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Barriers to and opportunities for integrating climbing in physical education

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ABSTRACT

This study aimed to describe barriers to and opportunities for integrating climbing, as a form of adventure education, in Austrian school physical education (PE). Guided by the theoretical framework of self-determination theory and the pedagogical model of Outdoor Adventure Education, fourteen teachers with and without experience in integrating climbing in PE were interviewed using a semi-structured interview approach. Teachers reported positive impacts of climbing in the pedagogical areas of sociological competencies and adventure experience, as well as physiological and psychological benefits. Potential barriers referred to organizational aspects including time, group size and infrastructure. They stated that the integration of climbing in PE depended solely on the willingness of the PE teacher to integrate it. Advanced training courses for PE teachers may foster implications of adventure education in PE and its integration into the school curriculum in order to address the youth culture and provide a meaningful experience in PE.

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Introduction

Worldwide, 81% of adolescents aged 13–15 years do not reach the recommended level of 60 min of physical activity per day (Bull et al., 2020). Many adolescents drop out of organized sports due to a lack of enthusiasm, as well as a lack of time and conflicts of interest (Butcher et al., 2002; Slater & Tiggemann, 2010). Adventure sports, also known as high-risk sports, action sports or lifestyle sports, are mostly self-organized and do not fit the traditional pattern of club sports (Houge Mackenzie et al., 2018; Thorpe, 2016) including strict training times. As lack of time is a frequently named barrier to adolescents' sport participation (Duffey et al., 2021), adventure sports could bear a chance for increased sport participation in adolescents. These sports include, for example, climbing, skateboarding, parkour, and freestyle and freeride skiing/snowboarding. Young persons aged 10 to 24 years, seem to show an especially high interest in these sports (Bennett et al., 2003; Mei-Dan, 2018). However, age is not a decisive factor as there is increasing research about adventure participation in persons of older age (Hickman & Stokes, 2019; Petry & Gilbertson, 2019; Sugerman, 2001).

Risk-taking, either a subjective or objective part of adventure sports, contrasts with an ever-increasing need and understanding of safety as found in many areas of Western social systems (Sandseter, 2011). However, focusing exclusively on safety and risk prevention could hinder children and adolescents from learning risk-management skills and developing confidence in their actions, and thus could put them at greater risk later in life (Sandseter, 2011). Thus, there is a need to find

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opportunities to integrate elements of risks in a controlled setting in PE. The following study investigated, from a teacher's perspective, the opportunities for and barriers to integrating climbing as a form of adventure education in PE.

Theoretical framework

Recent research has shown numerous positive psychological effects of adventure sports participation such as improved mood, higher resilience, and self-efficacy. Researchers suggest that adventure experiences enhance subjective well-being through basic psychological need satisfaction and contact with nature (Houge Mackenzie & Hodge, 2020). According to self-determination theory (SDT), the basic psychological needs of autonomy, competence and social relatedness were all named as motives for the participation in adventure sports across multiple adventure activities (Frühauf et al., 2022). Since the three factors of SDT, autonomy, competence, and social relatedness, are factors that are especially important during the developmental phase of adolescence, introducing adventure sports could be an intervention strategy to target developmental changes in adolescents (Dahl et al., 2018). The two basic psychological needs of autonomy and competence also align with the pedagogical model for outdoor adventure education which describes enhanced personal growth through adventurous experiences (Williams & Wainwright, 2016). The model includes the four key factors of experiential learning, mainly being outdoors, challenge by choice and managed risk. Challenge by choice allows students to choose their challenge based on their own emotional and physical ability and helps them to make their own decisions (Panicucci, 2007). Adventure education is often described in relation to experiential learning and can be defined as 'direct, active, and engaging learning experiences that involve the whole person and have real consequences' (Prouty, 2007). The most powerful learning experiences are described as encouraging the students to confront and solve problems and become interactive and dynamic learners (Panicucci, 2007).

