INTRODUCTION

Through performing everyday activities at home and in the school setting, children develop abilities and skills [1]. Which activities are chosen and how they are performed are influenced by the context, and the performance of an activity builds one’s motivation, routine and abilities. Children and adolescents with attention deficit hyperactivity disorder (ADHD) display developmental difficulties concerning inattention, hyperactivity, impulsivity and social interaction, which bring difficulties in activities in everyday life [2–5]. The symptoms diminish as the children grow up, but at least 50% percent of the children still have impairing symptoms in adulthood. Autism spectrum disorder (ASD) is the behavioral expression of a neurological disturbance which is triggered in different ways and in different stages of development [5–7]. Children with autism have difficulties within the areas of verbal and nonverbal communication, understanding of social codes, image ability and play [6–8]. They may have difficulties with social interaction in different ways and limited opportunities to initiate activities. An updated literature review indicates that many symptoms overlap between ADHD and ASD in children and adolescents and that comorbidity between the two diagnoses is common [9].

Children with ADHD and ASD [10] often show sensory processing challenges [11–13]. These children often raise their activity levels when they are exposed to
sensory input (hearing and visual) and have difficulties lowering it again and therefore easily become stressed [2, 7]. Research show that there are similarities between children with ADHD and ASD regarding sensory processing patterns and behavior strategies to manage sensory stimuli [14]. A decreased ability to interpret sensory information often leads to evasion of participation in activities [15], and restricted participation in daily activities decreases children’s opportunities for everyday learning [16, 17].

In summary, children with neuropsychiatric disorders are at risk of having limited participation in everyday activities and it is of great importance to examine new interventions which may enable increased activity performance. A common intervention in children with ADHD is stimulant medication [18, 19]. To improve functioning and lower risks for future disabilities, it is important to combine stimulant medication with other interventions such as psychosocial treatments, parenting interventions and child psychological therapy [3, 4, 18]. Common intervention approaches for children with autism are psychosocial and educational interventions such as the Treatment and Education of Autistic and Communication Handicapped Children (TEACCH) program [20], which uses structured teaching procedures, and Applied Behavior Analysis [21]. There is also a general increase of psychotropic medications among children and especially among children with autism [22, 23].

Occupational therapy provides Sensory Integration Therapy (SI) to this group of children [24, 25]. SI was designed by A. Jean Ayres [25] when she studied the question of a relationship between learning difficulties among children and a decreased ability to interpret sensory input. SI is defined as the neurological process which organizes sensory input from the context and makes it possible to use the body effectively [24, 25]. The integrative functions are normally activated at engagement in an activity and the ability to process and integrate sensory information is of vital importance to maintain balance and encourage health and wellbeing [26]. Sensory Integration difficulties are labelled Sensory Processing Disorder (SPD), which can worsen the impairment that the diagnosis of ASD brings the child [27]. Ayres [25] observed that children with ADHD and ASD were calmed by deep pressure stimulation when rolled up in a gym mat. For the purpose of enabling activity participation interventions are developed that use deep pressure to calm down [15, 24, 28]. One example is to use the weight of a ball blanket, which supports the body to feel its boundaries [29]. A case control study which explored this method found that children with ADHD benefitted from a ball blanket to fall asleep and to sleep well during the night. Participants in this study were 21 children with ADHD and 21 typical developing children during 28 nights. All children slept 14 nights with a ball blanket and 14 nights without. Results showed that the time it took to fall asleep when using the ball blanket was the same for the children with ADHD and the typical children. Inattention and hyperactivity were rated by both parents and teachers at the end of both periods and also after 7 nights after the use of the blanket. The children with ADHD were observed by their teachers rated to improve their activity function in the school setting even after the period the ball blanket was used. Their activity levels were lowered and their attention spans increased according to the measurement using the ADHD rating scale [30]. Fertel-Daly, Bedell and Hinojosa [31] studied deep pressure intervention for preschool children with ASD who used weighted vests during daytime while performing activities. The participating children increased focus and attention and showed less distractibility when they wore weighted vests. Follow-up showed that the gains in behavior were partly enduring, suggesting that the intervention had some lasting effect. Occupational therapists who participated in a survey reported that the use of weighted vest intervention increased focus on tasks and extended attention spans when used on preschool children with autism, ADHD and delayed development [32]. Students with ADHD showed increased focus in a study when they wore weighted vests, and three of the four students wanted to wear the vests on occasions other than wearing vest for the study [33]. A randomized two-period crossover design with children with ADHD resulted in significant improvements in attention, less talking, decreased fidgeting and leaving their seats while wearing a weighted vest, compared to wearing a vest without weights [34]. In addition to the positive result above, another study found that weighted vests did not decrease stereotyped behaviors or support arousal for the six participated children with autism performing table-top activities in the school setting [35]. Davis et al. [36] examined the effects of weighed vests on aggressive and self-injurious behavior of a young boy with autism and their result found no effect on the behaviors that were analyzed.

