and 61 children without asthma (mean age 10.97). Asthma; diagnosed on the basis of wheeze and recorded bronchodilator responsiveness or peak flow variability as recommended by British Thoracic Society/Scottish Intercollegiate Guidelines Network guideline (2006).  Rather more children in the non-asthma group had parents in professional or managerial occupations, but this difference was not significant. | Case-control study | Children were asked to rate a range of activities, both active and sedentary, (55 items) in a 3-point scale (none, a little, a lot) at 3 time points (today before school, yesterday after school, yesterday at school) the previous 24h.  Scores summed to total score of sedentary activities and total score of PA. | 1. Psychosocial  **Exercise beliefs Questionnaire**  **Mental health**  (Strengths and Difficulties Questionnaire (SDQ), Parent Version, Goodman, 1997)  2. Socioeconomic  **Parental occupation**  National Statistics Socio-economic Classification (UK, 2000) | 1. Psychosocial  Children with asthma with better mental health (lower SDQ score) participated in significantly more PA (*r*= -0.35).    2. Socioeconomic  Socioeconomic status (Professional/managerial occupation vs. other) was not associated with number of physical activities. | 1. Psychosocial  *Exercise beliefs;* asthma as a barrier and increased control as a facilitator reported. No information regarding construction of factors or questionnaire. Responses from both parents and children.  *Mental health (SDQ)*; 25 items divided into 5 subscales each of 5 items; conduct problems, hyper-reactivity/inattention, emotional symptoms, peer problems and prosocial behaviors. Internal consistency reported by Goodman, 2001; Cronbach´s α 0.73. The instrument has been reported to discriminate child mental health clinic attendees from community controls.  2. Socioeconomic  *Occupation;* Professional/managerial, Intermediate, Routine or Student/unemployed. |
| Hsu et al. 200688  Taiwan | To assess the amount of PA children with asthma participate in and to explore the factors which influence their levels of PA. | 152 children age 8-11 years with asthma diagnosed by a physician, clinically stable, without any other chronic disease or major physical disabilities. | Cross-sectional survey | Three-day PA log (3-dPAL; Bouchard et al 1983). Recall of nine levels of PA in one weekday and one weekend day which were categorized in mild activity, moderate activity and vigorous activity. Pilot studied on 15 school-aged children with a test-re-test reliability of 0.78 and thereafter refined. | 1. Psychosocial  **Contemplation stage changing exercise behavior;** Five stages ofTranstheoretical Theory (Prochaska et al. 1997, Walton et al. 1999)  **Perceived health status;** 4 items, from Perceived Health Status scale (Hunt et al 1980, Yoos et al 1997)  **Physical self-concept;** 29 items (Fox et al 1989, Marsh 1993, Chung 1996)  **Environmental factors** (no information provided) | 1. Psychosocial  None of the psychological factors influenced time spent in PA.  Access to exercise facilities positively influenced MVPA (β=0.235) and access to sports team positively influenced VPA (β=0.193). | 1. Psychosocial  *Perceived health status*;4 items, 5 point Likert scale from Perceived Health Status scale (Hunt et al 1980, Yoos et al 1997).  **Reliability**  Cronbach´s α 0.71.  *Physical self-concept;* 29 items with a 6-point Likert scale, high score represents positive self-concept. Items cover flexibility, endurance, appearance, agility, obesity and strength.  **Reliability**  Cronbach´s α 0.89. |
| Walders-Abramson et al. 200989  Denver, Colorado, USA | (1) Do children with asthma have lower levels of objectively measured physical activity compared to otherwise healthy controls at baseline? (2) Will children with asthma demonstrate a smaller response to a brief, pedometer based activity intervention compared to controls? (3) What are the psychosocial, demographic, and physiologic correlates of activity? | Recruitment from urban primary care clinics serving disadvantaged populations.  Children (59 with asthma, mean age 13.3 (SD 1.8), 59 controls, mean age 13.2 (SD 1.8)) 10-16 years with no other chronic disease than asthma or physical challenges.  Asthma; physician diagnosed of at least one year duration and one or more prescription of medications with FEV1 >85% and no hospitalization due to exacerbation the last 2 months.  Asthma was ruled out in controls by physical examination, clinic history and spirometry.  Most families (66.1%) reported a total income of less than $50,000. | Case-control intervention design | PA measured by pedometer (Omron  Pedometer Model HJ-112®) recorded for 7 days pre- and post-intervention. | 1. Psychosocial  **Psychosocial Correlates of Physical Activity interview -** parent and child psychosocial correlates composite score; (Saunders et al 1997; Motl et al 2000) | 1. Psychosocial  No group differences were found in physical activity attitudes, self-efficacy, or social support for physical activity between cases and controls. Youth with asthma had lower health belief scores (mean (SD) 72.9 (9.5), reflecting less positive health attitudes, compared to controls (mean (SD) 76.9 (9.1). Despite this difference, health belief score did not relate to activity levels at baseline, follow-up or the change score (data not shown). Additionally, both groups demonstrated comparable psychosocial correlate composite scores, and these scores were not related to change in activity level. | 1. Psychosocial  *Psychosocial Correlates of Physical Activity interview*; (Saunders et al 1997; Motl et al 2000) with strong psychometric properties and extensive previous use in literature. Motl et al 2000; Dishman et al 2002; Sallis et al, 2000)  One parent from each family and the identified child were asked to respond to a set of items using Likert-type scales, with interviews lasting approximately 45 min. A sample item included asking the youth to respond to the following question along a five-point Likert-type scale of how much they agree with the statement: ‘‘I can be physically active during my free time on most days.’’  **Reliability**  A parent and child psychosocial correlates composite score was generated to compile responses across domains of health beliefs, activity attitudes, self-efficacy, and social support for physical activity. Cronbach’s α for all measures ranged between 0.70 and 0.87 in the present study. |
| Cheng et al. 201097  Chongqing, China | To investigate the current status of children with asthma taking part in exercise in China. | Recruitment through the Asthma Control Center of a Children´s Hospital and controls randomly from a primary school.  123 children (82 boys) 7-14 years of age with a diagnosis of asthma, no use of inhaled steroids the day before the visit; no administration of oral corticosteroids in 4 weeks before the visit; and no asthma attack in 2 weeks before the visit.  Asthma; National Guidelines for Asthma (Respiratory Section of Chinese Pediatric Association, 2008)  Controls; 109 healthy children (60 boys) never diagnosed with asthma selected randomly from a primary school with similar age and gender composition. | Case-control study | Participation in PA; frequency and duration of PA. (days per week and minutes per day). | 1. Psychosocial  **The pediatric asthma quality-of-life questionnaire** (PAQLQ, Juniper et al, 1996)  **Questionnaire for children with asthma**:  Views about the relationship between asthma and exercise  Parents' and teachers' attitudes towards asthmatic children taking part in sports and whether these adults had restricted children's exercise.  Doctors' attitudes towards asthmatic children exercising and whether they had discussed physical activity with the children. | 1. Psychosocial  In children with asthma:  Children with low PA (<3 days per week or <20min per day) significantly more frequently reported belief that exercise will make asthma worse and parents´ and teachers´ restriction of exercise and significantly less frequently reported that doctors approved them to participate in sports.  Children with asthma and low PA reported significantly lower PAQLQ total scores and scores of activity, symptoms and emotional function domains compared with those with high PA. | 1. Psychosocial  No further information provided. |
