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## Motivation for physical activity in adolescents with asthma

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### ABSTRACT

**Objective:** We explored motivation for physical activity (PA) and exercise in adolescents with asthma who entered and continued a 10-week play-based exercise intervention.

**Methods:** Eighteen adolescents with asthma, aged 13–17 years, participated in a 10-week play- and interval-based indoor exercise intervention during winter and autumn months. Semi-structured focus group interviews were conducted in weeks 2 and 8, focusing on motivation for PA and exercise, as well as field observations of exercise sessions in weeks 2, 6, and 8. The first interview was analyzed separately from the second one and descriptive observational data were obtained using thematic analysis and self-determination theory as a framework.

**Results:** In the first round of focus group interviews, participants ( $n = 18$ ) described amotivation and motivation for PA within the following five themes: “teachers’ lack of asthma knowledge”, “embarrassment over asthma symptoms”, “not being able to keep pace with peers”, “seasonal challenges”, and “mastering fun physical activities”. Based on the second interview ( $n = 14$ ) and descriptive observational data ( $n = 18$ ), participants reported and revealed amotivation and motivation for PA within the following four themes: “understanding and relatedness”, “social support”, “competition”, and “mastering fun activities”.

**Conclusion:** We conclude that play-based exercises designed for groups of adolescents with asthma can support motivation for PA and exercise and reduce social and asthma-specific barriers.

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## Introduction

Asthma affects 11–14% of children and adolescents worldwide (1). It is defined as “a chronic inflammatory disorder associated with variable airflow obstruction and bronchial hyperresponsiveness. It presents itself with recurrent episodes of wheeze, cough, shortness of breath, and chest tightness” (2). Physical activity (PA) can provoke asthma symptoms (3), and thereby affect motivation and participation in PA negatively (4). Caspersen et al. (5) defined PA as “any bodily movement produced by skeletal muscles that result in energy expenditure above resting level”.

Moderate-to-vigorous intensity PA exercises have positive health benefits, such as improved cardio-respiratory fitness, reduced exercise-induced

bronchoconstriction (6), better quality of life (7), and are important for the development of social skills (8). PA is considered safe if the asthma disease is stable (9) and children with asthma—in line with healthy peers—are recommended to perform moderate-to-vigorous intensity PA for at least 60 min per day (10). There is no consensus in the literature on whether adolescents with asthma are less physically active than their peers. Cassim et al. (11) reported that the levels of PA among children with asthma were similar to peers without asthma. However, asthma severity, being overweight (12), and fear of asthmatic symptoms are reported as being associated with the perceived limitations for PA (13,14). Additionally, adolescents with asthma may feel inferiority for

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participating in PA compared with their peers, because of their experiences of inability (15). They can feel excluded, and choose to downplay their asthma symptoms to avoid appearing different from peers (16).

In adolescence, enjoyment of PA, parents' and teachers' positive attitudes and beliefs about PA and health, and social support have been reported associated with higher levels of PA (17). In adults with asthma, less knowledge, low self-efficacy, and negative attitudes toward asthma were associated with negative perspectives of participating in PA, and thereby less motivation for PA (14).

Self-determination theory (SDT) is commonly used to explain motivation for PA (18). It emphasizes various types of motivation, on a scale from amotivation, through extrinsic motivation, to intrinsic motivation (19), either because a given task is perceived as rewarding and meaningful in itself (intrinsic motivation) or because there are factors such as bad conscience and pressure from others (extrinsic motivation) (20). The theory of basic psychological needs (BPN) is a sub-theory within SDT. BPN explains how three basic psychological needs—autonomy, competence, and relatedness—are connected with intrinsic motivation (21). People who perform a given task on the basis of intrinsic motivation will experience positive outcomes and well-being to a greater extent than those who do so on the basis of external motivation or amotivation (20). Adolescents with asthma manage their asthma and PA more independent than younger children (10,11). Thus, autonomy, competence, and relatedness may be of specific significance in adolescents with asthma. To our knowledge, no studies have investigated motivation for PA in adolescents with asthma. The present qualitative study was conducted to investigate motivation for PA and exercise among adolescents with asthma who entered and continued a 10-week play-based exercise intervention.