A weighted vest and a ball vest are similar to each other. The weighted vest has pockets in front, back and on top of shoulders where weights are inserted, and this vest is supposed to give deep touch pressure to the body of the wearer [34]. A ball vest is tighter on the body and has canals on front and back filled with heavy plastic balls. The balls are supposed to give pointwise deep touch pressure to the skin and body and are also supposed to stimulate the kinesthetic sense of the muscle joints. Accordingly, both vests are supposed to give deep
pressure and a ball vest also to give stimulation of the sensory system of the body.

In a literature review Morrison [37] observed that, among occupational therapists weighted vests are perceived as beneficial but the evidence to support the positive effect is restricted. There is a similar case with ball vests that research reflecting the use of these vests is limited although they have become a more common intervention. Consequently, there is a need to investigate the usefulness of a ball vest for the wearer. Because the context influences activity performance which is a dynamic interplay between the performer and the environment [1] we decided to address observations of parents and teachers in this study. The current study addresses questions on how the adolescents with neuropsychiatric disorders and the adults in their context experienced the use of a ball vest in various activities and daily situations. Furthermore, this study seeks to contribute knowledge that facilitates the performance of daily activities for children and adolescents with neuropsychiatric diagnoses. The aim of this study was to explore the use of a ball vest in everyday activities from the perspective of adolescents with neuropsychiatric disorders, their parents and teachers.

METHODS

Design
A qualitative descriptive approach was used [38]. Interviews were conducted after the participants had used a ball vest for a period of eight weeks.

Procedures
A secretary sent out cover letters with information and consent forms on the study, and an enquiry to participate to parents of adolescents who met the inclusion criteria (n = 40). The adolescents got an easy-read letter with consent form that was especially addressed to them. Seven adolescents and their parents accepted and were invited to an information meeting, where ball vests were on loan. What was important to think of during the introduction was given by the first author, and the families were given opportunity to ask questions. Information was given about the time range of the loan and that interviews would be conducted subsequently. Because of the qualitative design of the study there were no further instructions given on the use of the ball vest.

Participants
Inclusion criteria were adolescents in mainstream schools with ADHD, ASD or both diagnoses in ages 9 to 14 years, their parents and teachers. Adolescents with intellectual disability were excluded, because they were expected to have difficulties carrying out an interview and developing their answers. Participants were recruited from both Neuropsychiatric Teams of the Children’s and Youth habilitation Centre (CYHC) in a northern county of Sweden. Seven out of forty enquiries were returned with an agreement to participate and the remaining thirty-three did not respond. The two female teachers of the participants who wore the ball vests regularly in the school setting were also asked to participate, and they agreed.

After a month one family discontinued their participation. Thus six adolescents, five boys and one girl, six parents (four mothers and two fathers), and two teachers participated in the study. Two of the adolescents had an ADHD diagnosis, two had an ASD diagnosis and two had both diagnoses.

Materials
The participating adolescents were invited to try wearing a ball vest to get the opportunity to discover what experiences they could have from wearing it in their daily life. The vest was in most cases handled by the adolescents, but sometimes parents or teachers asked them to wear it. A ball vest in junior size weighs 2.5 kg and is manufactured with an elastic fabric that fits tight to the body. On the front and back there are channels filled with heavy plastic balls. The vest is closed with a zipper and has a simple system of strings on the back and at the sides which makes it easier to adjust individually. The vest is portable and the wearer can choose to use it in different activities and contexts.