Climbing as a form of adventure education

Climbing is a special form of resistance training with potential positive influences on physiological, social and psychosocial aspects which was mainly investigated in therapeutic settings in people with psychiatric disorders (Frühauf et al., 2019, 2021; Karg et al., 2020). Health experts (e.g. physicians, psychologists and pedagogues) described enhanced coordination and strength as some of the potential physiological effects of climbing (Frühauf et al., 2021). Furthermore, through the unique demands found in climbing, which involve the experience of unusual heights as well as the responsibility and trust in the belaying partner, climbing might enhance concentration, focus, psychosocial aspects such as cooperation and respect and trigger emotions, such as fear, joy or pride and the possibility to test one's limits in a safe environment (Frühauf et al., 2021; Leichtfried, 2015).

Climbing can be practiced in various environments, e.g. on artificial walls in indoor and outdoor settings as well as natural rock. Whereas different forms of climbing exist, if not stated otherwise, the current study used the general term 'climbing' to refer to sport climbing (which excludes mountaineering, ice climbing and trad climbing). Bouldering, as a form of climbing with a height of up to 5 meters without the necessity of a belayer, will be referred to separately. The injury risk in indoor climbing with 0.02 injuries per 1000 h can be considered as low (Schöffl et al., 2013). Climbing in a school sport context could provide meaningful experiences and a diversity of learning activities for students, with high pedagogical benefits as was shown in a case study of 13–16 years old students (Boudreau & Gibbons, 2019). Since climbing can be implemented in a facility-based setting it supports the pedagogical approach of challenge by choice for students (Panicucci, 2007). It includes individualized learning activities, progressively challenging learning activities as well as a safe and collaborative environment (Boudreau & Gibbons, 2019). Austria is a country with a long tradition of mountainous activities and an ever-increasing number of indoor climbing

facilities (e.g. Alpenverein 2023) providing opportunities for schools to integrate climbing into mandatory PE lessons. Considering the potential pedagogical benefits and the opportunity to provide meaningful experiences for PE students, little is known about real and potential barriers for integrating climbing into PE from a teachers' point of view, or the pedagogical experiences from those teachers who have already integrated it in their classes. Thus, the following study aimed to describe barriers to and opportunities for integrating climbing, as a form of adventure education, in Austrian school physical education.

Method

Since the aim of the research project was to get a deeper understanding of the experience and barriers with climbing in a PE context, rather than to validate pre-existing hypothesis, a constructivist-interpretive approach was used. The authors acknowledge that multiple realities exist and that knowledge and meaning are socially constructed (Lincoln et al., 2011). Consistent with the epistemological stance, a qualitative approach using semi-structured interviews was applied.

Participants

In total 14 teachers from higher education schools in Austria¹ were interviewed. The schools were from both rural and urban areas. All students were from coeducative schools, however, Austrian law enforces sex-segregated physical education from the fifth grade onwards ('Schulorganisationsgesetz [school organization act] §8b. (1) BGBl. Nr. 242/1962'). PE is mandatory throughout all classes with a minimum of 2 hours per week.

Participants were selected using a combination of purposive sampling strategies, namely criterion-based (Patton, 1990) for PE teachers, and snowball recruitment (Hennink et al., 2011). The primary criterion was that PE teachers had a minimum of 5 years of teaching experience and teach PE in high school. The study ensured to include an even gender distribution in teachers as well as an even distribution of teachers who already integrated climbing into PE. Teachers had a mean age of $40,5 \pm 9,8$ years and a mean experience as teachers of $15 \pm 9,3$ years. Table 1 shows further characteristics of the teachers.

Table 1. Teachers' characteristics.

