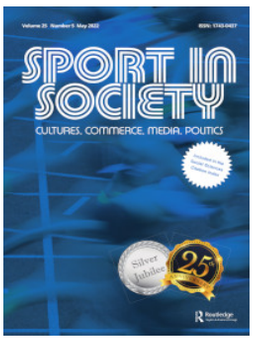

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The co-development of inclusive tools in physical education for pupils with and without disabilities

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ABSTRACT

The development of inclusive tools for Physical Education (PE) is often conducted without involving children as co-developers or viewing education as consisting of heterogeneous target groups, not as individuals with different needs, such as disability. This study forms part of a larger project on innovations from a norm-critical perspective on tools for PE with children and companies as co-producers. The particular focus of this study is to test and evaluate a prototype from a child's perspective, with the specific aim of investigating how participation, inclusion and learning are described in the use and development of a new sports tool in the subject of PE at three schools in Halland, Sweden. The study uses qualitative methods such as interviews, films and participant observations using an intervention approach.

The results of the study show that participation and inclusion play an important role in developing and using tools in PE. The study also suggests that participation and inclusion may enhance learning in the development and creative use in classes in which it was necessary for the children to manage challenges and obstacles.

KEYWORDS

Children; disabilities; inclusion; learning; norms; participation

Introduction

Knowledge about the importance of norms for development, learning and participation has contributed to a collaboration between researchers and companies to enable inclusive education in the subject of Physical Education (PE) at schools in Sweden. Through this initiative, researchers and companies have developed innovative sports tools together with students and norms concerning sports and education have been identified. The developed innovative sports tool is called Kids Sand Glove. Students from three primary schools were involved in the process and their views and experiences are important to the development process of inclusive tools in PE. It is important to study how the students perceive the Kids Sand Glove prototype and challenge the standards for inclusive development. The idea is that all children, regardless of their circumstances, should be able to participate in PE. Eleiko

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Sports AB, a world leader in bar and weight production and Unisport, formerly Rantzows AB, who design most sports halls in Sweden, have been intimately involved in the ONCIRI (Open Norm-Critical Innovation for Relational Inclusion) project with the overarching aim of challenging norms and seeing new opportunities for product development. Based on the students' desire to improve their ability to exercise strength, the "Kids Sand Glove" prototype, a glove worn on the hands of students, was produced by Eleiko Sports AB. The glove has a small sandbag as a weight, thus contributing to increasing the strain in all movements. This article focuses on this process and on the students' thoughts and participation when they were testing and developing the tool. Emphasis has been placed on all students in the subject of Physical Education being able to participate.

For many children with disabilities, sport and exercise could be of even greater importance than for children with no disabilities, particularly with regard to health and well-being (Kristén 2003; Shields, Synnot, and Barr 2012; Kiuppis 2018). However, participation in school PE and/or leisure time sports activities is not always available to children with disabilities taking into account both the barriers and facilitators associated with the perceptions related to personal, social, environmental and policy or programme factors (Longmuir and Bar-Or 2000; Berg Svendby and Dowling 2013). According to research, inclusion should begin at preschool or primary school since educational objectives are most often referenced to cognitive, social, motor development or adaptive behaviour. However, there appears to be a reflective gap between the intention and implementation of inclusion across Europe. Schools should address students with special education needs (SEN) in teaching situations, for example, in PE lessons. Moreover, the teachers' knowledge of and attitudes to inclusion is crucial to how teaching is carried out regarding both inclusion and participation. The inclusion in Physical Education is a right for all children regardless of their physical, psychological, social and an existential abilities (Berg and Ekblom 2016; Diniz and Viana 2016). The Swedish National Agency for Education uses the following definition of disability:

> /…/permanent physical and/or intellectual limitations to a person's ability to function as a result of injury or illness existing at birth, that has subsequently occurred, or that can be expected to occur (Hammarberg 2015, p. 14)

The industry that supplies schools with sports equipment for children has expressed a need to develop inclusive tools for use in physical education. Children and young people with disabilities (particularly those who have a physical disability) exhibit the poorest health status in Sweden (Swedish National Institute of Public Health 2008). In the subject of Physical Education in Sweden, there is still a lack of extensive research on how students with disabilities perceive their opportunities and obstacles in teaching. Even at a global level, there have been relatively few studies based on the circumstances in PE (Block and Obrusnikova 2007; Qi and Ha 2012). The norm-critical perspective and the children's ability to speak must be strengthened and developed (Ring, Kristén, and Klingvall-Arvidsson 2017; Giese and Ruin 2018).