## Methods

### Study design

This qualitative study was part of a larger quasi-experimental, research project established to develop, conduct and evaluate a play-based exercise intervention adapted to adolescents with asthma at two study sites in Southern Norway. The project was approved by the Regional Committee for Medical Research Ethics in South East Norway, (2017/1320). All participants gave informed written consent to take part in

the study, and those aged less than 16 years gave consent together with their parents.

### Participants and recruitment

Information about the project was spread through social media and by cooperation with asthma specialists. Inclusion criteria for participants were: (1) adolescents aged 13–19 years; (2) a diagnosis of asthma confirmed by a specialist in pulmonary medicine, allergology or pediatrics; and (3) dyspnea, chest tightness and/or wheezing, and/or use of asthma medication during the past year. Adolescents with other chronic diseases, functional disabilities, or a travel time >1 h from fitness facilities were excluded. Twenty-two participants were recruited to join the intervention.

### Exercise intervention

One-hour PA sessions took place indoors in a gymnasium at a fitness center twice a week for 10 weeks at both locations. Participants themselves had to arrange transportation to the exercise locations, which were in walking distance or well reachable with public transport. Twenty exercise sessions were designed and led by instructors, educated or undertaking education in sports science. Each session started with a 10–15 min warm-up period at low intensity. The main period lasted 30–35 min aiming for high intensity exercise, and the session ended with a 5–10 min cool-down session with low intensity. The sessions included a combination of group- and play-based activities such as relays, obstacle courses, and competitions that were easy to master in terms of motor skills and coordination. Two instructors were present at all exercise sessions to organize and encourage the adolescent participants.

### Data collection

Participants' weight status was evaluated using gender- and age-adjusted body mass index cutoffs defining thinness, overweight, and obesity according to the International Obesity Task Force references (22). Lung function were measured at an indoor exercise laboratory 1 week before and week 1 after the intervention. Lung function was determined by spirometry (Oxycon Pro, Jaeger, Würzburg, Germany) as forced expiratory volume in one second (FEV<sub>1</sub>). Asthma control was assessed during pre- and post-test sessions. The Asthma Control Questionnaire (23) includes six self-

reported questions with a 6-point response format. A seventh question with the same response format was filled out by the test leader based on the FEV<sub>1</sub> result. A score of <0.75 was defined as well-controlled asthma (23).

Participants' habitual PA was measured using a SenseWear™ Pro mini armband (Body Media Inc. Pittsburgh, PA, USA) according to Berntsen et al. (24). The participants were instructed to wear the accelerometer for 7 days, except during water PA activities. Moderate-to-vigorous intensity PA was calculated and defined as  $\geq 3$  metabolic equivalents (SenseWear Professional software v. 8.1).

At each exercise session, instructors noted attendance among participants, and self-reported perceived exertion during sessions was reported using Borg's rate of perceived exertion scale, ranging from 6 (no effort) to 20 (exhaustion) (25).

### Focus group interviews

Semi-structured focus group interviews about participants' experiences, views, and reflections about motivation for PA, were conducted (26). Interviews took place before or after an exercise session in week 2 ( $n = 18$ ) and week 8 ( $n = 14$ ) at both locations, with a focus group range of 3–5 participants (two interviewed individually). In total, 10 interviews were conducted and led by one moderator and one co-moderator, where at least one of the moderators had met the participants in advance during testing at the physiological laboratory or during exercise sessions (for the individual interviews only one researcher was present). All interviews were moderated by an experienced female nurse author (either TB or THF), in her mid-to-late-twenties, and co-moderated by master's students in public health (TB or JBS) or sports science (KT) with no previous experience with adolescents with asthma, and concerned the participants' motivation for PA.

The first interview focused on the experience of having asthma, and the participants' abilities and limitations of undertaking PA. The second interview focused on experiences, limitations, and social interactions within the interventions. Using a semi-structured interview guide, each topic was discussed until the participants had no further comments (27). Follow-up questions were asked to get more detailed and nuanced information about the topics of interest (26).