Participants	Gender	Age [years]	Experience teaching climbing in PE	Recreational mountain activities	Member of an alpine association
1 (Alice)	Female	29	yes	yes	yes
2 (Adam)	Male	55	yes	yes	yes
3 (Bibi)	Female	29	No	yes	yes
4 (Chrisi)	Female	35	No	No	No
5 (Don)	Male	29	No	yes	yes
6 (Emil)	Male	30	Yes	Yes	yes
7 (Fred)	Male	40	Yes	Yes	yes
8 (Gisela)	Female	42	Yes	No	No
9 (Henry)	Male	40	No	No	No
10 (Ingo)	Male	50	No	No	No
11 (Jana)	Female	57	No	No	No
12 (Konrad)	Male	53	No	no	no
13 (Louis)	Male	45	Yes	Yes	Yes
14 (Maya)	Female	33	No	no	No

Data collection

A semi-structured interview was carried out with each participant by the second author. An interview guide was used to ensure that each participant was asked the same questions but at the same time allow them to talk freely about their experiences. One pilot interview was carried out with a teacher recruited through personal contact prior to the data collection. The interview guide was revised after the pilot interview. The interview guide included questions on experience in teaching climbing in PE (e.g. 'Please talk about your experiences with climbing in PE'), barriers ('Which barriers to integrating climbing in PE exist?'), advantages and disadvantages of integrating climbing in PE (e.g. 'Which experiences can students make when participating in climbing?') of integrating climbing in PE. Follow-up questions were pre-phrased (e.g. 'What are positive experiences of students participating in climbing?'). Further, the interviewer could ask the participants for examples (e.g. Could you give me an example?) or a clearer description (e.g. Could you explain that further/with more detail?). Interviews were carried out by one interviewer (DS). The average interview duration was 20 minutes. All interviews were conducted in German and carried out one-to-one at the school the participants were teaching. Approval by the Board for Ethical Questions in Science of the University of Innsbruck in accordance with the Declaration of Helsinki, was given (No.44/2021, Date 06/2021).

Data analysis

Before analyzing the data, all interviews were transcribed verbatim by the interviewer in German language. Transcription was carried out immediately after the interview. Any non-verbal communication was noted such as laughs or long pauses. The data were then analyzed independently by the first author, who was not the interviewer, in several distinct stages using MAXQDA Software ("MAXQDA," 1995-2022). MAXQDA is a manual software tool which facilitates the coding process by using drag and drop options, colouring and visualization. (1) First, the interviews were analyzed where the first author read the transcripts several times to immersed in the data as a first step. (2) Secondly, an inductive thematic content analysis (Braun et al., 2016) was carried out where raw data were given codes (e.g. 'responsibility'). (3) This procedure was repeated for all 14 interviews. (4) In the next step of the analysis, all interviews were cross-checked, ensuring that coding was consistent and accurately represented the data. (5) Following this, similar codes were grouped into subthemes (e.g. 'social competencies') and (6) higher-order themes (e.g. 'positive aspects') (Table 2).

(7) The final step was to confirm the codes and themes with the co-authors, whereas the last author acted as a critical friend (Smith & Sparkes, 2009). Although the critical friend did not analyse the full sample, in terms of disagreement or uncertainty by the primary analyst, codes and themes were discussed until full agreement was reached. All interviews were analysed in German, raw quotes have been translated into English, with the hope that the data will speak for itself and the voices of the participants might be heard. The participants were given pseudonyms in order to humanize the participant and help the reader to understand their stories.

Results

The results were grouped into the two overarching themes of Opportunities and Barriers (Table 2). Whereas Opportunities encompassed the themes of pedagogical aspects and teacher's interest, Barriers included the themes of negative aspects and potential barriers. Positive pedagogical aspects were named in the areas of social competencies, adventure, and physiological and psychological aspects. Teachers believed that the integration of climbing in PE strongly depended on the own interests of the PE teacher. Negative aspects were most often identified as objective risks such as falls and physiological aspects such as missing strength. Potential barriers were mostly named as organizational reasons, including time, group size and infrastructure.

Table 2. Themes, Subthemes and Codes.