Data collection
The first author collected the data by semi-structured interviews with a focus on the participants’ experiences of using the ball vest in everyday activities [38, 39]. Interviews were booked and carried out individually with all participants directly after the vests were returned. The participants chose the surroundings where the interviews took place; some chose the school setting, and some chose the premises of the CYHC. The interviews lasted between 30 to 45 minutes.

The interviews followed an interview guide with open-ended questions to facilitate supplementary inquiry. Examples of questions were: Give an example of how it was for you to wear the ball vest at home. Tell
me about a usual situation when you wore the vest. Tell me about how it was to use it in the beginning. Describe what situations make you wear it. Give an example of how it was for you to wear the ball vest in school.

Data analysis
The interviews were written out verbatim and data were analyzed by the first author using qualitative content analysis following guidelines by Graneheim and Lundman [39]. At first the transcripts representing each of all fourteen interviews were read through a couple of times to receive an overview of the data. The transcripts were compared to discover and identify similarities and differences in experiences, outlining the substance of the data. Patterns concerning the use of the ball vest at home and in the school setting were identified. In a second step each interview was reread and meaning units which seized the use of the ball vest and the experiences of wearing it in various activities were identified. The captured meaning units were condensed so that the core of the meaning in each unit was recognized. These condensed meaning units were abstracted into codes and categories regarding the adolescents’ and their networks’ experiences of the ball vest. In the third stage the codes and categories were compared concerning differences and similarities and sorted into four themes of which two also were divided into subthemes. The content of the meaning units were foundation to what themes and subthemes that were chosen. In the fourth stage, the content of the themes and the subthemes were compared to the original text, and it was confirmed that they reflected the content of the interviews. Throughout performing the analysis, emerging findings were discussed with the co-authors.

Every theme and subtheme that the analysis identified described different aspects of the experiences of wearing a ball vest and how it was used. Table 1 shows an example of the qualitative content analysis process in which the theme The ball vest as mind and body helper emerged. Table 2 shows one example of the qualitative content analysis process in which the subtheme Possibilities to be active and participate in school setting emerged.

Ethical aspects
The fact that the recipients of the enquiry letters were families who had contact with the CYHC could have made it difficult to decline. However, the letter clearly informed that the decision of participation or not would not influence the further contact with the CYHC.

The participating adolescents belong to a group which may have difficulties expressing themselves verbally. This circumstance put demand on the interviewer to be extra attentive in order to fulfil ethical standards. The interviewer had to be considerably conscious about the balance of power between adults and adolescents and to create a comfortable situation while questioning [40]. The questions had to be put in a substantially natural, attentive and simultaneously distinct way. In the result, pseudonyms are used for the adolescents’ names. The Regional Ethics Board in Umeå, Sweden approved the study, study code 2014-92-31M.

RESULTS
The result of the analysis is presented in four themes, of which two themes were sorted into three subthemes that each described the experiences of wearing a ball vest and how it was used. The four themes are:
1. A desire to relive an earlier experienced feeling;
2. The ball vest as mind and body helper with three subcategories; 3. The Ball Vest as an Activity Friend with three subcategories and 4. Attitudes of people influenced the use of the ball vest.

A desire to relive an earlier experienced feeling
The analysis showed that most adolescents had earlier tried a ball blanket which was remembered as cozy to wind down with and hoped that the ball vest would bring the same sensation. Oscar, nine years old, said: “Directly when we got the letter about the vest I thought I should try it because the ball blanket had been so calming and maybe this also would feel real nice”.

In the beginning of the period of wearing the vest for the study, a calming feeling was experienced, which brought a desire and a longing to experience this positive feeling again. Patrick, 10 years old, said: “I actually can buy a vest, if we have the money. I would like to, because I could concentrate better, and it was really comfortable to wear. I thought that it reminded me of the ball blanket, it felt almost the same. It felt good when the balls squeezed”.