Aim and research questions

The aim of this study is to investigate how participation, inclusion and learning are described in the use and development of a new sports tool in the subject of Physical Education.

Research questions

In what ways do students describe their learning, experiences/perceptions of participating in the development of new sports equipment in the subject of Physical Education?

How do students describe opportunities and obstacles in the use and development of new sports equipment in the subject of Physical Education?

Which norms are observed (identified) in studies in which researchers observe and interview children?

Theoretical framework

Our theoretical basis is about learning and participation related to collaborative learning, relational perspectives, variation theory and learning by doing.

We use a critical pragmatic perspective on inclusion in PE. Using this approach, all activities and the consequences of activities should be viewed in context. With this in mind, the terminology of participation and learning should be defined. The term "participation" is defined by the World Health Organization as "the nature and extent of a person's involvement in life situations and includes activities of self-care, mobility, socialization, education, recreation, and community life" (World Health Organization, 2007). Based on a critical understanding of categorisation processes in education, a relational perspective on school problems is the project's starting point. From this perspective, special needs support is given "for incorporating differentiation into instruction and content" (Persson 2013). Difficulties arising in education are not restricted to the individual student, but to the educational encounters where they occur (Barow, Persson, and Allan 2015). With this in mind, innovative PE tools are intended to support teaching strategies and the process of pedagogical and inclusive differentiation within the class.

"Collaborative learning" is a generic term for teaching methods in which pupils, students and teachers learn together. Students work in small groups to maximize their own and each other's learning (Johnson, Johnson and Holubec 1990). Students also learn to work together and support each other. The development of social skills is the key to excellence in teamwork and promotes learning, and is an important element if it is embedded in new products. This method benefits all students, but particularly students with disabilities and/or students who achieve poor results in academic contexts (Sund 2007). A comprehensive study by Wallhead and O'sullivan (2005) examined the effects of the Physical Education curriculum model in which contemporary theoretisation has the potential to promote the more positive cultural aspects of sport and physical activity and challenge the exclusionary discourses of much instutionalised sport. Thus, participation is a key concept to collaborative learning, as well as product evaluation. Jansson (2001; 2011) developed a *model of participation and belonging* that captures several aspects of participation. According to Jansson (2005), the concept of participation contains both objective (observable) and subjective (self-experienced) components. The components of the participatory model are illustrated as aspects of belonging and togetherness both includes accessibility (physical, socio-communicative and symbolic), collective action, commitment, recognition and autonomy. Thus, the concept of *togetherness,* elaborated by Jansson (2001, 2005), could be the correct approach when studying participation and social interactions in PE settings. The findings from Smith (2004) also confirm the participatory benefits of providing

education with equal opportunities; in practice, providing benefits in terms of integration in PE concerning pupils with special needs.

The terminology of "learning" can be defined as a variation theory. This theory is about a special form of learning, about learning that makes the learner better prepared to handle new and unknown situations in the future. A key idea is that our action in the world is a function of how we perceive the world in a way that enables students to act in their world in a powerful way, to enable them to see their world in a powerful way, to reflect on and experience something new, through self-experienced, practical experiences (Marton and Booth 2000; Marton 2015). Problems should be experienced through action and reflection and the phrase "*learning by doing*" characterises Dewey's philosophy. Theory and practice should be evaluated equally and become each other's preconditions, meaning that individuals live as they learn (Hartman, Lundgren, and Hartman 2004).

Referring to Dewey, Öhman (2014) writes that genuine education will give students the opportunity to broaden their experiences where they pay attention to the environment and where they can act through moral responsibility. Education must prepare opportunities so that students learn and grow based on their own experiences and goals. Månsson and Nordmark (2015) see a risk in education if a school is too distanced from an individual student's needs, which could result in the value of the individual being influenced by different norms or preconceived opinions about what it means to be a member of society. According to Almqvist et al. (2008), Dewey believes that our world and ourselves are created through all the encounters that we constantly experience and that these phenomena have no essence in themselves, but their meaning arises based on the events in which they participate. According to Hartman, Lundgren, and Hartman (2004), Dewey emphasizes the importance of the individual being reflecting on their actions. This study uses the didactical questions what, how and why in the discussion in order to invlove the students and give them the opportunity to be seen and heard. Quennerstedt and Larsson (2015) mention that these questions are comon in physical education research and are a usful resource when investigating the what and how teachers teach and students learn. Hildebrand (2016) emphasises Dewey's philosophical concepts of "experience" and "situation" that make sense of meaning creation in life.