Overarching theme	Theme	Subtheme	Code	
Opportunities	Pedagogical Aspects	Social Competencies	Responsibility Trust Teamwork	
		Psychological Aspects	Conquering fear Self-efficacy Individual adaption to difficulty level Solving problems	
		Physiological aspects Adventure	Motor competencies Testing limits Experiencing risk Variety	
		Interest	Personal interest School's interest	
		Potential Barriers	Organization	Group size Time Infrastructure
	Barriers	Potential Barriers	Legal requirements	Specific training Consent by parents
			Negative Aspects	Objective danger Falls Rockfall
		Negative Aspects	Physiological aspects	Missing strength Overweight students Excessive demand Overstrain
			Teacher's perspective	Responsibility Group size

Opportunities for integrating climbing in PE

Opportunities for integrating climbing in PE were mostly identified as pedagogical aspects, like developmental factors which included psychological aspects, social competencies and physiological aspects by teachers irrespective of their experience in climbing. The interest of the teacher and the allocated school was reported to play an important role in the realization of integrating climbing in PE.

Pedagogical aspects of climbing

Pedagogical aspects of integrating climbing in PE were described by all teachers regardless of their background and experience in climbing. These included psychological aspects, social competencies, physiological aspects and adventure. Psychological aspects, such as conquering fear, increasing student's self-efficacy, the possibility to individually adapt the difficulty level to participants' needs, and the ability to solve problems were found as the following quote illustrates:

I think that students can be courageous and also reach their limits, which can also be exceeded in a protected setting. Perhaps routes can be managed, which seemed impossible in the beginning. In this way one can also celebrate great successes. The great thing about climbing is that everyone, even if you are a beginner, can somehow still have their success. Even if you have more experience and can climb difficult things, you still experience challenges and success. You can differentiate very well and give everyone the opportunity to develop. (Alice)

Conquering fear and experiencing sensations of height in a protected setting were described by 10 of 14 participants and were seen as a major pedagogical advantage of climbing.

Dealing with fear is also trained very intensively. How do I manage to overcome my fears and deal with them? This is a very valuable experience, especially in a society that is very focused on security and does not allow such experiences. (Louis)

The physiological experiences of climbing were described as positive adaptations in strength and coordination but also as physiological sensations. The feeling of carrying one's body weight mostly with one's own arms was seen as a good pedagogical experience as this teacher explained: 'They experience the force of gravity on their bodies. Climbers have to work their way up against gravity. This is a completely different strain on the body and mind than other classic sports.' (Konrad)

Social competencies were described as responsibility, trust and teamwork. Possible transfer effects into everyday life were also mentioned by participants. The advantage of developing trust and responsibility was mentioned more often by teachers with experience in teaching climbing in PE. One teacher explained how he saw it as an important pedagogical aspect that in climbing students had to take responsibility but also trust someone as explained in the following: 'I believe that especially sport climbing can have a great pedagogical input. Taking responsibility for others, but also trusting someone, is in my opinion very important for further in life.' (Henry). With regard to responsibility and trust, teachers mentioned that in climbing students were taught to be disciplined and work consequently by the activity. If not following those rules there is the potential for a negative outcome not in terms of bad grades but actually in terms of an accident.

Climbing also happens in a social environment and that's a good thing, being in a belay partnership [e.g. belayer and climber]. You make experiences that are not artificial or vicarious, it is just so that the belayer then has the responsibility, and this cannot be surrendered vicariously. The student is taught that it is now really about their partner's life. It is a matter of life and death. Gravity is merciless and 10 meters is easily enough to achieve serious consequences. That is my experience with the students. That they perceive it in such a way very early [in climbing]. It is no longer a game, there is more at stake. I think it's a great opportunity to show responsibility, which is perhaps not perceived so directly in other sports. (Adam)

Other advantages of climbing were described in the subtheme adventure. This included descriptions about how students could test their limits and take risks in a protected environment, as the following quote illustrates:

I often notice that students hardly have the opportunity to do anything risky anymore. Because they grow up very protected. Because their parents often prevent them from trying something risky. Many children are afraid even at low heights. Risk assessment is missing to a large extent. Sport climbing offers the possibility to experience heights very safely and to learn risk assessment. Basically, on the subject of risk sports. Good risk assessment is important not only in sports but in many areas of life. I think that is an essential point. (Emil)

Related to the possibility of testing the limits, coping with fear was mentioned as a valuable experience that could be explored in climbing and had potential transfer effects into everyday life.