The ball vest as mind and body helper
A great sense of comfort and fatigue made life brighter
The analysis revealed that the ball vest provided a pleasant feeling of fatigue and comfort. The vest gave heaviness on the body described as a pleasant hug and a feeling of being safe and brought a need to yawn. Agnes’ father explained: “She likes to wear it, and that proves that something happens in her body. I think there is something with the balls that makes her feel calmer and safer that gives her body a nice feeling on the whole, that gives a kind of massage on her back and both sides of her body. Otherwise you could wear any vest at all”.

The vest brought a confident feeling and was worn
### Table 1. Examples of the qualitative content analysis process in which the theme *The ball vest as mind and body helper* emerged

| Identified meaning unit | Condensed meaning unit | Code, underlying meaning | Subcategory | Category |
|-------------------------|------------------------|--------------------------|-------------|----------|
| Well, when we got the letter I thought that it would feel rather nice like, and that I should become calmer of it, of having it. | … got the letter, thought it would feel nice, become calmer. | Had an expectation that the vest would feel nice and bring composure. | Had an expectation that the vest would feel nice and to bring composure. | Had an expectation that the vest would feel nice and to bring composure. |
| It has been rather heavy to use, but has been calming in the same time. Thus I have become calmer; I have not been that stressful. | Become calmer, haven’t been that stressful. | Become calmer, haven’t been that stressful. | Used as shelter in the afternoon when messy at home when the family gathered. | Winded down by the vest. Calmer, not stressful. The vest gave a nice heavy feeling. Used as shelter in the afternoon when messy at home. |
| I used in the afternoon when it was pretty messy at home, when everyone came home and hurried round. | Used in the afternoon when it was messy at home, when everyone came home | Used as shelter in the afternoon when messy at home when everyone came home | | |
| When I was very excited and became calmer when I put the vest on and so. | I was very excited and became calmer when I put the vest on | Winded down by the vest | Winded down by the vest. Became calmer wasn’t that stressful. | |
| It felt very nice to wear it, in the same time a little heavy in a nice way the balls gave a nice feeling. | It felt very nice to wear it, in the same time a little heavy in a nice way, the balls gave a nice feeling. | The vest was very nice to wear, it was a little heavy in a nice way, the balls gave a nice feeling. | The vest was very nice to wear, gave a nice heavy feeling. | |

### Table 2. Examples of the qualitative content analysis process in which the subtheme *Possibilities to be active and participate in school setting* emerged

| Identified meaning unit | Condensed meaning unit | Code, underlying meaning | Subcategory | Category |
|-------------------------|------------------------|--------------------------|-------------|----------|
| I have used the vest every day since I got it. It has felt good to use the ball vest. It feels important | Used the vest every day since I got it. Feels good, important | The vest was used every day, felt good and important | Used the vest very day since I got it. It feels important | The vest was worn during lessons in school whenever the need was. Felt good, brought calmness, made it easier to listen and to sit longer time. |
| I had it mostly in school during lessons, took it off during breaks and lunch. | Mostly in school during lessons, off during breaks and lunch. | The vest was worn in school during lessons, not breaks and lunch. | The vest was worn during lessons in school because it brought calm and made it easier to listen. | |
| It has been good when I had it on in the classroom, the lesson went better. | It has been good when I had it on in the classroom | Wearing the vest felt good. | | |
| I had the vest on during Swedish, English classes and reading. All was better; I was calmer and listened better. | Wore the vest during Swedish, English classes and reading. All was better; I was calmer and listened better. | Wore the vest during Swedish, English classes and reading. All was better; I was calmer and listened better. | | |
| I put it on when I want, when I feel for it, it can be that I feel I will not be able to sit in the classroom for so long, not the whole lesson. Then I put the vest on. | Put it on when I want, can be that I feel I will not be able to sit in the classroom the whole lesson. | Put it on when I want, can be that I feel I will not be able to sit in the classroom the whole lesson. | Wear it whenever the need, can be a feeling not being able to sit in the classroom the whole lesson. | |
| It feels good to have it on I like the balls. | Feels good to have it on I like the balls. | The vest feels good to wear and the balls are nice | The vest feels good to wear | |
to be able to perform an activity or to be able to relax and calm down in stressful moments. Andrew liked that the vest made him relax so well that he fell asleep when he was sitting on the couch and had nothing to occupy himself with. Ben’s mother stated that when her son tried the vest for the very first time, he after 10 minutes uttered: “Mum, it feels in my body like I’m going to burst into laughter!” Ben then looked very pleased and she recognized a positive feeling in him that sort of poured through his body. He was very calm and looked like he had received a kick of endorphins. During the following intervention period he took the initiative to wear it himself on half of the occasions, saying: “Well, now mum I have to have the vest. Now I must have it. Mum, I use the vest for a while”.