Method

The qualitative methods used in this study comprised interviews and participant observations using an intervention approach within ordinary PE school contexts. Applications such as jumping ropes, ball games, dance, circuit training, games and play were studied. Documentation of the study comprises recorded interviews, films of pupils using the Kids Sand Glove, as well as field notes. All three researchers discussed the material in the results analysis.

Study design

The study was conducted at three elementary schools in south-west Sweden with approximately 15–20 children with and without disabilities, a total of around 60 children between 10 and 15 years of age. The schools were selected because they had inclusive classes in PE.

Lesson 1	Lesson 2	Lesson 3
Approx. 10 pupils from a class -The pupils develop a game, dance or circuit training using the Kids Sand Glove, together with teachers, companies and researchers. -Filming the pupils Interview/three focus groups	Approx. 20 pupils -The pupils teach the movements from the different teams to the rest of the class. -The movement develops together with the class. -Reflection -Filming the pupils -Interview/three focus groups	Approx. 20 pupils -The pupils implement the final result from the teams. -Filming the pupils -Reflection -Interview/three focus groups

Figure 1. Study model of developing tools for inclusion in PE.

Each school class had one or two students with disabilities. The schools were permitted to work with a certain theme such as dance, games and circuit training with strength training. The themes developed during three lessons in PE, see Figure 1.

Procedure

The procedure for connecting children in the process of testing and developing tools for PE followed the same structure of all schools. Informed consent was distributed via the respective PE teacher and was returned to the researchers. Pupils who expressed concern about being filmed or parents who did not agree to participating on film were excluded from being filmed but have been included in the analysis. None of the pupils refused to be interviewed. The children were not required to explain their non-participation in the study. The interviews were conducted in focus groups that included children with and without disabilities. The students were divided into groups by the PE teacher. The interviews were conducted during nine PE sessions and all interviews were recorded. The duration of each interview was around 15 mins.

Preparatory visits were conducted with pupils and teachers and the aim of the study was explained. Pupils were given the opportunity to ask questions and express their expectations or uncertainty about the study. Almost all children were positive about the study and were excited about being involved in the process of testing and developing tools for children for PE in schools.

Data analysis

Data were collected through interviews, films and participant observations during the winter of 2017 and the spring of 2018. The interviews were conducted in a relaxed and informal manner during PE lessons, and hand-written notes were taken during the interviews. The interviews were recorded digitally and transcribed prior to the start of the analysis. Data coding, analysis and interpretation depended on the descriptions being as complete as possible, so transcripts were prepared from every session. Coding of the interviews started by discussing the results after the interviews and how they related to children, disabilities,

inclusion, learning, norms and participation and how they correlated with the interview questions and aim of the study. Two main themes emerged from the interviews. These two main themes were identified from each of two categories:

Children's perceptions of participation and inclusion using a new sports tool

- *Creating adapted physical education for the children*
- *-Being involved in Physical Education*

Children's perceptions of learning using a new sports tool

- *-Developing bodily awareness among the children*
- *-Reflecting on opportunities in Physical Education.*

According to Braun and Clarke (2006, p. 82), a theme is *"something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set"*. Identifying themes suggests a creative but systematic search for pieces of data that belong together or are of importance because they are significant in other ways. Thus, the selection of data involves an awareness of the tension between the aims, questions and opportunities for the empirical data to reveal something surprising and unknown. Data selection also requires an awareness of the position of the researchers' own interests because it is the researchers who will be selecting the data and excluding other views. Data must be interpreted, and it is the researcher who does this. This particular point drew our attention to the matter of congruence, which is a methodological challenge (Macleod et al. 2017).

The research group collaboratively analysed the data together with shared transcripts and film sequences. It was important that the analysed data were representative of pupils with and without disabilities. A range of themes emerged from these transcripts and they were reduced and refined through an iterative process of reviewing the aims and theoretical concepts. The final findings of this study were developed from dynamic discussions between all authors.