Dealing with fears is also trained very intensively. How do I manage to overcome my fears and deal with them? This is a very valuable experience, especially in a society that is very focused on security and does not allow such experiences. (Louis)

Interest of teachers and schools in climbing

Participants reported that it depended on the interest of the teacher to integrate non-traditional sports like climbing in PE. Some teachers talked about their school being generally open to the integration of non-traditional sports in PE. This was explained through a climbing infrastructure, the integration of other non-traditional sports or the personal interest of the dean of the school, as this teacher explained:

At our school, it [climbing] has a rather high priority. Several teachers go climbing with their students and our dean is a physical education teacher and a very good climber and therefore he has often climbed with students and passed on his knowledge and motivation to other teachers. (Chrisi)

However, the school emphasizing the integration of climbing in PE did not necessarily mean that the teacher had experience in teaching climbing in PE, as the previous quote from Chrisi, a teacher without experience with climbing in PE, showed. One teacher explained that a personal interest in climbing and non-traditional sports would be necessary in order to teach it safely and to be motivating.

In my opinion, the teacher must have a certain interest in order to be able to teach this sport [climbing] in such a way that everything is done safely and correctly. [...] For me, non-traditional sports have great value. I believe that I can reach the students better [with non-traditional sports] and connect better with their way of life. This is then also a key to their motivation. (Louis)

Despite seeing the possibility of integrating climbing in PE, some teachers said that they were not interested in doing so because they could not relate to adventure sports, as this teacher explained:

Personally, I think I can provide more than enough content in my class with traditional sports. That's why I don't even attempt such experiments [climbing] at all. I also personally have no connections to trend sports or similar sports. (Maya)

Barriers to integrating climbing in PE

Teachers reported several barriers when integrating climbing in PE, such as organizational problems (e.g. group size, time and infrastructure), legal requirements and parental consent. Thereby the identified barriers differed between teachers with and without experience in climbing. Negative aspects were thought by some participants to be higher objective dangers than usual PE, different physiological aspects and a heightened responsibility for PE teachers.

Potential barriers

Barriers to integrating climbing in PE were mostly identified as organizational aspects, including missing infrastructure, limited time in PE and large group size of classes. A large group size was a barrier named by more teachers with experience in climbing in PE than those without. The necessity of specific climbing education as a barrier was mentioned by more participants with no experience in climbing than those with experience. Connected to the necessity of specific climbing education, teachers without experience were unsure who was allowed to integrate climbing in PE from a legal perspective. In general, teachers who haven't had any experience in teaching climbing named more barriers than teachers with experience.

For me, feasibility is one of the main reasons why it is unsuitable for teaching. I have to visit an external sports facility, I need trained staff to prevent accidents and much more. These are already reasons enough not to integrate this sport in the classroom. (Konrad)

Only a few teachers made a distinction between bouldering and climbing. Some teachers talked about bouldering being more feasible for PE than top rope climbing as this teacher explained: 'The classes are very large and I think you need more supervising teachers so that nothing goes wrong. Especially when it comes to rope climbing. I see fewer barriers with bouldering.' (Emil)

Time was stated as another barrier to integrating climbing in PE, such as time to get to the infrastructure and less time for students to be physically active, as teachers feared that more time is occupied by the technicalities involved in climbing. Four teachers stated that movement time in PE was the major factor for their choice of activities. As one teacher explained in the following quote, climbing was not seen as an activity which provided enough moderate to vigorous physical activity:

Climbing is not something I can integrate into my lessons. I only have a limited amount of time to provide exercise for the students. I believe that climbing takes up a lot of time, which the students then lack in movement time. (Maya)

A further barrier which was named by three teachers, was possible discussions with parents when leaving the school compound. Leaving the school compound was necessary since the climbing infrastructure was not provided in the school compound: 'And you shouldn't neglect the safety issues from parents' (Louis)

Negative aspects of climbing

Potential negative consequences, in case of an error through belaying, were highlighted by 8 persons, whereas the majority who named this disadvantage had no experience in climbing in PE. The risk of injury was seen as rather low and none of the teachers with climbing experience in school has mentioned any adverse events related to injuries in climbing in PE. Some teachers with no experience said that they could not assess the dangers. One participant mentioned rockfall as a danger. However, teachers with experience in climbing in PE almost solely used indoor climbing facilities. Excessive demands for the students were mentioned as a potential disadvantage of climbing. This could happen especially in weaker and overweight persons. One teacher reported his experience with excessive demands in climbing with students.