### Field observations

Field observations were conducted at 10 exercise sessions. Two observers were passive and did not participate in the activities (28). The observations focused on how participants expressed and presented themselves, and interacted with each other and instructors concerning their asthma, abilities, limitations, and attitudes to various types of PA.

The first two field observations were conducted by TB and THF, the latter observations only by TB. Keywords were noted during exercise sessions and more extensive notes from field observations were written shortly after. Notes from field observation were sorted as methods, descriptive data, and reflective notes (29). *Methods* described the surroundings, where the exercise sessions were held and who were present. *Descriptive data* objectively described events and conversations that were held during exercise sessions. *Reflective notes* documented the researcher's personal experiences and reflections (29). Notes and observations were discussed after each exercise session (with TW). Attendee numbers during field observations varied from five to nine.

### Analysis

The interviews, lasting 13–73 min, were audio-recorded and transcribed verbatim and thereafter analyzed thematically together with the descriptive notes from field observation in six steps (30), using an abductive approach. In this approach, the researcher moved between data and theory by identifying possible patterns (31), using SDT as a framework. All interview data and descriptive notes from field observations were imported into the software program Nvivo11 (32) and analyzed according to the research question. The first interview was analyzed separately from the second one and from the descriptive observational data.

First, text passages were read by the first author (TB) to become familiar with the data. Notes of possible patterns and themes were taken. Second, the text was coded into elements close to the actual words used by the participants (30). Third, SDT was used to construct the following main themes: amotivation, external motivation, and intrinsic motivation. Relevant data were gathered to look for subthemes (30). Fourth, subthemes were reviewed for consistencies (30). When satisfied with the themes, the first author (TB) went back to the dataset to ascertain whether the themes reflected the whole dataset. Fifth, each theme was defined and named (30). Each step was discussed

**Table 1.** Study characteristics of participants included in the study. Numbers are given as median (min, max) unless otherwise stated.

	Pretest and session data ( <i>n</i> = 18)	Posttest data ( <i>n</i> = 15)
Males <sup>a</sup> , <i>n</i> (%)	11 (61)	9 (60)
Age	16.08 (13.47, 17.48)	16.36 (14.11, 17.67)
Ethnicity		
Caucasian, <i>n</i> (%)	13 (72)	12 (80)
Black/African, <i>n</i> (%)	3 (17)	2 (13)
South East Asian, <i>n</i> (%)	2 (11)	1 (7)
Body Mass Index z-score <sup>b</sup>	0.58 (−1.88, 2.99)	0.59 (−2.41, 2.73)
Overweight <sup>c</sup> , <i>n</i> (%)	6 (33)	4 (27)
Asthma Control Questionnaire	0.79 (0.0, 2.86)	0.71 (0.29, 2.00)
FEV <sub>1</sub> (% predicted)	91 (73, 112)	85 (61, 112)
MVPA <sup>d</sup>	1.07 (0.25, 3.41)	1.20 (0.47, 2.48)
PA ≥ guidelines <sup>e</sup> , <i>n</i> (%)	11 (61)	11 (73)
VO <sub>2max</sub> (ml/kg/min)	40.8 (16.6, 60.1)	42.5 (29.7, 57.3) <sup>n=14</sup>
Exercise session data		
Attendance	15 (1, 20)	n.a.
Borg's RPE 6 – 20 <sup>f</sup>	14.5 (10.0, 16.7)	n.a.
Heart Rate	153 (124, 164)	n.a.

<sup>a</sup>Compared to females.

<sup>b</sup>International Obesity Task Force references (22).

<sup>c</sup>Compared to normal weight.

<sup>d</sup>Hours per day.

<sup>e</sup>≥60 h moderate-to-vigorous physical activity/day.

<sup>f</sup>BORG's RPE-scale 6–20, average per participant for all sessions.

Abbreviations: FEV<sub>1</sub>: forced expiratory volume in one second, MVPA: moderate-to-vigorous physical activity, PA: physical activity, VO<sub>2max</sub>: maximal ventilated oxygen, RPE; rating perceived exertion, n.a.: not applicable.

with other researchers (ID, TW) to look for alternative explanations. Because the data were collected at different times, the analyzing process was repeated between each step. Last, each theme was related to the research question and existing literature. Quotations from the participants have been translated from Norwegian to English with support from a native English-speaking editor.