| Stevens et al. 201090  USA | To examine the relationship between medical home quality and measures of daily life experiences among children with asthma. | National Survey of Children´s Health (2007), 6357 respondents with one child <18 years (6-17 years, mean 11.6) with current asthma (57719 without asthma).  55% vs. 63% had a poverty status ≥200% of federal poverty level, 54% vs. 89% had a household member employed 50+ weeks per year and 92% vs. 90% of parents had a high school graduate or higher in children with vs. without asthma, respectively. | Cross-sectional population-based study | **After School Activity Participation**; Days past week exercise/sport/PA for 20+ min including sweat/breathe hard; participation last year in sports (yes/no). | 1. Psychosocial  **Medical Home Total Score** (perceived, including five features;access, continuity, comprehensiveness, family-centered care and coordination of care.  **Neighborhood environment;** availability of parks/playgrounds and recreation or community center; neighborhood safety (Likert scale of 2 items including safety of school and safety of community).    2. Socioeconomic  **Poverty status** (≥200% of federal poverty level).  **Parent education** (high school graduate vs. less than high school).  **Parent employment** (worked at least 50 weeks last year) | 1. Psychosocial  Medical Home Total Score was associated with days last week in exercise/sports/PA (β 0.10 (0.01, 0.19)) but not with sports participation last year. The features of access (β=0.08 (C95%CI 0.03, 0.13)) and family-centered care (β=0.10 (C95%CI 0.04, 0.16)) were associated with days in exercise/sports/PA while access (OR 1.09 (95%CI 1.02, 1.16)) and coordination (OR 0.93 (95%CI 0.88, 0.98)) were associated with participation in sports last year.  Availability of parks/playgrounds and recreation/community center were not associated with days of exercise or participation in sports last year.  Safety of school/community was associated with days of exercise (β=0.28 (C95%CI 0.07, 0.50)) and participation in sports last year (OR 1.64 (C95%CI 1.37, 1.98))  2. Socioeconomic  Poverty status (OR 3.11 (2.39, 4.03)), employment 50+ weeks last year (OR 2.67 (95%CI 1.89, 3.78)), and high school graduate (OR 2.87 (95%CI 1.95, 4.29)) were associated with participation in sports last year.  Poverty status was not, while employment 50+ weeks last year (β=0.47 (95%CI 0.04, 0.90)), and high school graduate (β 0.59 (0.08, 1.09)) were associated with days past week in exercise/sport/PA. | 1. Psychosocial  Medical Home Total Score based on American Academy of Pediatrics seven features previously used (Bethell et al, 2004, Shi et al, 2004, Stevens et al, 2009).  Each question was assigned a score of 0-12 (12 correspond to the best score).  Factor analysis of Medical Home Total Score; indicating 4 features. 5 features still created.  Summary score of each feature divided on all non-missing questions.  Total score as average of the averages.  Neighborhood environment; no further information provided.      2. Socioeconomic  No further information provided. |
| Correia et al. 201291  Recife, Brasil | To compare PA levels in asthmatic adolescents with and without EIB and the influence of mothers´ beliefs of asthma worsening due to PA and attitudes in restraining their children´s PA, asthma severity, severe EIB, or bronchospasm perception. | Recruitment through an allergy clinic where participants had their disease and severity classified.  134 adolescents with asthma aged 10-19 years, 82 with intermittent/mild asthma and 52 with moderate/severe asthma classified according to Global Initiative for Asthma. 31 with EIB and FEV1 decrease >20%, 31 with =10 to <20% decrease in FEV1 post exercise. | Cross-sectional study | Short version of **International Physical Activity Questionnaire (IPAQ). (**Craig et al 2003) Include PA performed for at least 10 continuous minutes at any day on the previous week and its intensity. Participants classified as active if they reported PA >150 min/week and 30 min/day more than 5 days/week | 1. Psychosocial  Athletic competence and self-worth domains of the **Self-Perception Profile for Children** (Harter, 1982)  Mothers´ anxiety levels with the **Hospital Anxiety and Depression Scale** (Botega et al 1995)  **Attitudes and Beliefs towards PA** (Lang et al, 2004)  Additional questions towards mothers whether they could identify asthma or wheezing during or after PA and if they imposed restrictions. | 1. Psychosocial  46 (34.4%) reported that their mothers actively advised against PA – not associated with level of PA.  There was a significantly stronger sense of self-competence in the athletic domain of the Self-Perception Profile for Children who were inactive compared with active adolescents (mean score 15.5 vs. 14.0) but no difference in the self-worth domain.  97% of mothers believed that exercise is important, 78% believed that adolescent with asthma cannot participate in PA as much as their healthy peers, and 44% that exercise can be harmful. Those beliefs were not associated with level of PA in adolescents. | 1. Psychosocial  No further information given. |
| Basso et al. 201396  Sao Carlos, Brazil. | To determine whether the quality of life of adolescents with asthma correlates with parameters obtained prior to and after the six-minute step test (6MST); spirometric results after the 6MST; and level of physical activity. | Recruitment through active community surveillance.  19 (15 boys) adolescents with asthma between 11 and 15 yrs. Asthma; clinical and/or spirometric diagnosis, confirmed with pre- and post-bronchodilator. Clinically stable, and with no other disease preventing them from proposed tests.  All mild intermittent to mild persistent asthma according to criteria from GINA (2007). | Cross-sectional study | The short version of the **International Physical Activity Questionnaire** (IPAQ, Portuguese Brazilian version; Matsudo et al 2001)  7 open questions which provide information to estimate weekly time spent in different activities (duration and frequency of moderate to vigorous activities and in walking). Participants are classified as sedentary, insufficiently active, active or very active. | 1. Psychosocial  **The pediatric asthma quality-of-life questionnaire** (PAQLQ, La Scala et al, 2005) | 1. Psychosocial  Weekly time spent in walking correlated significantly with symptom domain of PAQLQ (0.45), Weekly time spent in VPA (0.50) and total weekly time in PA (0.51) with the activity limitation domain of PAQLQ. | 1. Psychosocial  *PAQLQ*; 23 items in three domains (symptoms – 10 items, activity limitation – 5 items, emotional function – 8 items). Children report how they feel the previous week in a 7-point scale ranging from extremely bothered (1) to not bothered at all (7). Scores for each domain are summed and divided by number of questions, and total score by summing the individual domain scores. |
| Dantas et al. 201492  Pernambuco, Brazil | To investigate whether mothers try to impose limitations on the physical activity (PA) of their asthmatic children/adolescents; identify associated factors; and explore if this attitude has any impact on children’s PA levels. | Recruitment among children previously diagnosed with asthma and referred to the Pulmonary Function Laboratory to investigate EIB.  115 pairs of mothers and their offspring. Children were 13.06 years (mean) and 67 were males. 70 (61%) had intermittent or mild persistent and 45 (39%) had moderate to severe asthma.  Asthma severity classified according to GINA (2009).  Of the 115 mothers, 10% were illiterate, 63% had completed elementary school and 27% high school. Income levels were classified as ≤1 minimum monthly wage ($280 US) at the time of the survey (47%), >1 <2 minimum monthly wage (37%) and ≥2 minimum monthly wage (16%). | Cross-sectional study | **International Physical Activity Questionnaire** (IPAQ,administrated to children)translated into Portuguese and validated in Brazil (Guedes et al 2005)  Participants divided in 2 groups; active (very active or active) and inactive (irregularly active or sedentary). | 1. Psychosocial  **Questtionnarie towards mothers regarding PA prevention.** | 1. Psychosocial  37% of mothers impose restrictions on their children´s PA which were not associated with level of PA in children. | 1. Psychosocial  *Questionnaire towards mothers regarding PA prevention*; “Do you prevent your child from taking part in sports or games because of asthma in the period when he/she is not having an attack?” |