Intervening studies

Participatory research/user involvement in research and development means that the target groups should be more or less involved in all or parts of the research process. Pupils and companies were involved in everything from being creative in the process of suggesting the needs of PE in terms of inclusive tools in education, to children testing and evaluating the prototypes produced by the companies (Wermeling and Nydahl 2011). The research discipline is in the field of disability studies, but also concerns research related to PE, identity and materialities (Ring, Kristén and Klingvall-Arvidsson, 2017). In all these fields of research, user participation or participatory research is an important starting point for co-produced research on inclusive PE for all school pupils (Hillén, Johansson, and Karlsson 2013; Jurkowski 2008; Schalock et al. 2002). This also includes participation from companies in the study. However, participatory methods are also viewed in terms of critical assumptions in inclusive and participatory processes, in which some pupils are favoured more than other pupils in the studied schools (Metzger 2013).

The project involves the co-development of tools for PE with children and researchers as mediators between companies and children in a collaborative learning process that includes loops in which the ideas and the views of the children are transferred to the companies. They have modified their ideas and built their prototypes based on ideas from children. The researchers played a mediating role trying to create learning about norm critique for companies and enlisting children with and without disabilities to test and evaluate prototypes made by the companies.

Ethics

The study has been ethically approved, Ref. no.: 2015/851.

We believe that collaboration and co-production of innovations related to education benefit from the dynamics of involving all children in the classes studied. Dynamics between children with or without disabilities in creative processes benefit from the perspective and scope of the potential variety of cases. However, norms are part of structural aspects and involve power issues. Power and disability aspects are crucial in this study since these perspectives may address questions that are relevant to this research in terms of how different perspectives produce different outcomes. Some of these norms concern gender issues, which have been considered insofar as we have analysed the differences in intensity and meaning of the links in PE related to gender. This is also true regarding the ethnic dimensions and levels of ability.

Participation in testing and evaluating prototypes that were documented using a tape recorder and films was voluntary. The research was conducted in accordance with the principles of ethics, being morally right, honourable, virtuous and decent. The research has adopted ethical behaviour by not causing people harm and being honest and fair. Any conflict of interest between the researcher and participants was carefully handled in terms of the potential risks by taking ethical principles into account by considering activities from their relevance, unavoidable risks, minimising risks. Participants were informed about the risks, as well as voluntary participation and the right to withdraw from the project at any time. Participants were encouraged to correct activities if they perceived an activity as wrong. The material was collected over an extended period by three researchers. Thus, the project will maintain confidentiality and avoid the disclosure of personal information, discomfort and uncertainty.

Methodological challenges

The project focuses on norm critique. Norms are usually defined as ongoing cultural, unwritten and tangible rules of what is considered normal or non-normal. Norms are products of values and beliefs and they create expectations of individuals and group behaviour, lifestyle and appearance. Such values, beliefs and expectations can be situated in time and space and are referred to as "normative normality" (Tideman 2000).

Norms also influence how we perceive and label ourselves and others and how we identify ourselves in relation to others (Lövkrona and Rejmer 2016); deviating from norms often means exclusion and discrimination. The role of norm criticism is to make prevailing power structures visible. These include structures relating to gender and sexuality roles, radical and queer issues, disability, etc.

This study has attempted to ascertain that norms are unwritten and silent values that influence individual and group behaviour and that these norms are in contrast with official curricula that overtly and explicitly define what is expected in terms of both goals and learning outcomes. The study has also recognised that norms are not only shaped and shared by children in schools, they also exist between teachers and between children and teachers. Norms could be innocently involved in procedures that might seem practical and necessary, but on closer inspection could instead be related to structures of inequality and power. We discovered this complex power relation between adults (interviewer) and pupils (interviewee) on several occasions during the data collection.

The power relation between pupils and researchers can be defined in terms of congruence. Congruence and norms go hand in hand since silent acceptance of norms shapes what a person can be expected to say or not say in a specific situation. Congruence was defined here as a state of agreement on a prevailing norm. It involves interpersonal interaction characterised by what is "appropriate" for subtle, expressive and affective relationships, rather than "logical" and clear orders (Jensen & Löw, 2011). Children are particularly sensitive to agreements about what they are expected to say or do, more so in a school situation in which adults place expectations on children's values and norms. School children are monitoring and scanning for an adult's expected answers and they may tend to adjust their opinions if they feel that they have crossed the boundary of a norm. This may have made the children more helpful and positive about the study than if we had been studying adults. It may also have influenced a company's willingness to develop prototypes that may not have been on the agenda if economic incentives and financial goals had been primary. An ordinary product development process may have resulted in other types of prototypes or ideas.