I can tell you this from my own experience, it is possible to overchallenge students. One is confronted with large groups, [and] it is difficult to individualize. This can lead to overstraining. It goes so far that one almost traumatizes individuals. Based on the group dynamics, they may not want to embarrass themselves. It is important to maintain a high level of sensitivity so that the students are encouraged and given the opportunity to experience effectiveness without being overwhelmed. (Adam)

The argument which was only mentioned by teachers with experience in PE was that students who were overweight had a harder time and reached their limits more quickly. This could also happen to students who were not used to this specific strain.

Negative aspects are certainly that weak or overweight students reach their limits extremely quickly. But also many other students reach their limit because they are simply not used to the strain. The risk is that after 10–15 minutes you simply can no longer hold on to the holds because the forearm muscle fails. (Emil)

One teacher, who had experience in climbing with students, and where the school was explicitly supportive of integrating climbing in PE, said that she sees the major disadvantage of climbing in terms of the willingness of the teacher:

I see problems more from the perspective of the teacher, if you don't have the confidence to do it yourself. It depends very much on the size of the group and whether I'm confident enough to go climbing with so many students. You also have to differentiate between rope climbing and bouldering. I think the barrier for bouldering is lower than when I say we go toprope climbing, there is simply the aspect with the height and belaying added. [...] And you would have to argue to the parents why you are going to the climbing hall now and not staying in the gym. [...] I believe that many colleagues do not dare to do this because they think the risk of injury is too high, or the organizational effort is too high. (Alice)

Discussion

This study aimed to describe barriers to and opportunities for integrating climbing, as a form of adventure education, in Austrian school physical education. All teachers named positive pedagogical aspects of climbing as an activity in PE, such as enhancing social competencies, or psychological aspects, such as conquering fear and increasing self-efficacy. However, the majority named further organizational reasons, such as infrastructure, time and group size as barriers to integrating climbing in PE. Further, the choice of activities in PE seemed to depend on the personal interest of the teacher.

Results in alignment with the theoretical framework

The pedagogical model of OAE comprises the factors of experiential learning, mainly outdoors, challenge by choice and managed risk (Williams & Wainwright, 2016). All, bar one factor, could be found in PE teachers' descriptions of climbing in PE settings. The interviewed PE teachers described the benefits of climbing in comparison to traditional sports with a special emphasis on experiential learning, such as students being able to take responsibility and having trust. This could result in enhanced social relatedness as described by the self-determination theory. The possibility to

uniquely adapt the level of difficulty based on each of the students' abilities was mentioned as a benefit of climbing. Teachers described the possibility of easily reaching their own set goals, which is in line with the other factors of the self-determination theory of competence and autonomy. Individually adapting the level of difficulty in climbing, highlights the factor of challenge by choice of the pedagogical model of OAE (Williams & Wainwright, 2016). The fourth factor, managed risk, was mentioned as a positive aspect of climbing by teachers with experience in teaching climbing in PE. Teachers without experience in teaching climbing saw the risk in the activity as a negative factor and a barrier. This result of differing perceptions showed that there is a need to integrate the positive aspect of risk management and its implication, especially in the developmental phase of adolescence, in teacher's education. The factor of mainly being outdoors was not fulfilled based on teachers' descriptions of mainly using the indoor infrastructure. However, this made it possible to enhance the factor of challenge by choice for individual students since they could manage risks in a controlled indoor setting without further environmental factors. To provide not only physical but also emotional safety, which was mentioned as an important factor of adventure-based learning by Sutherland and Legge (2016), PE teachers with climbing experience described the importance of not overstraining students through climbing. This was reported to be especially important for overweight students and students with less physical strength.