| Latorre-Roman et al. 201493  Andalusia, Spain | The aim of this study is to test the psychometric properties of the Physical Activity Enjoyment Scale (PACES) in children with asthma. | 185 students (mean age 11.8) between 10-15 yrs. 107 with severe asthma diagnosed by an allergy specialist according to criteria from GINA (2005) and 78 healthy children with similar age and BMI. | Case-control design | **Physical Activity Questionnaire for Children** (PAQ-C) (Kowalski et al, 1997; Spanish version Martínes-Gómez et al, 2009).  Registers the PA competed in 7 days before administration. Cronbach´s α in the present stud of 0.726. | 1. Psychosocial  **Physical Activity Enjoyment Scale (PACES)** (Motl et al, 2001; Moreno et al, 2008) | 1. Psychosocial  Spearman´s r´ coefficient between average PAQ-C and PACES was 0.378. | 1. Psychosocial  *PACES*; 16 items, preceded by the sentence “When I am active…” evaluating the enjoyment from the highest level to the lowest. Answers are given in a 5-point Likert scale.  Factor analysis reveal 2 factors; PA enjoyment and PA boredom. Confirmatory factor analysis results show an acceptable goodness of fit confirming the factorial structure of the scale of enjoyment. Further, the scale revealed convergent validity with PA.  **Reliability**  Cronbach´s α in the study was 0.907. |
| Teng et al. 201422  Taiwan | To compare the amount of physical activity between asthmatic and non-asthmatic adolescents in Taiwan, as well as to investigate the influential factors associated with insufficient physical activity in asthmatic adolescents. | Purposive sampling from eight junior high schools.  286 adolescents with asthma and 588 without between 12-16 years.  Asthma; diagnosed by a physician at least 5 mon. before the study.  Adolescents with and without asthma were not different in socio-economic status score. 38% of boys vs. 33% girls with asthma had low socio-economic status. Medium status was recorded in 46% vs. 60% and high status in 17% vs. 7% in boys vs. girls with asthma, respectively. | Cross-sectional population based study | **International Physical Activity Questionnaire** (IPAQ,Chen, 2006; Liou et al, 2008)  Reports of PA last 7 days in 5 domains; activity in school, self-powered transport, household work activity, leisure time PA and sedentary activities. Test-re-test reliability of 0.75 over two weeks | 1. Psychosocial  **Family support** (Lee´s social support for PA scale (2000).  2. Socioeconomic  **Five Social Classes** (Hollingshead & Redlich, 1958) ranging from high (1) to low (5), divided into low (4 and 5, medium (3) and high (1 and 2) (Oguma et al 2002). | 1. Psychosocial  Adolescents with low family support were significantly more often inactive (<300min MVPA/week; 45% vs. 17.1%) and were significantly less in MVPA compared with adolescents with high family support (504 (±514) min/week vs. 831 (±646) min/week).  Adjusted OR of high family support (0.39 (95% CI 0.20, 0.74) versus low (1.0) for being in insufficient PA (<300min MVPA/week).  2. Socioeconomic  No statistical significant association between level of PA and social class. | 1. Psychosocial  *Family support;* high score indicates stronger family support.  **Reliability**  Cronbach´s α 0.83 and test-retest reliability 0.89.  Then classified into two groups by 50th percentile; below and above 50th.  2. Socioeconomic  Five social Classes; based on occupation and education. No further information given. |
| Tiggelman et al. 2014a26  Netherlands | To test 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. | Recruitment from 213 primary schools and 73 secondary schools, and magazine announcement.  261 families with one adolescent (mean age 11.9 years) diagnosed with asthma by a physician and who had used asthma medication at least once during the last 12 months and with adequate Dutch language skills.  Mothers´ educational level was lower (elementary, lower vocational; 10%), Intermediate (intermediate general, intermediate vocational; 40%), and higher (higher general, higher vocational, university; 50%). | Cross-sectional population-based study | **Adolescent’ Participation in Sport Clubs**. Adolescents 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, (Ainsworth et al, 2011) for each sport, which were then multiplied by the frequency with which the adolescents participated in this sport. | 1. Psychosocial  **Maternal Sport-Specific Support** (4 items from the Dutch Sport-Specific Parental Support Scale (Jurg et al 2005) and 2 items from Davison et al (2003)  **Maternal Beliefs About Offspring’s Participation in Sport**. 12 items from the Attitude towards Sport Scale (Jurg et al 2005).  **Maternal Beliefs About Own Participation in Sport**.  13 items on the Beliefs about Sport Scale (Jurg et al 2005)  **Maternal Physical Activity**. One item (Jurg et al 2005)  **Maternal Self-Efficacy to Stimulate to Participate in Sport**. 7 items (Jurg et al 2005)  **Adolescents´ Self-Efficacy**, 8 items from the Self-Efficacy Scale (Jurg et al 2005)  **Adolescent’s Beliefs About Sport Participation**, 14 items from the Attitude towards Sport scale (Jurg et al 2005). | 1. Psychosocial  Maternal sport specific support (β=0.21) and her self-efficacy (to stimulate sport participation in offspring) (β=0.26) accounted for 19.5% of the variance in adolescents´ sport participation.  Adolescents´ self-efficacy significantly mediated the effect of maternal self-efficacy on adolescent sport participation (indirect effect; β=0.09, SE=3.01), and when adolescents´ self-efficacy (β=0.28) and beliefs (n.s.) were included, 25.2% of the variance in adolescent sport participation was explained. | 1. Psychosocial  *Maternal Sport-Specific Support;*(4 items from the Dutch Sport-Specific Parental Support Scale (Jurg et al 2005); (e.g. “How often do you watch your child participate in sports?”) and 2 items from Davidson et al (2003) (“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?”)  Reports on a 5-point Likert scale ranging from never/almost never (1) to every day (5).  **Reliability**  Cronbach´s α of the six items was 0.63.  *Maternal Beliefs About Offspring’s Participation in Sport*; 12 items from the Attitude towards Sport Scale (Jurg et al 2005). (e.g., “When your child participates in sports, he/she has fun with his/her friends”). Responses on a 5-point Likert scale ranging from (1) I do not agree at all to (5) I completely agree.  **Reliability**  Cronbach’s α 0.75.  *Maternal Beliefs About Own Participation in Sport*; 13 items on the Beliefs about Sport Scale (Jurg et al 2005) (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.  **Reliability**  Cronbach’s α 0.78  *Maternal Physical Activity;* One item (Jurg et al 2005) (“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?”) 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*; 7 items (Jurg et al 2005) (e.g., “Do you find it easy or difficult to stimulate your child to participate in sports when you do not have much time?”). Responses measured on a 5-point Likert scale ranging from (1) very hard to (5) very easy. Higher scores indicated higher levels of self-efficacy.  **Reliability**  Cronbach’s α 0.92  **Adolescents´ Self-Efficacy**, 8 items from the Self-Efficacy Scale (Jurg et al 2005) (e.g., “Do you find it difficult or easy to participate in sport when there is a nice program on television?”) Responses measured on a 5-point Likert scale ranging from (1) very hard to (5) very easy.  **Reliability**  Cronbach’s α 0.78.  **Adolescent’s Beliefs About Sport Participation**, 14 items from the Attitude towards Sport scale (Jurg et al 2005). (e.g., “When I participate in sports, I have fun with my friends”). Responses were measured on a 5-point Likert scale ranging from (1) I do not agree at all to (5) I completely agree.  **Reliability**  Cronbach’s α 0.74. |