Results

The pupils at the different schools became acquainted with the Kids Sand Glove prototype and the aim of the research project was for the pupils to participate in finding different opportunities to use the tool together. The prototype was prepared based on the students' desire to increase their strength.

Children's perceptions of participation and inclusion using a new sports tool

Participation and inclusion are key concepts in the study and, as researchers, we have a perception of what participation and inclusion mean for the students. However, the results reveal interesting statements from the students, highlighting the importance of discussing the understanding of these two concepts. The two categories *Creating adapted physical education for the children* and *Being involved in physical education* combine and deepen the understanding of the theme of participation and inclusion.

Creating adapted physical education for the children and being involved in physical education

The children, both with and without disabilities, were well aware of their abilities and stated that there would be increased participation if people listened to them. The children talked

about how they could use the Kids Sand Glove and suggested improvements to the sports material. There was a sense of adaptation and involvement among all the pupils and they spoke with enthusiasm.

> "I thought that having them was fun, trying something new, because in physical education you often repeat the same thing several times" (Anna).

> "It was really fun to make up something of your own, something you think is fun "(Johan).

These statements are interpreted more as an adaptation in which the meaning of the concepts becomes an informed reasoning based on a norm of participation:

> "Because you can use it in different ball games, as well as relays and, when you take part in gymnastics, for example, you can use it with different tools and so on" (Selma).

> "Because it's easy, it's like you can still throw the ball all over the court. In our game it didn't matter if you couldn't throw the ball as far as normal because you can still hide and someone else can take the ball" (Lova).

Some students were knowledgeable about what participation and inclusion could mean. Participation could be about involvement in a decision, being involved or, as a student, being careful to emphasize a willingness to not participate. However, at the end of the conversation it emerged that some students had no problem voicing their opinion. The statements by Daniel and Andrea are interpreted as relating to how students participated actively and voice their interesting ideas:

> "I think that you could use this for everything in PE, as an extra weight when playing handball, so so that you get more training" (Daniel).

> "I think that it could change training/PE, kind of like if you want to test it in something you already do(have done). You know, try with this on" (Andrea).

The following two statements were interpreted as relating to the poor self-esteem of the student because of a performance requirement that did not involve the student. It could be important to understand how the possibility of participating affects the students:

> "Being allowed to decide" (Carl).

> "I had to join and decide, but I didn't want to. I wish they would think of something/…/ because they certainly have better ideas than me" (Frida).

Inclusion is about the creation of communities and we observed that the students formed groups and discussed the use of the Kids Sand Glove. Children with disabilities were given a significant role and were more clearly involved in the community because their opinions were important. The class jointly identified different usage solutions and several communities were observed.

> "It feels important to be involved in something new and to start thinking about how everyone is able to participate" (Lina).

From an inclusion perspective, the children stated that everyone could be involved when they used the Kids Sand Glove and that the sports material had been adapted and was easy to use. From a norm-critical perspective, it is possible to interpret the children's responses as meaning that not everyone is always included in the activities, for example, due to the

characteristics and nature of different sports equipment. The children described the use of the tool for all in terms of possibilities based on adaptation: "Easy to use for everyone", "Everybody can join in", "We help put on the Kids Sand Glove", "We attend games and sports together", "It might be difficult to put on the Kids Sand Glove if you were on your own". The children also talked about obstacles: "When I can't agree and decide", "If the sand glove gets too heavy or falls off", "Some people may not be able to put it on their arm because of an injury".

When we observed the PE lessons, we noted that the pupils with disabilities were involved and that their views seemed to be important. A student with a disability who used to hide in the utility room suddenly became interested in being involved and helped his classmates put on the Kids Sand Glove. He also participated in table tennis wearing the Kids Sand Glove. The PE teacher was very happy with the student's participation.

The teacher stated:

> "He usually doesn't participate, but this is something new and I'm surprised" (Erik).

There is a silent norm that accepts that a student with a disability does not always participate in PE activities, and this means that inclusion requires active participation and not just attendance.