Lucas’ mother noticed he had the strongest need to wear the ball vest in the afternoon, when the effect of the stimulant medication disappeared. Patrick discovered that the vest gave massage on the back and shoulders when he pulled his shoulders up and down and thought it was comfortable to do this now and then to become more aware of his body.

Loosened up to be able to socialize

The analysis revealed that the vest brought a soothing effect on mood and temper and contributed to the ability to endure sounds, light and smells better. During the afternoons after school the adolescents often got irritated because they experienced this time as messy. At this time of day the adolescents could get very edgy if someone touched them, or when they stood close together with their siblings or sat at the table during dinner. Some participants experienced that wearing the vest could reduce such incidences and make it possible to handle the teasing of younger siblings without getting tantrums. Wearing the vest made it easier to loosen up and focus on what parents and siblings said and handle the situation in a proper way. The vest was also used to wind down all on their own when contact with others was unwanted. One of the boys put it on deliberately for half an hour afterwards to be able to meet and socialize with family and friends for a long while in a balanced way. Andrew, 13 years old, explains: “The ball vest was comfortable to wear. It made thus I did not get so fast angry with my brother”.

Lucas, 13 years old, explained that when he wore the vest while playing computer games, he did not get as upset as he used to when the keys got stuck. He said: “Well, then I can lose in certain games. When I had the vest on I could just simply start from the beginning and I did not get so enraged either”. When he had discovered this, he began to put the vest on before he started playing.

The ball vest as a friend and pet

The ball vest brought a feeling of comfort when things were strenuous both in school and at home. In general, the vest helped to hold one together and supported the adolescents when they were sad or missed someone. The vest was handled gently and protected and sheltered from other students in school and from younger siblings at home. It was described as a friend that could make the adolescents calm down when they were angry and support them to feel better when they were sad. Lucas said: “Yes, it feels like someone is there to hug you all the time. You need to have a little, well... if you feel alone, maybe miss someone or so. Well, I missed my cat, and then I put the vest on and then it felt much better”.

The vest was experienced as hugging and consoling by the adolescents, and when hurting themselves they said they were less distressed. Giving the ball vest back after the loan was described by one participant as similar to have to leave a dog or a cat with a new owner because not being able to take care of it.

The ball vest as an activity friend

Easier to think of what to do and keep it in mind

Several participants described that the vest made it easier to be concentrated on activities they wanted to do. The vest also enabled to perform activities they did not want to do, such as tidying the room, doing homework, and writing, doing math’s, and making a snack. Andrew explained that he could walk wildly around not knowing what to do but when he put on the vest, on it became easier to do activities that were planned. He uttered: “I concentrate when I wear the vest because then I am calm, I can think of what I have to do and keep it in my mind – do not think of other things, and I finish what I have to do. Then I do those things first. If I don’t wear it I don’t concentrate as well. I can sit and write or do something, and then whoop – start to do something else and immediately stop doing what I have to, for example write. Instead I fetch and build with Lego, because that is one of the most fun things I can do, I think, actually”.

Possibilities to be active and participate in the school setting

The two adolescents who brought the vest to school regularly wore it during lessons containing exposition, instruction and individual school work. Wearing the vest brought an ability to pull together and participate and stay in the classroom during a whole lesson performing school activities. Oscar was calm and listened better when he used the vest during academics. His teacher observed him being proud wearing the vest and that the vest gave him gravity, as if he felt, Here I am! Patrick,
11 years old, thought that the best time to wear the vest was when his teacher gave instructions and information, which then were easier to receive. Agnes explained that during the two days she wore the ball vest in the school setting, she relaxed more than she used to. Because of negative attention from other students, she discontinued bringing it but wore it at home at breakfast before going to school, and then had a calming feeling of still wearing it when she entered school.