| Tiggelman et al. 2014b21  Netherlands | To examine whether habitual PA could predict changes in psychosocial outcomes (i.e. symptoms of anxiety and depression, quality of life (QOL) and stress) and asthma control over time in adolescents with asthma and whether gender moderated these relationships. | Recruitment from 213 primary schools and 73 secondary schools, and magazine announcement.  Participants; Families with one adolescent (mean age 13.9 yrs.) diagnosed with asthma by a physician and who had used asthma medication at least once during the last 12 months and with adequate Dutch language skills. In 2012, 258 families (98.9%) with 265 adolescents participated and in 2013, 253 families (96.9%) participated with 260 adolescents. | Longitudinal population-based study | Adolescents reported up to five habitual activities (e.g. soccer, wii and school gym) in which they participated and the time spent engaging in that particular activity. Adolescents also reported whether they rode a bike or walked to school, the distance to school and the time it takes them to get to school from home.  All PA’s (i.e. habitual activities, school transportation and instruments played) were given a MET-score based on the Compendium of Physical Activities (Ainsworth et al 2011), and these MET-scores were then multiplied by the minutes that the adolescents spent on participating in these activities every week. These scores were then summed to create a total PA score. | 1. Psychosocial  **Hospital Anxiety and Depression Scale (HADS**, Dutch version, Sigmond & Snaith, 1983)  **Adolescent Asthma Quality of Life Questionnaire (AAQOL)** (Rutishauser et al 2001; dutch version; Ven van de MOM et al 2007)  **Perceived Stress Scale-10** (Dutch version, Cohen et al 1983) | 1. Psychosocial  Habitual PA was not correlated with any of the psychosocial variables. | 1. Psychosocial  *HADS;* Dutch version, Sigmond & Snaith, 1983) Symptoms of anxiety (e.g. I feel tense or wound up) and depression (e.g. I look forward with enjoyment to things) were assessed with seven items measured on a four-point scale, with higher scores indicating more symptoms. For this study, anxiety and depression were combined into one scale (Spinhoven et al 1997)  **Reliability**  Cronbach’s α 0.76 (2012), and 0.74 (2013).  *AAQOL;* developed uniquely for adolescents with asthma. 6 subscales: symptoms (six items, e.g. ‘‘How bothered have you been by wheezing?’’ 2012 α=0.87, 2013 α =0.88); medication (five items, e.g. ‘‘How bothered or concerned have you been about taking medication for your asthma?’’ 2012 α =0.71, 2013 α =0.76); physical activities (six items, e.g. ‘‘How often did running make you cough or wheeze?’’ 2012 α =0.80, 2013 α =0.83); emotions (five items, e.g. ‘‘How often did you feel worried or concerned because of your asthma?’’ 2012 α =0.86, 2013 α =0.85); social interaction (five items, e.g. ‘‘How often did you feel worried or embarrassed when taking asthma medication in front of other people?’’ 2012 α =0.64, 2013 α=0.61); and positive effects (five items, e.g. ‘‘With regard to your asthma, how often have your friends been helpful and understanding?’’ 2012 α =0.78, 2013 α=0.80).  Measured on a seven-point Likert scale from 1 to 7. An overall measure of QOL (total QOL; α =0.91) was created without the positive effects domain because it could not be meaningfully added to the total score and without the symptom domain, because this domain had too much content overlap with asthma control.  *Perceived Stress Scale-10;* 10 items (e.g. In the last month, how often have you felt confident about your ability to handle your personal problems?) were measured on a five-point Likert scale ranging from 0 (never) to 4 (very often)  **Reliability**  Cronbach´s α=0.82. |
| Vangeepuram et al. 201425  New York, California and Ohio, USA | To investigate the association between asthma diagnosis and physical activity and to examine differences in these associations by race/ethnicity, weight status and caregiver education. | 1182 girls (399 from NY, 339 from Ohio, 444 from California) between 6-8 yrs. (mean 7.3)  Asthma diagnosis (16%) was assessed using the Brief Pediatric Asthma Screen (BPAS; Wolf et al, 2003) with a positive answer on 1 of 4 asthma questions and a report of physician diagnose of asthma.  One-third of all respondents reported highest level of caregiver education as high school or less, one-third as some college and one-third as a bachelor’s degree or higher. | Cross-sectional population-based study | PA was assessed with a step counter diary (completed by girls from the California and New York sites; Yamax SW-200 Digi-walker pedometer) Average of pedometer steps per day for at least 4 days. Other activities; queried in diary for seven consecutive days. Parents were also asked questions about the girls’ physical activities (questionnaire self-administered at the Cincinnati site and administered by an interviewer at the other sites). Standard questions for usual activities (hours per week and months per year). MET values assigned according to Ainsworth et al (2000) and converted to METhr per week of MVPA. Nonscheduled activities, active hours and hours spent weekly in physical education were also reported in the questionnaire. Time spent each day in sedentary activities was included. | 2. Socioeconomic  **Self-reported level of caregiver education** (less than or greater than a high school degree and less than and greater than a Bachelor´s degree). | 2. Socioeconomic  Girls with asthma with caregiver education levels of bachelor’s degree or more had significantly more daily pedometer steps (11355 vs. 9139, *p*=0.02) compared to girls with asthma with lower caregiver education than bachelor´s degree. In terms of non-scheduled activity differences were marginally significant (8.08 vs. 5.92, *p*=0.05).  No significant findings when using less than or greater than a high school degree as the cutoff for level of parent education. | No further information given. |
| Latorre-Roman et al. 201569  Andalusia, Spain | To analyze the effects of physical activity program on sport enjoyment, physical activity participation, physical self-concept, and quality of life in children with asthma. | 105 students (mean age 11.53 years; 58 intervention group, 47 control group) with asthma.  Asthma; diagnosed by a specialist in hospitals. Treated for at least 6 months and in a stable phase (no exacerbations last 6 months, no musculoskeletal problems or mental disabilities.  Severity of disease assessed by criteria from GINA (2011). | Quasi-experimental study | **Physical Activity Questionnaire for Children** (PAQ–C) (Kowalski, Crocker, & Kowalski, 1997).  Appropriate for school children (8-14 years old), registers the physical activity performed 7 days prior its administration. Teenager version of Martínez-Gómez *et al.* (2009) translated into Spanish and updated from its children’s version. Cronbach’s alpha in this study was 0.726. | 1. Psychosocial  **Physical Activity Enjoyment Scale** (PACES) (Motl *et al.*, 2001), Spanish version (Moreno, González-Cutre, Martínez, Nestor, & López, 2008). | 1. Psychosocial  The increase of the enjoyment (mean 0.67 (SD 0.71) vs. 0.04 (SD 0.72)) positively correlates with increase in total PAQ-C (*r*=0.383), Item 2 (“In the last 7 days, during your physical education (PE) classes, how often were you very active (playing hard, running, jumping, throwing)?” (*r*=0.258)) and Item 3 (“In the last 7 days, what did you do most of the time *at recess*?” (*r*=0.246)) post intervention compared with baseline. | 1. Psychosocial  *Physical Activity Enjoyment Scale;* (Motl *et al.*, 2001), Spanish version (Moreno, González-Cutre, Martínez, Nestor, & López, 2008).  Consists of 16 items, preceded by the sentence “When I am active...,” and evaluates the enjoyment from the highest level (e.g., “I enjoy,” “It is very exciting,” “I find it enjoyable”) to the lowest (e.g. “I am bored,” “I do not like it,” “It frustrates me”). The answers were collected in a Likert scale whose punctuation ranks oscillate from 1 (totally disagree) to 5 (totally agree).  **Reliability**  Cronbach’s alpha in this study was 0.907. |