Children's perceptions of learning using a new sports tool

Learning is a key concept in the study and, as researchers, we have a perception of what learning means for the students. However, the results reveal interesting statements from the students, highlighting the importance of discussing the understanding of this concept. The two categories *Developing bodily awareness among the children* and *Reflecting on opportunities in Physical Education* combine and deepen the understanding of the theme of learning.

It is important that learning is discussed together with the pupils and that the questions Why, What and How? are raised so that the pupils will learn about inclusion.

- Why am I participating in this project?
- What will we learn?
- How can we use and contribute to the development of learning with new tools for everyone?

The Kids Sand Glove will be a tool about which these questions can be discussed in the PE lesson and not only a tool for physical movement. The Kids Sand Glove contributes to learning by allowing students to reflect on and discuss the sport of the future by suggesting activities using the Kids Sand Glove. Together, the students encountered obstacles and discovered opportunities so that everyone could be included in the sport. There are norms about how a physical activity should be performed during a PE lesson and the students' suggestions related to familiar physical activities. Thus, the Kids Sand Glove is a tool for the teacher where students can learn about the different abilities and circumstances of individuals.

Developing bodily awareness among the children and reflecting on opportunities in physical education

When we filmed the children during a lesson, they used sand gloves when they took part in long jump. They made two jumps with and two jumps without the tool. We filmed the sequence and, after each jump, we interviewed each student. The students showed an awareness of the effect of having a weight on their hands and they said that it was harder to run wearing sand gloves. The students also said that they felt more stable in the body when they used sand gloves. They also noted a difference and the jumps became longer when they didn't use the sand glove. The students' comments about the movement with and without tools was interesting.

> "The jump got longer when I first used sand gloves and it felt easier to jump after that …" (Fredrik).

The students had a similar experience when they threw a ball. They made the same kinds of comments and felt more stable, but it was harder to throw wearing sand gloves. However, they were very happy and said that they were throwing further and received an immediate positive response after they had thrown. This created motivation and the students wanted to throw again immediately.

> "I noted that I learned to take in a lot more and then my throws got much longer" (Lisa).

When we asked how these exercises could be performed so that everyone could join in, one student replied:

> "It might be an idea to replace the heavy ball with a lighter ball. The weight is in the hand here (pointing to the sand gloves) instead/…/(thinking) then it may be easier for those students who don't have so much strength/…/to throw the ball" (Åke).

When we asked about what the children felt in their bodies when using the Kids Sand Glove, they replied:

> "What I noticed was that you got tired much faster because it's the weight that makes you tired" (Joel).

> "I also thought it was fun to wear, you get more fit, and so on. You start to move more" (Mia).

> "If you run in a competition then you get much stronger if you wear it" (Daniel).

The students' comments and suggestions in the discussions gave a clearer picture of how they wanted to develop an inclusive education. When asked about how sports equipment should be designed, one student replied.

> "It shouldn't be too difficult, everyone should be able to use the equipment, and it should be fun to use (Hugo).

The children made various suggestions for the further development of the Kids Sand Glove.

The children proposed developments such as making the Kids Sand Glove softer and more comfortable, using bolder colours, different weights and sizes, easy to use and wear the Kids Sand Glove, more like a habit, designed for both arms and legs, avoid the sand glove becoming loose.

The research project has also focused on the tool with regard to creating the opportunity for all students to be active during a Physical Education lesson. This means that the tool will not be adjusted but will be a natural tool for the various circumstances of all students. This challenge involves changing an approach or norm about the meaning of participation and inclusion. By creating tools designed to suit all students, we may be able to achieve an inclusive experience.

The students' ambition to develop the tools so that the opportunity for everyone to participate was described as follows:

> "It's hard to put it on yourself" (Fredrik)

> "So, you can also use the tool if someone has bad eyesight, a friend can help" (Emma).

One example is when the students completed the station training twice, once with the instructor at each station and once in two pairs, with the goal of developing movements for everyone. The criteria were an alternative exercise for a student sitting in a wheelchair, a pupil with visual impairment, as well as a self-chosen alternative based on their own body. Generally, the students believed that there was a need for a companion support/companion for the students with visual impairment. The support/companion had to be capable of clearly explaining the different exercises, for example, by holding the hand, forearm, etc, in order to increase the understanding of the actual exercise. For students in wheelchairs, examples included balancing on the rear wheels, driving forwards and backwards, lifting the armrests, gymnastics exercises, using a companion support/companion, etc.