## Results

Eighteen participants aged 13–17 years took part in the intervention long enough to join the qualitative study. Fifteen participants completed the intervention. Study characteristics of participants included in the study are presented in Table 1.

### *Motivation for physical activity while entering the intervention*

In the first round of focus group interviews (*n* = 18), five themes (see Table 2) were identified affecting motivation for PA, as listed below.

#### *Teachers' lack of asthma knowledge*

Participants described challenges with physical education (PE) because they felt they were not being taken seriously when experiencing asthma symptoms and were being pushed harder than they were capable of, which sometimes created amotivation:

You lose motivation, when you need a break or something like that, and your teacher says that you can't take a break because you are like the others. Girl, 16 years.

Participants believed that these challenges could be solved, and thereby get more motivated to participate in PE, if the teachers had more asthma knowledge:

It could have been much easier to explain [if teachers had asthma knowledge]. I think it would have been easier, at least in physical education sessions. Boy, 16 years.

#### *Embarrassment over asthma symptoms*

Participants described embarrassment associated with comments and unwanted attention around asthma symptoms and the use of asthma medications:

Sometimes I can wheeze so much that someone behind me starts to make fun of the sounds that I'm making. That is really unpleasant. Girl, 16 years.

Unwanted attention around medication led participants to hide their medicine or only take medicine at home:

Previously I used the medicine at school... But then after Sundby [The Norwegian elite cross-country skier who was expelled for using Salbutamol in large doses in 2016] was targeted for doping because of asthma medicine, I got some comments such as, 'you are doping yourself'. So now I prefer to take my medicine before I leave home. Boy, 17 years.

#### *Not being able to keep pace with peers*

Some participants described how they could not keep pace with peers during PA, especially when running:

**Table 2.** Summary of themes identified through thematic analysis.

Motivation for physical activity while entering the intervention (5 themes)	Motivation for physical activity during the intervention (4 themes)
<i>Teachers' lack of asthma knowledge</i> <i>Embarrassment over asthma symptoms</i> <i>Not being able to keep pace with peers</i> <i>Seasonal challenges</i> <i>Mastering "fun" physical activities</i>	<i>Understanding and relatedness</i> <i>Social support</i> <i>Competition</i> <i>Mastering "fun" activities</i>

We were supposed to run around the [name of a small lake], and I could not participate because first I had to warm up, and second, I could not run as long as the others. Boy, 14 years.

Even though participants reported that they had accepted this limitation, they also reported a wish to manage levels of PA similar to their healthy peers, whereas it could lead to amotivation when they could not do so:

If I am alone and the others are much fitter than me, exercising is not fun. Boy, 13 years.

### **Seasonal challenges**

Participants described worsened asthma symptoms when they were exposed to pollen or cold air. This impaired their motivation for PA, both because of increased asthma symptoms in their daily life and because the PA facilities in the local community were not designed for adolescents with asthma:

That was the main reason I had to quit [football], because we had sessions in like one and a half hours, in the middle of winter. It was freezing, and when I got home, I could barely breathe. Boy, 16 years.

### **Mastering "fun" physical activities**

Those who exercised or enjoyed PA did so because they experienced PA as "fun", which was reported in relation to mastering the physical activities:

And it's fun to see your progression, and it's fun to keep up with [strength training before the exercise intervention], and ... it's like a hobby. Boy, 17 years.

### **Motivation for physical activity during the intervention**

In the second round of focus group interviews ( $n = 14$ ) and in the field observations ( $n = 18$ ), participants reported and revealed motivation for PA in four themes (see Table 2), as listed below.

### **Understanding and relatedness**

It was important that the intervention was only for adolescents with asthma because they could feel empathy with the other participants:

I feel like everyone has some understanding of it [asthma]. So, I can take it [medication] in front of the others without actually thinking about it. Girl, 16 years.

We observed that participants used asthma medications in front of each other. Participants also reported an experience of being at the same fitness level as the others, and thereby felt like they managed types of PA they earlier could not. Participants also reported the instructors' asthma knowledge and consideration for their asthma as being important for their motivation for PA.