| Westergren et al. 201595  Oslo, Norway | To investigate if self-perceived competence, enjoyment, support from others and social-physical environment were associated with vigorous physical activity (VPA) and secondarily to assess if such associations were modified by asthma and asthma severity | Enrollment of 3754 children from a general urban population at birth.  One-hundred and seventy-four adolescents (mean age 13.6 (12.8, 14.3), 95 (66 boys) with current asthma at 10 or 13-year inclusion and 79 (41 boys) without asthma. At 13-year inclusion, four adolescents without asthma from 10-year follow-up had current asthma. Asthma; the presence of at least two of the following three criteria: (a) dyspnea, chest tightness and/or wheezing, (b) doctor´s diagnosis of asthma and/or (c) use of asthma medication (b2-agonists, sodium chromoglycate, corticosteroids, leukotriene antagonists and/or aminophylline).  Current asthma; defined asthma (as above), plus at least one of the following three criteria fulfilled: (a) dyspnoea, chest tightness and/or wheezing in the last 12 months, (b) use of asthma medication (b2-agonists, sodium chromoglycate, corticosteroids, leukotriene antagonists and/or aminophylline) in the last 12 months and/or (c) a positive exercise-induced asthma test (conducted at 10 years only).  Asthma severity assessed pragmatically by use of β2-agonists, inhaled corticosteroid or exacerbations last 14 days. | Nested case–control study | PA levels were recorded using the **SenseWear Pro2 Armband** and computed at one-minute intervals, randomly starting on a Wednesday or on a Sunday and including three week-days and one weekend-day PA data were adjusted for the mean hours each day the Armband was worn, to acquire 24-h units. Days were the Armband was worn less than 19.2 h (80%) were excluded from analysis. VPA was defined as PA above 6 Metabolic Equivalents (METs). Moderate physical activity (MPA) was defined as PA with cut of points between three and six METs. | 1. Psychosocial  **Self-perceived personal, social and environmental factors** were assessed by a paper-based validated self-report questionnaire. | 1. Psychosocial  No significant differences between adolescents with and without asthma were identified in terms of VPA, competence- enjoyment, support from others and social-physical environment. Peer support (β=0.29 (95%CI 0.05, 0.52)) and competence-enjoyment (β=0.23 (95%CI 0.01, 0.44)) were significantly and positively associated with VPA, and teacher support (β= –0.26 (95%CI -0.50, -0.02)) were inversely associated. The model explained 25% of the variance in VPA.  There were no significant association between MPA and either factor included. | 1. Psychosocial  *Self-perceived personal, social and environmental factors* were assessed by a paper-based validated self-report questionnaire (Ommundsen et al 2006; Ommundsen et al 2008; Bergh et al 2001) designed to capture theoretically derived relevant perceived personal, social and environmental factors shown to influence PA in children.  To test the construct validity for the instrument exploratory factor analysis with varimax rotation was conducted.  Cronbach’s α was used to assess the internal reliability of the instrument.  In the parental practical support, teacher support and physical-social opportunity scales one item each with poor loading were removed to increase internal reliability.  Social support questions (emanated from Bandura´s social cognitive theory); Response format 1–4; 1=never or hardly ever, 2=once or twice a week, 3=almost every day and 4=every day  *Parental practical support* (2 items; e.g. “How often does your mother or father take you to exercise or play sports?”)  **Reliability**  Cronbach´s α=0.59  *Parental emotional support* (2 items; e.g. “How often does your mother or father encourage you to play, exercise or do sports?”)  **Reliability**  Cronbach´s α=0.68  *Peer support* (3 items; e.g. ”How often do your friends exercise or play sports with you?”)  **Reliability**  Cronbach´s α= 0.82  *Teacher support* (2 items; e.g. “How often does your teacher talk about exercise in lessons?”)  **Reliability**  Cronbach´s α= 0.60  Competence, enjoyment (emanated from Harter´s competence motivation theory) and environment questions; response format 1–5; 1=does not suit for me, 5=suits for me.  *Competence-enjoyment* (5items; e.g. “I wish I could play more games and sports than I get chance to.”)  **Reliability**  Cronbach´s α= 0.73  *Safe environment* (4 items; e.g. ”It is safe to walk or play alone in my neighborhood during the day.”)  **Reliability**  Cronbach´s α= 0.75  *Physical-social opportunity* (2 items; e.g. ”There are other children nearby home to go out and play with.»)  **Reliability**  Cronbach´s α= 0.48 |
| Tiggelman et al. 201594  Netherlands | 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. | Recruitment from 213 primary schools and 73 secondary schools, and magazine announcement.  Participants; Families with one adolescent (mean age 13.9 years) diagnosed with asthma by a physician and who had used asthma medication at least once during the last 12 months and with adequate Dutch language skills. In 2012, 257 families with adolescents participated and in 2013, 253 families (151 male adolescents, 102 female adolescents) participated. | Population-based longitudinal study | Adolescents’ 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. Only PA aimed at maintaining or improving physical fitness and skills were included and were assigned MET-scores (Ainsworth et al 2011). 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. | 1. Psychosocial  **Maternal/paternal Sport-Specific Support** (4 items from the Dutch Sport-Specific Parental Support Scale (Jurg et al 2005) and 2 items from Davison et al (2003)  **Maternal/paternal general beliefs about their child’s sport participation** 13 items of the Attitude towards Sports Scale (Jurg et al 2005)  **Maternal/paternal asthma-specific beliefs about their child’s sport participation** 7 items (Lang et al 2004).  **Maternal/paternal self-efficacy to encourage child’s sport participation** 7 items (Jurg et al 2005) | 1. Psychosocial  At baseline; Father´s support (*r*=0.17), father´s general beliefs (*r*=0.27), mother´s general beliefs (*r*=0.29), father´s asthma specific beliefs (*r*=0.26), mother´s asthma specific beliefs (0.27), father´s self-efficacy (*r*=0.36) and mother´s self-efficacy (*r*=0.27) correlated significantly with adolescents´ sports participation.  At 1-year follow up; Father´s support (*r*=0.15), father´s general beliefs (*r*=0.19), mother´s general beliefs (*r*=0.18), father´s asthma specific beliefs (*r*=0.19), mother´s asthma specific beliefs (*r*=0.26), father´s self-efficacy (*r*=0.21), mother´s self-efficacy (*r*=0.21) and sports participation at baseline (*r*=0.44) correlated significantly with adolescents´ sports participation  Path analyses for fathers (model fit indices: CFI=0.912; RMSEA=0.171) showed that none of the sport-specific parenting variables predicted changes in adolescent sport participation over time, except asthma specific beliefs which significantly predicted change in girls´ participation from baseline to follow-up (β=0.25). For mothers (CFI=0.932; RMSEA=0.153), positive asthma-specific beliefs (β=0.22 for total group and β=0.21 for males and β=0.36 for females) about sport participation significantly predicted an increase in sport participation of adolescents with asthma over time. Multi-group analyses showed that the set of predictors were similar across gender. | 1. Psychosocial  *Maternal/paternal Sport-Specific Support;*(4 items from the Dutch Sport-Specific Parental Support Scale (Jurg et al 2005); (e.g. “How often do you watch your child participate in sports?”) and 2 items from Davidson et al (2003) (“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?”)  Reports on a 5-point Likert scale ranging from never/almost never (1) to every day (5).  **Reliability**  Cronbach´s α of the six items was 0.84 for mothers and 0.89 for fathers.  *Maternal/paternal general beliefs about their child’s sport participation*; 13 items of the Attitude towards Sports Scale (Jurg et al 2005) (e.g. When your child participates in sports, he/she has fun with his/her friends). Responses 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.  **Reliability**  Cronbach´s α=0.80 (mothers) =0.76 (fathers).  *Maternal/paternal asthma-specific beliefs about their child’s sport participation;* 7 items (e.g. When your child participates in sports, his/her asthma gets worse) (Lang et al 2004). Items 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 seven items was calculated.  **Reliability**  Cronbach´s α=0.75 (mothers) =0.70 (fathers).  *Maternal/paternal self-efficacy to encourage child’s sport participation;* 7 items (e.g. Do you find it easy or difficult to encourage your child to participate in sports when you do not have much time?) (Jurg et al 2005) 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.  **Reliability**  Cronbach´s α =0.88 (mothers) =0.92 (fathers). |