Other perspectives on learning are, for example, when the students described learning during the process of developing the sports tool. Another example is when the students noted that the sports tool is for all children and that it enables children with disabilities to participate in PE activities.

> "Yes, it can suit anyone because it is kind of designed in such a way/…/Yes, but you can wear it. It's made to fit everyone, if you are perhaps a little different, then you can still wear it" (Frida).

The students also discussed features such as the strength and versatility of the sports tool. Part of the learning process was also the creativity and interaction created with the help of the sports equipment, and this promoted a discussion among the students about the available opportunities.

> "I think you can use it for everything in sports, and as an extra weight; if you play handball, you get more exercise" (Håkan).

> "We played football, though we did it our own way, so that the goalkeeper was on a mattress. And then there were blue lines and inside the blue lines everyone had to be goalkeepers. And it was a little hard wearing the gloves because they were a little heavier" (Melvin).

When we interviewed the pupils, they reflected and had a clear understanding of why inclusion and their views were important. This will be a mediated tool for learning and

understanding. This project, in conjunction with Eleiko Sport AB, has created instructions and different ways of using the tool.

Discussion

Open Norm Critical Innovation for Relational Inclusion (ONCIRI) evaluated and developed sports tools from a norm critical perspective so that all children could participate in Physical Education and Health in schools. The product was tested and created together with children, teachers and companies. From an inclusion perspective, the children stated that everyone could participate when using the Kids Sand Glove and that the sports material was easy to use. One difficulty could be putting on the glove if you were on your own (Ring, Kristén and Klingvall-Arvidsson, 2017). The study showed that participation and inclusion play an important role in developing and using the Kids Sand Glove in PE (Berg Svendby and Dowling 2013). New teaching materials that can be used by all children in Physical Education contribute to the development of social skills and increase the opportunity for children with disabilities to feel involved (Sund 2007). The study also suggests that participation and inclusion may enhance learning, within the development and creative use in classes, in which it was necessary for the children to deal with challenges and obstacles (Smith 2004; Jansson 2011). The teaching methods included various forms of collaborative learning, for example, when the children worked in smaller groups during station training and attempted to use the Kids Sand Glove in targeted exercises (Johnson, Johnson and Holubec 1990).

This qualitative study comprises interviews, participant observation using an intervention approach in ordinary PE school contexts. Participatory research/user involvement in research and development involved pupils and companies as co-producers in all or parts of the research process. However, the participatory methods were also viewed in terms of critical assumptions about inclusive and participatory processes, in which some pupils are favoured more than other pupils in the studied schools. This study has attempted to ascertain that norms are unwritten and silent values that influence individual and group behaviour and that these norms are in contrast with official curricula that overtly and explicitly define what is expected in terms of both goals and learning outcomes. The study has also recognised that norms are not only shaped and shared by children in schools, they also exist between teachers and between children and teachers. Norms could be innocently involved in procedures that might seem practical and necessary, but on closer inspection could instead be related to structures of inequality and power. We discovered this complex power relation between adults (interviewer) and pupils (interviewee) on several occasions during the data collection in terms of congruence and willingness to deliver what is expected from pupils. In our participant observation, we discovered that a determined concept with the suggestion of using the Kids Sand Glove is necessary, but that it could also be used in a process of learning. The possibility of asking questions and discussing everyone's right to be included, and to involve the students in finding different exercises and games, is important. Norms in PE limit the students possibilities and participation in physical activity for all. The students engaged in familiar physical activities and experienced difficulty going beyond the traditional games and physical activities (Wallhead and O'sullivan 2005; Ring, Kristén, and Klingvall-Arvidsson 2017).

Interviews with children are always a challenge since power relations influence the interview situation, the data and therefore also the analysis. Children are eager to satisfy the expectations of adults in general and scientists in particular. Our roles as researchers might have influenced the children and could also have affected the children by making their answers more positive than critical. The relation and interaction were defined as a sensitivity based on congruence, in which adults influence what children say in interviews, for example, by being too helpful in giving the answers they think the adults want. The problem with congruence is difficult to avoid, even if trust has been developed over an extended period (Jensen & Löw, 2011). Future research on children must consider power relations when conducting interviews with children. It may also have influenced a company's willingness to develop prototypes that may not have been on the agenda if economic incentives and financial goals had been primary. An ordinary product development process may have resulted in other types of prototypes or ideas.