Climbing as an intervention strategy to target developmental changes in adolescents

Pedagogical benefits of climbing were described, especially within social competencies, by participants in the study. Social interaction was one of five themes identified, and was central towards a meaningful experience in PE as reported by Beni et al. (2017). Other themes which were found to be important for a meaningful experience in PE were 'fun,' 'challenge,' 'motor competence' and 'personally relevant learning.' Most of these themes were also identified as positive aspects of climbing in the present study. For example, the possibility to experience adventurous activities and risk in a secure environment. This concept is also known as positive risk-taking in the literature (Duell & Steinberg, 2019). In adolescence, there is an increased receptivity to rewards, mostly associated with an increased willingness to take risks (Galván, 2013). Exploratory behaviors and the search for new experiences, triggered by reward receptivity in adolescence, seem necessary for adolescents to achieve independence (Galván, 2013). The concept of taking positive risks, as it was explained by teachers when talking about climbing in PE, is a behavior that is socially accepted and might contribute to the constructive development of children and adolescents (Duell & Steinberg, 2019). Current research stressed the necessity to provide health-promoting behaviors in adolescence that address developmental changes during adolescence (Dahl et al., 2018). Target areas could include the need for new and exciting experiences, as well as motivation for status, prestige, and respect in terms of social recognition, building on this to provide motivation for learning prosocial behaviors (Dahl et al., 2018). Prosocial behavior such as taking responsibility for fellow students in climbing was identified as a pedagogical aspect of climbing in PE by the majority of teachers in the present study. Thus, climbing seemed to be a possible intervention strategy to target developmental changes in adolescents and provide a meaningful experience in PE.

Besides these positive aspects, negative aspects were also mentioned, which warrant attention. Although none of the teachers reported having experienced injuries in climbing, higher objective risk through climbing was named frequently by teachers as a negative aspect. This directly led to the teacher's responsibility, which was seen as higher in climbing compared to traditional sports. Responsibility was experienced as greater, because of the student's height exposure while climbing, and was reported to increase with larger group sizes. Large group sizes were seen as a barrier to climbing, especially by teachers with experience. Bouldering seemed to provide fewer barriers to integration into PE. Bouldering was also associated with potential positive effects on self-efficacy and well-being in adults with depression in previous

studies (Karg et al., 2020; Kratzer et al., 2021). Another negative aspect mentioned by experienced teachers was the possibility to overstrain students, especially those with less strength or with limited exercise capacities. Despite climbing being described as an inclusive activity, which was also recommended for people with physiological and psychological disorders (Oriol et al., 2018), a strong focus should be placed on the structure of the climbing lesson, in order to give enough breaks to avoid overstrain in students. Some teachers mentioned, that the activity of climbing was physiologically challenging since most students are not used to activities which involve hanging and feeling their own body weight. Climbing in a PE context could provide meaningful experiences for students and a diversity of learning activities with high pedagogical benefits (Boudreau & Gibbons, 2019). Individualized learning activities should include progressively challenging learning tasks as well as a safe and collaborative environment (Boudreau & Gibbons, 2019). As mentioned by Beaumont and Warburton (2019) sports like climbing have the opportunity to be relevant to youth culture and as an individualised non-aggressive activity might be suitable for inclusive and coeducational PE. This would provide an argument for coeducational classes when teaching climbing since PE classes are separated by sex in Austrian schools. Schwab and Dustin (2014) described, in their article, an example of one PE teacher who engaged his students in adventure activities and gave them the opportunity to learn about risk and safety, decision-making and further social competencies while being physically active in an outdoor environment. Considering the opportunities of adventure sports, described by Schwab and Dustin (2014), and the identified pedagogical benefits of climbing in this study, a change in the national curriculum towards integrating more sports relevant to young people, such as adventure sports, should continue to be discussed (Beaumont & Warburton, 2019).