**Associations are reported as significant if the *p*-value reported by authors of each study is ≤0.05**.  
Abbreviations: n; numbers, PA; physical activity, N.A., not applicable, *r*; correlation coefficient, β; regression coefficient, OR; Odds Ratio, **95%CI**; 95% confidence interval, ICC; intraclass correlation coefficient, SD; standard deviation, CFI; comparative fit index, RMSEA; root-mean square error of approximation, MET; metabolic equivalents, hr; hour

**Appendix 3** Extraction chart for qualitative papers included in the review (n=13).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Author(s), year of publicationref, and origin/ country of study** | **Aim of the study** | **Study population (recruitment strategy, gender, age, asthma status and definition, socioeconomic characteristics)** | **Design** | **Key findings: psychosocial and socioeconomic issues related to participation in PA** |
| Williams 200029  London,  UK | To explore the interaction of gender with the management of chronic illness during adolescence, focusing on the ways in which the social constructions of femininities and masculinities affects how young people live with asthma or diabetes. | Twenty (10 male, 10 female) adolescents with diabetes (type 1, insulin-dependent with daily injections) and 20 (10 male, 10 female) with asthma (moderate to severe treated with anti-inflammatory inhalers and bronchodilatators) aged 15-18 years and the parent most involved in helping to manage the chronic illness.  All social classes were represented, majority from middle-class. | Individual in-depth interviews, conducted as semi-structured `guided conversations´, taped and fully transcribed.  Transcripts coded by an open system according to Strauss and Corbin (1990) with a grounded theory approach, comparing the data for similarities and differences, sorted into broader conceptual themes which eventually became part of the larger theoretical framework. | Exercise is influenced by the construction of masculinities and femininities and advantage boys concerning exercise because of contemporary meanings of masculinities.  Boys pronounce emphasis on the importance of sport and exercise, and their health assessment was linked to the amount of sport played. Girls participated in little sport and exercise and expressed guilt about it, as the cause of unhealthiness. Boys perceive themselves in control by `willpower´ in contrast to girls, and thus possible also disparaged identity when not in control. Focus on control and health through exercise may act as a `double edged sword´ with an `uneasy tension´ between valued and disparaged identities. |
| Callery et al. 200368  Manchester, UK | To gain insights into the beliefs of a group of 25 young people aged nine to 16 years old and their carers about asthma and its management.  To assess the health beliefs, perspectives and concerns of young people with asthma and their carers. | Twenty-five participants aged 9-16 years with asthma (and no other chronic lung condition) who were prescribed inhaled corticosteroids and their main carers. 17 were recruited through hospital after an un-scheduled visit 12-24 months previously and 8 from primary care who had seen their general practitioner the 12-24 months previously. All four steps of asthma severity according to British Guidelines on Asthma Management were represented, with most participants from step 2 indicating moderate asthma. | Open-ended conversational interview. Children interviewed alone, lasting about 1 hour, following a topic guide which were subsequently adjusted to reflect emerging themes (theoretical sampling).  Analysis by principles of grounded theory. Transcripts of interviews; open coding – grouping into conceptual categories – patterns of similarity and difference – searching for cases who does not fit the emerging pattern to saturate and develop categories rather than force data into existing categories. | Concerns about “tolerable” asthma, and the effort to minimize symptoms – related to child feeling normal and to parents fear and anxiety;   * PA limitations – keep inactive to avoid symptoms – and feel normal. * Reluctance to PA restrictions to not make children different from peers. * Good days – feeling normal and like others – run like others, participate in PA without worrying about asthma – making asthma invisible. * Bad days – when asthma become visible. |
| Rhee et al. 200770  Central Virginia, USA | The purpose of this study was to explore psychosocial experiences and coping strategies of a sample of adolescents with asthma based on their own accounts. Specifically, this study attempted to capture adolescents’ perception of and emotional reactions to asthma and to identify adolescents’ attitudes toward dealing with the physical and psychosocial challenges posed by asthma. | Nineteen participants with asthma. Mean ages were 13.4 (SD=1.01) for participants in the younger groups (12-15 years) and 16.5 (SD=0.71) for those in the older groups (16-18 years).  Eight (42.1%) participants had parents with college graduate or higher.  Participants were recruited through the use of flyers posted in asthma and teen clinics, recruitment letters sent through local school nurses, and a community contact person. Interested participants contacted the study team by telephone and were screened via a return telephone call by a member of the study team. Eligibility criteria included having current asthma diagnosed by health care professionals, absence of other physical illnesses or cognitive-mental illnesses, and ability to communicate in English. Eligibility was determined based on self-report from teens and parents. School nurses confirmed eligibility for teens recruited from the schools. Asthma severity was not used in defining eligibility for study inclusion. All participants responded that they used at least one medication to control asthma symptoms in a survey questionnaire. | Focus group study. Participants were divided by age groups, younger (12 through 15 years) and older (16 through 18 years). Each age group contained three subgroups (boys, girls, and mixed gender). Each participant attended one of the following six sessions (older girls; older boys; older mixed gender; younger girls; younger boys; younger mixed gender).The study team included focus group facilitators (nursing doctoral students in their candidacy) who were gender-matched to participants.  Participants completed a survey questionnaire collecting demographics and asthma-related information immediately before a 10-minute warm-up question and answer group session. Prior to each group session, participants were given a brief description of the study and a chance to ask any questions. Three general questions exploring teens’ psychosocial experiences with asthma were used across all groups, providing a semi-structured group interview setting. The questions were: “What is it like to have asthma?” “What kinds of things does asthma stop you doing that you want to do?” and “When is not such a bad thing to have asthma?” Focus group facilitators supplemented each major question through appropriate follow- up questions and probes to yield more accurate and in-depth responses Each focus group lasted 40 minutes to 1 hour, excluding the 10 minutes’ warm-up. Discussions were audiotaped and transcribed verbatim.  Field notes recorded by a member of study team who observed sessions were also used as a supplemental source of data to denote the overall atmosphere of each session, as well as participants’ nonverbal behaviors.  Data were analyzed by three independent researchers in a reflexive manner until consensus was reached regarding interpretation of the data. A multistep analysis plan was used: each transcript was first read in its entirety for initial descriptions that answered the three questions asked in the interviews. Then the responses were subjected to textual line-by-line analysis with the goal of revealing and refining categories in those answers. Codes were initially assigned, reviewed, and confirmed or rejected. After this step, codes were categorized and used to create descriptive summaries. Subsequent levels of category refinement and reporting were reviewed and validated by the study team and an experienced qualitative research consultant. | *Doing less with more effort;* Most of the participants reported that their involvement in physical activities or sports in various degrees was often less than their healthy peers and required extra effort on their part, which they often felt was unrecognized and underappreciated by others.  *Missing out;* A sense of loss and/or unfairness was perceived when participants compared their situations with healthy peers.  *Not all bad;*providing an excuse to eliminate themselves from undesirable situations such as running the mile or other physical activities. This was particularly true for the younger participants.  *Perceptions and attitudes of others;* A couple of girls believed that “people just got tired of” them because they disappointed others (peers, coaches or parents) due to limited physical activities or caused others inconvenience. This perception appeared to be directly linked to the sense of guilt expressed by female participants. Participants of all age groups and genders voiced their belief that others (e.g., peers, family members, and other adults in the schools) lacked understanding about the adolescents’ asthma, particularly the extra effort expended to keep up with their peers physically.  *Toughening;*In responding to others’ misunderstanding (e.g., accusations of faking or being wimpy), some adolescents “toughen up” themselves unrealistically. Strong motivation to be viewed or treated as equal to peers appeared to cause them to disregard symptoms and to push themselves beyond their physical limitations. Participants, especially older boys, exhibited apparent downplaying of symptoms, denying any serious impact of asthma on their lives. Older girls were more explicit in exerting their needs in interacting with peers.  *Guardedness;*Having experienced serious consequences of asthma, some younger and older participants reported becoming more vigilant in monitoring and managing their symptoms. Any tendency to withdraw from physical or social activities as a result of this form of guarding could deprive these teens of normal adolescent experiences. On the other hand, adolescents who are “staying on guard the whole, the most of the time” can be meticulous in taking preventive and therapeutic measures when faced with potential or actual threats from their illness.  *Modifying;*Older groups spoke at length about lifestyle adjustment, realistic assessment of their conditions based on prior experiences, and personal decision to live their lives to the fullest despite the illness. Some activities were given up completely and replaced with more easily tolerated activities (e.g., swimming instead of softball). Adolescents also explored ways to continually engage in desired activities in spite of the asthma by modifying either the pace or intensity of the activities (e.g., jogging instead of sprinting), as well as adjusting self-expectations. Despite having asthma, most participants expressed efforts to stay active and engage in desired activities through adaptation. |