### **Social support**

Social support by friends and family was expressed as important factors by the participants in assisting them to join and continue the intervention. Peers with asthma were also reported as important because they did not notice that they got as tired when exercising in company with peers. Motivation also increased when other participants encouraged them:

He did one push up and lay flat on his stomach. His teammate looked at him and said: 'Come on, you can do it. Let's do it together'. They both took nine more pushups counting out loud. Field observation number 7.

Support from instructors was also mentioned as an important factor for greater motivation, especially when instructors joined the activities:

And the instructors are quite often included in the activity. It was so much fun last time. Boy, 16 years.

During observations, we observed a decrease in participants' efforts if the instructors turned their backs on them but a higher exercise intensity if the instructors looked at them directly.

### **Competition**

All participants reported competitive games as being motivating, and we observed higher intensity for those activities that included competition. Some participants

kept up the intensity, encouraged and congratulated each other based on effort, and reported effort as the most important:

And of course, if we win then it's also fantastic. But that's not what I care most about. Not if I feel that the effort has been good enough. Girl, 17 years.

Other participants only encouraged or congratulated each other based on the result and kept quiet if they lost the competition. Some even sabotaged the efforts of the team that was poised to win:

He found the note that the other team needed to win the competition and ran away with it. When the other team caught up with him, he laid down with the note under himself. Field observation number 9.

We observed a variation in the instructors' behaviors—some of them encouraged effort, while others mostly encouraged results or performance. Dominating behavior concerning encouragement observed between participants depended on the instructors' mode of encouragement.

### **Mastering “fun” activities**

Physical effort was observed to be affected by different exercise activities, whereas some activities were reported as fun themselves, while others were only completed because the instructors told them to. All participants described a feeling of perceived self-efficacy, either because of their own performance:

Now I manage ten pushups. I couldn't do one before. Boy, 16 years.

or based on their performance or results:

I beat the coach in wrestling. [Laughing] Three times. I'm happy with that. Boy, 15 years.

Either way, mastering the PA exercises was the basis for well-being and self-confidence in the activities and contributed to a desire to continue with the activities that the participants mastered particularly well.

## **Discussion**

In the first interview, our participants reported amotivation for PA, which differ from experiences from within the intervention. Intrinsic motivation for PA related to mastering “fun” physical activities was, however, reported in both interviews. Based on the second interview and descriptive observational data, enhanced motivation for PA was reported and observed by relating to and feeling respected within the activities, and by social support by family,

instructors, and other participants. Competitive games in which the instructors encouraged efforts rather than results led to enhanced efforts and motivation for PA.

Adolescents with asthma have previously reported normalization strategies and minimizing their symptoms and usage of medications (33). In contrast, PA can provoke asthma symptoms which can also be accentuated by cold air and atmospheric pollen (3). Embarrassment over symptoms and medications and feeling different from their peers (10,14,15,33) may hence underpin amotivation for PA. Similar experiences were noted here when participants talked about PE or PA during leisure times.

Westergren et al. (17) reported that lack of knowledge about asthma on the part of teachers and parents could lead to lower levels of PA by restricting children's exercise. This contrasts with experiences reported in the first interview where participants reported amotivation for PA by being pushed harder than they felt capable of, or not getting a break when they needed it. None of these asthma-specific barriers associated with PA and exercise were mentioned specifically within the intervention. This could have been because the intervention was facilitated for adolescents with asthma. It was observed that participants reminded each other of, and used, medications in front of each other. They described that they now did indeed “fit in”, and thereby felt supported and understood during the intervention because they all had similar challenges. Also, instructors' consideration of participants' asthma was reported as being important for participants during the intervention. Our findings are supported in theory by Ryan and Deci (34) who explained how feelings of relatedness and probability of returning to an activity increase if participants feel supported and respected within the particular activity.