Practical implications

The rationale for teaching certain health behaviours was one of the three most influential aspects of topic choice in teaching health education (Cahill et al., 2014). Although teachers were aware of the positive pedagogical aspects of climbing, teachers with no experience saw more barriers that hindered them from integrating climbing into PE. As there was a large knowledge gap reported about who would be allowed to teach climbing in PE, the opportunities of integrating bouldering as an easier-to-implement form of climbing should be communicated to teachers. Including climbing in PE teacher's education could target some barriers, such as fear of teaching climbing or insecurity about who is allowed to teach climbing. In Austria, PE teachers are allowed to teach climbing in PE when they attended specific climbing training as part of their studies or as further training through a university, alpine association or the federal sports academy (BMBF 2014). Hovey et al. (2020) reported that integrating aspects of outdoor education into PE education (e.g. at University) could lead to increased self-efficacy for prospective PE teachers to teach outdoor education later in life. Thus, integrating climbing into PE teachers' education may also provide them with confidence to teach climbing in schools, next to the legal foundation. Some teachers feared that students would not get enough moderate to vigorous physical activity (MVPA) through climbing. However, Gehris et al. (2012) investigated physical activity levels during adventure-PE lessons and found that the greatest percentage of MVPA occurred in high elements which is comparable to climbing in a gym. High elements include the necessity of climbing equipment and can occur on a vertical wall or similar elements requiring a belaying partner. The time spent in MVPA in high-element activities (40%) was reported to be similar to traditional PE activities such as basketball (37%) and badminton (40%) (Chow et al., 2009; Gehris et al., 2012). Gehris et al. (2012) suggested that encouraging feedback from teachers to students as well as a focus on non-physical benefits such as social development which might enhance motivation and enjoyment could further enhance MVPA in adventure education.

Limitations

As a limiting factor, it should be noted that not all teachers distinguished between the forms of climbing, (e.g. bouldering, indoor climbing and outdoor climbing). Thus, some mentioned aspects might be specifically attributed to a specific form of climbing such as the factor of responsibility and trust which probably will not occur in bouldering (since there is no need for belaying). Further, the results of the study only draw on the interviews, no in-field observations (e.g. in the specific PE classes) or further data collection methods have been undertaken. The readers should avoid generalizing the results of this study since a qualitative study is used to examine issues in great detail and depth (Anderson, 2010) but cannot be used to make empirical statements about an entire population.

Conclusion

The aim of this study was to describe barriers to and opportunities for integrating climbing, as a form of adventure education, in Austrian school physical education. All interviewed teachers reported positive pedagogical implications through climbing which align with three of the four factors of the pedagogical model of outdoor and adventure education (experiential learning, challenge by choice and managed risk). Making one's decisions and experiencing risk in a managed environment could target important developmental aspects in adolescents. Although the fourth factor (mainly outdoors) of the pedagogical model of outdoor and adventure education was not met since most teachers used indoor climbing facilities, a heightened self-efficacy and better management with fear in students after climbing was reported by teachers. Some aspects seemed to be rather unique in climbing which involved the implementation of responsibility and trust in the partner, as well as the possibility to conquer fear and experience height. However, potential negative aspects, such as the objective danger through falls, put a high responsibility on the teachers and were among the organizational reasons reported as a barrier to climbing in schools. Bouldering seemed to provide less barriers, especially in schools with a climbing infrastructure. However, it seemed that the integration of different activities in PE mostly depended on the interest of the PE teacher and his or her beliefs of what their students needed. The bias of interest should be further analysed in PE teachers' choice of activities as well as discussed in teachers' education. There is a need for more structured research on the implications of adventure sports in physical education such as intervention studies comparing the effects of climbing with regard to traditional PE lessons. Further, the opportunity of integrating adventure sports such as climbing in the PE curriculum, in order to target developmental aspects and provide a meaningful experience of PE and lifelong sports participation for children and adolescents, should be discussed.

Note

1. Those schools provide a degree which allow students to attend a University and include school years 5–13.

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