| Walsh et al. 200898  Chapel Hill, North Carolina and Temple, Texas, USA | To understand differences in perceptions of patient-reported outcome domains between children with asthma and children from the general population. | Eight focus groups including 4-7 children in each (mixed gender). 2 groups including children with (n=13) and 2 without (n=8) asthma aged 8-12 years, 2 groups including adolescents with (n=7) and 2 without (n=13) asthma aged13-17 years) | Focus group led by a lead moderator and a co-moderator who were social work doctoral students. Semi-structured interview guide consisting of 4 major themes (physical, psychological/social, school and other). Audiotaped interviews, transcribed verbatim and thematic content analyses guided by themes from interview guide followed by grounded theory analysis. | Children/adolescents with asthma experience more difficulties when participating in PA compared with their healthy peers, more anxiety about having asthma attacks, and insufficient energy to complete school activities, especially PA.  Children/adolescents with asthma exerted great effort to try to be ‘‘normal’’ and ‘‘to be just like everyone else’’. Experience of ‘‘discomfort’’ during sport more attributable to emotional or social discomfort. |
| de Borba et al. 200999  Sao Paolo, Brazil | To understand the meaning the asthmatic child and his/her family attribute to the disease and the school implications. | Three children, a nine-year-old girl (serious asthma and chronic bronchitis), and two boys, one with nine (bronchospasm crisis from 1 years of age) and the other with ten years of age (serious asthma, chronic rhinitis, and atopic dermatitis), and their family members. | Qualitative case study that aims for a broad understanding of an organization or community, emphasizing the interpretation in context, and portraying reality in all its manifestations. Data were collected through participant observation, interviews, and therapeutic play. Each case analysis was separately accomplished and allowed the main axes and relationships that comprise the asthmatic child’s social world to be identified: the relationships with the family; the relationships established in their healthcare providing institutions; the school relationships and their expectations and dreams concerning the treatment, the disease cure, and their future accomplishments. | Three cases representing different issues influencing participation in PA.  **Milton case**; “*At this school, he will have physical education classes three times a week. At home, he just stays in and plays the videogame. I wonder if he can practice sports, though. I wonder if his crisis won’t be worse if he does, or if they’ll be more frequent, because he constantly complains about a shortage of breath. […] he is also afraid of having a shortage of breath, followed by a crisis” (Milton´s mother).*  **Marco Antônio case;** Given the stigma of a “sick” child that is attributed to him by his classmates, Marco Antônio created his own way in this social environment: because he is not able to rely on his classmates when needing help, when they ask him for help, he denies that to them. He used to receive the school teachers’ support, for they knew about the asthma situation through the boy’s father and complimented his performance and behavior, because he used to “*do his homework, be a good student, behave himself, differently from the other students, and do well on the exams”.* The teacher used to even modify the type of game they played so that he could participate without having a crisis interrupting the game. After two years, in the end of the data collection, Marco Antônio presents now a better health, being able to practice several sport modalities, with no physical limitations, which has been changing his relationship with classmates and facilitating his acceptance in the group. “*I played volleyball for a while, then basketball, now I play soccer twice a week.[...] I’m doing good at school, have friends among my classmates, including the rowdy ones, and play with everybody.”*  **Gabriela case;** Having serious asthma, with frequent crisis, and countless restrictions, seems not to have interfered in Gabriela’s school and sports’ activities. The girl shows preference to the Olympic gymnastics school where she is enrolled now and expresses, in several moments, that she likes it a lot and aims to, one day, get a golden medal for it. Such conquest is, for Gabriela, a very important future accomplishment, and the effort she can make in order to reach it is unlimited. |
| Fereday et al. 200930  South Australia | To discover:  • How South Australian children living with asthma, type 1 diabetes or cystic fibrosis describe their experiences and perceptions of physical activity, exercise, sport and play.  • How these children view physical activity's barriers and enablers.  • The perceptions of parents of children living with asthma, type 1 diabetes or cystic fibrosis about their children's participation in physical activity, exercise, sport and play. | Stage 1: Twenty-five children with diabetes type 1 (n=14), asthma or chronic respiratory illness (n=6) and cystic fibrosis (n=5). Twenty-five parents of children were also interviewed.  The children's ages ranged from 4–16 years old with an average age of 9.5 years  Stage 2: 12 students aged 5-12 years (8 with asthma, 2 with diabetes type 1 and 2 with other chronic disease) | Interpretive phenomenology; Stage 1: Focus group interviews, drawing maps (mapping), taking photos and designing `traffic light´ posters (photo-voice). Interviews were transcribed verbatim, read and coded, followed by clustering in themes sorted by common themes for all diagnose groups and specific themes for each diagnose group. Data sets were created for all participants linking data from interview, maps and posters with parent interview. Discussion and debate in the research group.  Stage 2: Focus groups, recorded, transcribed and coded. Themes were then compared to the data and analysis from stage 1. | Participation in a wide range of PA (organized and play in school and home). Chronic disease does not hinder participation in PA.   * Strong positive beliefs: Children may participate in anything (PA) that their peers did. * Parent believes they will do anything to enable this to happen.   Being included but with reports of being treated differently than peers. Running, cold weather and allergy to grass could induce problems. Choosing to participate in sport where they may avoid these situations. Not wanting publicity while reporting a special friend of support.  Parents “playing a juggling game a bit more” to help children with involvement in PA. Plan ahead bringing their `puffer´, subtle management to choose sports requiring less running and comprehensive practical support. Driven by desire to let their child be as normal as possible and being normal was participating in sports. |
| Protudjer et al. 200933  Manitoba, Canada | To better understand how children with asthma develop strategies to normalize their lives. | Eleven girls and eleven boys (11 years old) with asthma (Canadian Asthma Consensus Guidelines) from the Manitoba Birth Cohort (n=723, 34% with asthma)  A wide range of annual household incomes ($30,000 to >$80,000 Canadian [CAD]), and parental education levels (less than high school to postsecondary/university) were represented, 11 of 16 families who reported their household income were in a high-income bracket (≥$80,000 CAD), and 15 of 17 families who reported educational attainment had either postsecondary or university training. | Semi-structured in-depth interview framed by an interview guide about living with asthma and compare that to healthy peers. Average interviews were 29 min (15 to 60 min) in duration. Transcripts were analyzed using thematic coding. Initial identification of patterns of interest (normalcy lens) culminating in reporting meaning of themes. Line by line was coded with an inductive approach then codes were developed and explored for the whole data set. Themes were then reviewed for consistencies with the relevant data and then clearly defined and named. Findings were related to research questions and existing literature, repeatedly looking for alternate explanations. Significance criteria determined by Patton (2002); consistency and coherence that evidence support findings, enhance and broaden understanding and usefulness of findings. | Children acknowledge asthma impact their capabilities. Pain, hurt, shortness of breath hindering their potential making them feeling different than peers or horrible.  Minimizing impact of asthma through a different focus, and main problems mentioned as being different. Emphasizing abilities and minimizing differences compared with peers, downplaying impact of asthma.  Stressing normality stating that asthma does not limit things, even removing the asthma label entirely as a historical assessment in their life, and they have thereby nothing that prevents them from being physically active, also choosing not to use medications.  Emphasizing abilities by focus in skills (recreational and academic) advanced for their age, and helping others out with a goal to integrate in target group.  Adaptation in daily living: identifying interference with PA, low focus on prohibitions of PA and perceiving PA as a source of pleasure and camaraderie, sometimes substituting their current sport with another activity.  Adaption includes minimizing symptoms by use of medications despite the visible sign of disease through inhalers – alternating the associated costs. |