As demonstrated, social support—either from parents, other participants with asthma, and from instructors—was important for participants' motivation during the exercise intervention. In a systematic review about adolescents without asthma, Mendonca et al. (35) found an association between social support from friends and family and involvement in PA. However, they did not find an association between social support from teachers or instructors and involvement in PA, which participants in the present study reported as being important. Previously, it has been demonstrated that teachers' support in autonomy is a strong predictor of self-determined motivation (36), and an increased level of PA has been reported

among children and adolescents when experiencing an autonomous form of motivation (37).

Mastering PA was reported as essential to experience it as “fun”. When a participant mastered activities based on his/her own performance, enhanced intrinsic motivation and enjoyment of PA were reported additionally. On the contrary, when participants did not experience mastering or enjoyment of PA, they reported more external motivations. Mastering activities was reported previously while experiencing challenges that were not too challenging (36), which again stimulated feelings that PA can be “fun”. Lang et al. (38) reported that children with asthma who enjoyed PA were more likely to be physically active. Among adolescents without asthma, it was also reported that high self-efficacy in PA was associated with more vigorous involvement (39). As argued, mastering PA is not an asthma-specific motivator for PA in adolescence. Nevertheless, adolescents with asthma have described how they often feel as though they cannot manage as well as their healthy peers, which thereby decreased their self-efficacy in PA (15). One could argue that the current intervention did indeed facilitate a climate of mastery by including only adolescents with asthma. Participants in the first interview who described experiences from PE in that they could not keep pace with their peers, later described that they were at the same level as the others.

Here, competition was reported and observed to enhance intrinsic motivation when the instructors encouraged efforts rather than results. In contrast, competition could lead to amotivation when encouragement focuses on winning among participants who thereafter lose competitions. This result aligns with SDT, which claims that a controlling environment is influenced by temptations, threats, punishments, or rewards based on accomplishment that leads to a more external form of motivational regulation (21), which has been reported to be associated with lower levels of PA (37).

Worth noting, differences in asthma control, lung function, and other variables presented in Table 1 between those entering and completing the current study were small. Although FEV<sub>1</sub> decreased in one of the participants, asthma control in that particular participant did not decrease more than the minimal important difference (MID) of 0.5 (23). The participant having the poorest asthma control at pretest also improved more than MID during the intervention. The low participant number does, however, not allow any firm conclusions concerning the relation

between motivation for PA and lung function or asthma control.

### **Strengths and limitations**

Our findings were strengthened by including a study population of adolescents with asthma who reported similar barriers for PA which also have been reported previously (3,14,15,33). We applied thematic analysis, which is well recognized to increase the validity of the data (30), and reliability was strengthened by involving several researchers in the analysis (26).

As to limitations, our field observations might have been biased; it was challenging to capture them because multiple events occurred simultaneously (26), while the transparency of observational focus and notations strengthened the study. Nuances within focus-group interviews might have been concealed as research participants can avoid having opinions that contradict the majority (27). In addition, any influence on participants' expressed experiences by the relationship with the researcher during the interviews could not be controlled (31). Nevertheless, moderators strengthened the richness of the data by ensuring that all participants were included in group discussions. Moreover, reflection between researchers concerning the interpretation of participants' experiences increased the dependability of findings. However, the findings should not be interpreted as being generalizable and/or exhaustive concerning the motivation for PA among adolescents with asthma. Nonetheless, our rich empirical material during the timespan of the intervention strengthens the trustworthiness of findings and transferability of understanding about how adolescents with asthma can experience motivation for PA.

### **Perspectives**

The results indicate that facilitating involvement for adolescents with asthma might help remove previously reported barriers for PA and exercise. We also demonstrate the importance of understanding asthma both by other participants and by the instructors. This could suggest a need for more education on asthma among teachers in PE and instructors in leisure activities such sports, dancing and outdoors activities etc. Further research is needed to investigate how to facilitate relatedness, autonomy, and competence for adolescents with asthma when participating in PA in the community, including sports clubs, PE, and leisure activities



## Conclusions

Adolescents with asthma described enhanced motivation for PA and exercise through a play-based exercise intervention designed for them. This reduced social and asthma-specific barriers partly by fostering feelings for relatedness, autonomy, and competence.

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## Declaration of interest

The authors report no conflict of interest. We alone are responsible for the content and writing of the article.

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