The present project contributes to the knowledge and tools that make it possible for everyone to be included in school and PE. Previous research has repeatedly focused on disability rights and has had an evaluative role. Many previous development projects have focused on custom sports tools that have not been available to everyone (Block and Obrusnikova 2007). Challenging existing norms and normalising the inclusion of children with disabilities in the development of sports equipment for everyone is valuable. Participation in Physical Education and Health will make a difference in the future of children with disabilities, partly by improving health, and partly by changing self-expectations and engendering greater confidence in their own capacity during the school day (Kristén 2003; Shields, Synnot, and Barr 2012¸ Giese and Ruin 2018). A norm in PE, for example, is that traditionally lessons are structured to challenge students without disabilities. As a consequence, pupils with disabilities find it harder to be included in such able-bodied and structured teaching environments (Ring, Kristén, and Klingvall-Arvidsson 2017; Kiuppis 2018). With the help of the "Kids Sand Glove" prototype, for example, everyone can participate. The silent norm that accepts that students with disabilities are not always involved in PE activities is of concern, and despite the great efforts of PE teachers, there is an acceptance in teaching that not all students are fully included. Attendance seems to be a greater inclusion factor than being physically involved in the activities, which is what collaboration-orientated learning and Dewey's "learning by doing" advocates (Almqvist et al. 2008; Jansson 2001; 2005; 2011)

Another norm could be that the focus is sometimes on those children who cannot be included in teaching. Students with disabilities need to have an obvious position in teaching, for example by designing sports tools that can be used so that all students can participate, regardless of conditions. Creating new standards for inclusion is challenging and important.

The pupils' opportunities to work together in small groups and discuss the development of the Kids Sand Glove are examples of collaborative learning (Johnson, Johnson and Holubec 1990) in which the students could express their views and be included in the process. Pupils with disabilities could specify different needs, thereby providing a better understanding for all pupils. This shows that collaborative learning benefits pupils with disabilities, as suggested by Sund (2007). The new product, Kids Sand Glove, gave the pupils practical experience about new and unknown situations in line with the variation theory (Marton and Booth 2000; Marton 2015). This theory claims that our action in the world is a function of how we perceive the world. At the end of the lesson, the children reflected in bigger groups and gained new knowledge through action and reflection, just like Dewey's

theory "*learning by doing*" suggests (Hartman, Lundgren, and Hartman 2004). We can see important opportunities for the pupils to learn and receive a better understanding of different kinds of needs and that all children's reflections are essential. This project gave the pupils an opportunity to feel a sense of belonging and togetherness, which are components and aspects of the participatory model (Jansson 2005, 2011). The children made suggestions for development and different perspectives on inclusion. In line with Deweýs theory, it is important to give students the opportunity to broaden their experience of inclusion. Nevertheless, teachers also need some tools to guide the students in how to reflect on different actions in PE for everyone. There is a risk that schools are too far removed from the individual student's needs (Barow, Persson, and Allan 2015; Månsson and Nordmark 2015; Kiuppis 2018). This project has given the students an opportunity to reflect on training and norms, and these discussions gave us important insights into their needs. We have to improve our ability to listen to the students and their individual needs. In this project, Dewey's term *"learning by doing"* can be improved by the term *"learning by understanding"* in order to provide the opportunity for PE for everyone. The Kids Sand Glove can be a tool for teachers to educate students about different people's abilities and circumstances.

Thus, participation is a key concept to collaborative learning, as well as for product evaluation. The children's views were important for researchers and entrepreneurs in developing the ability to think in new ways. Belonging and togetherness among pupils and teachers during PE lessons contributed to adapting the PE material to everyone's needs and circumstances.

The final findings of this study:

> The students quickly found solutions and it was not perceived as a norm that the students felt that everyone had to do the same activity. Through the children's responses, we discovered their awareness of different opportunities and needs regarding their involvement in different sports during PE lessons. This awareness creates learning through reflection. This, in turn, contributes to the students' understanding of everyone's right to be involved. By using a tool such as the Kids Sand Glove, teachers can develop the students' learning by discussing the different uses of the tool, thereby contributing to deeper knowledge about adaptation, involvement, body and opportunities in PE through the students' reflections. The adaptation is not only about the design of the sporting equipment, but also about how it is used in teaching to stimulate knowledge and reflection on the differences in pupils. Involvement is about being able to participate and be included based on their circumstances.

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