| Shaw 201072  Arizona, USA | To explore the predominant categories and concepts involved with perceptions of exercise among school aged children with asthma. | Ten children (5 males, 5 females) with asthma aged 8-12 years.  Family income ranged from less than twenty thousand per year, up to greater than sixty thousand per year. | Grounded theory. Theoretical sampling; interview of new participants and/or follow up interviews and observations of initial interviews. Unstructured and semi-structured interviews, building rapport encouraging play and drawing to ease storytelling process and gain credible data. Interview until saturation of themes. Interviews were tape-recorded and transcribed. Analysis according to Corbin & Strauss; deconstructing in search of predominant concepts – beginning coding, comparative analysis, open coding, theoretical integration and theory refinement. | Ongoing creation of perception of exercise in children with asthma are interwoven and influenced by:   * Perceived benefits; fun, friends, health. * Striving for normalcy; keeping private, planning, continuing (adjusting, modifying, quitting, pausing). * Exercise interpersonal influences; parental (beliefs passed down to children), PE teachers (learning about PA), and health care providers (provides advice).   Asthma influences; symptoms (numerous individual descriptions), triggers (identification of several irritants; exercise as one), tolerated activity level (individualized; related to duration and intensity of activity; creates modification of activity). |
| Spencer-Cavaliere & Watkinson 2010100  Alberta and Manitoba, Canada | To explore the perspectives of children with disabilities regarding the concept of inclusion in physical activity. | Two girls, nine boys between 8-12 years with disabilities (cerebral palsy, fine and gross motor delays, developmental coordination disorder, muscular dystrophy, nemaline myopathy, brachial plexus injury and severe asthma (1 participant – extracted data related to 1 participant, 9 years of age). | Purposeful sampling with maximum variation, individual semi-structured interviews and reflective filed notes written immediately after interviews. Interviews were transcribed verbatim and analyzed according to Patton (2002). Initial tagging of 455 pieces of data, line-by-line analysis to group word, sentences and paragraphs until saturation was reached. | *Gaining entry to play* – feeling included; being invited and letting try out.  *Feeling like a legitimate participant* – feeling in a position to contribute.  *Having friends* – making you feel included in sports and games.  . |
| Williams et al. 201027  Tayside, Scotland | To explore the reasons for low physical activity levels among children with asthma and to identify strategies to improve activity.  To explore the ways in which children’s, parents’, and school staff’s beliefs about asthma and exercise influenced the child’s willingness to engage in physical activity, in order to identify effective strategies to improve activity levels | Thirty children (15 males, 15 females) with asthma (moderate or severe according to British Thoracic Society definitions) aged 6-14 years and 38 parents of those children, 10 physical education teachers, seven primary teachers, 3 guidance teachers, 2 school nurses, 2 activity coordinators, 2 head teachers and deputy head teachers participated in the study. | Purposive sampling to increase heterogeneity of factors known to influence activity. Individual interviews of children followed by individual interview of parents. Drawings and games were used to build rapport with younger children. Topic guide based on theory with broad prompts to explore beliefs and knowledge about asthma, symptom perception, experience of treatment and attitude towards exercise. Modified guide for parents´ interview. Children´s interview lasted from 20 min to 1.5 hours and parents´ interview lasted from 1 to 1.5 hours.  School staff was interviewed in focus groups consisting of 5-8 participants and which lasted for 1 hour. Transcripts (10 at first) were analyzed with constant comparative analysis; first assigned initial categories and codes (familiarization), second categories were compared within and across transcripts, third categories and concepts were cross linked to generate new meaning through creation of charts, and finally new concepts were linked to produce new interpretation (mapping and interpretation). Analysis was assisted by NVivo software. Data collection and initial analysis occurred simultaneously, and continued until saturation; that is until additional data did not add to the developing theory. | Beliefs about capability, safety and motivation most strongly influenced the child´s willingness to participate in PA, and their parents´ willingness to support it. Medical advice was used to explain and justify reduced participation in PA, and to stress that asthma should not prevent the child from engaging in PA.  *Capability* – belief that asthma places an actual physical limit on the intensity and duration, connected with interpretation of physical signals such as breathlessness as the sign of the limits.  *Safety* – exercise is a threat to be managed rather than something beneficial. Voiced particularly by older children and girls. Based on personal experience combined with medical information received, connected with beliefs of triggers (environmental and behavioral). Overexertion was the most common behavioral trigger, and girls were more likely to scale down activity. Many believed their general practitioner supported PA with less intensity and a minority (n=7) did attempt to increase duration and intensity by using inhalers and rest periods.  *Motivation* – using asthma as an excuse (teachers´ opinion which was reported to be more common in girls and in secondary school). Children were motivated by personal and social benefits rather than health. Fun, community, belonging, acceptance and enhanced self-esteem were motivating but undermined by perceived triggers. |
| Protudjer et al. 201234  Winnipeg, Manitoba, Canada | To gain insight into youths’ perceptions of screen time and physical activity by asthma status. | Twenty-two participants aged 15–16 years with (6 boys, 6 girls) and without (6 boys, 4 girls) asthma. Participants with asthma had asthma severity ranging from mild to moderate to severe based on methacholine challenges. | Purposive sampling. Semi-structured focus groups consisting of 2-4 participants (n=18) and individual interviews (n=4) lasting from 32-90 minutes. Focus groups included only boys or only girls with the presence or absence of asthma.  Constant comparative method rooted in a pragmatic worldview; problem-centered approach oriented on real-world practice which allows for the expansion of data, recognizing multiple realities rather than single connections in the data. Data collection and analysis continued until constructs were deemed to be saturated (constructs ceased to be identified with subsequent interviews or focus groups). | Common to youth with and without asthma:   * Sports are an integral part of youths´ lives; (a) help you keep focused, (b) striving to improve in the chosen sport, (c) activity is a stress release and (d) choice of sport is a matter of interest. * Screen time is important to youth; (a) much leisure time is screen time, (b) screen time is a source of communication and (c) a source of entertainment.   Theme unique to youth with asthma:   * PA used to be more difficult * Being active and living with asthma; (a) asthma is not an excuse and (b) asthma can still get in the way.   Control the disease enough to be socially accepted and selection of sports demanding less aerobic capacity. |
| Westergren & Lilleaas 201228  Norway | To understand the gendered practices of male asthmatic adolescents in terms of living with and managing their chronic disease.  To discover how par­ticipants interpreted their social worlds to create a sense of meaning in their everyday lives.  To identify the gender-related practices of participants and their possible consequences for health and disease. | Five male participants aged between 13 and 15 years diagnosed with asthma during early childhood, who used inhalation medications for symptom management and disease control, and staying in a specialist center for asthmatic children and youths participating in a 4 week training/education/treatment program. | A combined ethnomethodology (Bourdieu) and grounded theory design (Strauss & Corbin).  Semi-structured multistage focus group interviews (Hummelvoll) with 2 interview sessions within 24 hours. The first interview (43 minutes) focused on how the participants lived and coped with their disease, and the second interview (51 minutes) focused on their future expectations as 25-year-old men.  A grounded theory approach was used during the analysis. | PA supported participants´ aim of being men and non-asthmatic, as well as supported their treatment goals.  Physical activity is concerned with being strong, satisfied with physical achievements and identifying with sporting models. |
| Hamer 201471  Christchurch, New Zealand | The aim of this study was to explore how male adolescents understand and manage their asthma symptoms. | Recruitment initiated by contacting school-staff, followed by contacting students through school notices, school newsletters, posters, social media, and e-mailing. Snowball sampling of participants who spoke English, attended high school (12-19 years old), and lived in Chirstchurch, New Zealand. Fifteen male participants experiencing asthmatic symptoms, which had affected their life within the last years, aged 12-17 years from three different high schools with students from higher socioeconomic communities. | A qualitative descriptive study design was selected to investigate the experiences of male adolescents, focusing on their perceptions of societal and masculine influences on their asthma management. Individual semi-structured interviews (ranging from 7-20 minutes) were undertaken to capture data about their perceptions of masculinity, asthma management, interpersonal relationships, and their physical wellbeing.  Interviews audiorecorded and transcribed verbatim.  Thematic analysis with a semantic approach. Six analytical phases consisted of: 1) familiarising with the data, 2) generating initial codes, 3) searching for themes, 4) reviewing themes, 5) defining and naming themes, and 6) producing the report. | To counteract feeling different, isolated and marginalized, participants maintain control, and seek normality in front of peers.  The ideal male is sporty, healthy and nice with a good job or tall, athletic, strong, masculine, and tough.  Sport provides opportunities to live a normal, independent and healthy life, and role models support that. Sport both gives a sense of belonging and increased self-esteem and allows isolation of the less athletic team members.  Hence, participants toughen up and downplay asthma symptoms to avoid being different and soft, and maintain their desired identity of being independent, competitive, and strong. |

Abbreviations: n; numbers, PA; physical activity