**Satisfaction with performing interesting and funny activities**

The analysis showed that it was common to switch between activities such as building with Lego and watching a film, without finishing any of these activities. The vest brought the capacity to view a whole film without a break in the middle and made it possible to follow the storyline in a TV series you wanted to see. Lucas explained that if he wondered what to do, he sat down on his bed, put the vest on and then had an idea of what to do. He then could use his iPad, watch TV, play Minecraft, play cards or use his smartphone. Patrick said: “I have watched TV with it too, yes. It is comfortable to sit calm and nice and concentrate to watch a little... without walking away directly and think... nooooo, boring, kind of. Then I can stay and watch a while, to see what it is all about and think yes, this was pretty enjoyable after all, in spite of starting dull”.

Wearing the vest made it possible to build more creative and advanced constructions of Legos and other materials and it was deliberately worn to get imaginative and funny ideas. It also gave the opportunity to implement ideas for activities and how to use the vest could be arranged. When Ben got an idea of an advanced building project, he put the vest on in advance because he had discovered he had to wear it to be able to sit calmly and concentrate to carry the plan out. He thought the vest had a disadvantage in that it was clumsy and, in the way, when he sat on the floor building Legos, but he used it anyway because it made him relax.

**Attitudes of people influenced the use of the ball vest**

The analysis revealed that all six adolescents used the vest at home and that two of them also used it regularly in school. Another two wanted to wear it in school and brought it there for a couple of days and felt comforted by it but discontinued the use because of other pupils’ teasing. The adolescents who wore the ball vest regularly in school were younger and their teachers were engaged in the use. The vest was accepted by everyone in their school context and they got questions but not teasing. The older adolescents felt uncomfortable to wear the ball vest in school despite its benefits. They who attended upper secondary school felt deviant and stigmatized because of all the questions from other students who did not understand the purpose of wearing it.

**DISCUSSION**

This qualitative study brought an insight into how wearing a ball vest while performing everyday activities could be experienced by adolescents’, their parents and teachers. The theme “The ball vest as an activity friend” indicate that the ball vest may be an enabler to increase activity performance both at home and in the school setting among adolescents with neuropsychiatric disorders. This is illuminating because the ability to focus on and concentrate to perform an activity is a known issue among this group of adolescents [2−4, 6, 7, 18]. Regarding children with ADHD this result can be compared to another study where researchers found that weighted vests showed improvement in attention, responding and processing speed, executive management and on-task behavior [34]. Their study showed no significant improvement in impulse control and automatic vocalizations in a randomized, two-period crossover design, but the study supported the use of weighted vests to increase attention to task problems of children with ADHD.

In the present study, the adolescents reported an increased ability to perform various activities which means that this was essential to them. This condition supports earlier findings where students with disabilities communicated that to them the most important element was to be active and to be seen participating with others in their context [41]. That adolescents with disabilities emphasize the need to prioritize mainstream solutions were also found in other studies [42, 43]. In the Model of Human Occupation (MOHO) [1], participation is acknowledged as an important aspect of activity performance, and is perceived as engagement in play, work or daily activities, which are part of our sociocultural context and are desirable or necessary to our wellbeing. That the adolescents in the present study found that the ball vest brought possibilities to perform interesting and funny activities corresponds with how Kielhofner [1] describes pleasure as an important aspect of creating an active life.

The vest was useful at home but not all adolescents felt comfortable to wear it in the school setting. The subtheme “Attitudes of people influenced the use of the ball vest” indicate that the social context in the upper secondary school influenced negatively on the possibilities of using the ball vest. This finding supports earlier research that found the social context more important to students’ deciding to use or abandon their assistive technology than the benefits they received from the
devices [42]. However, this study also shows that the adolescents who used the ball vest in the school setting had teachers who were positive. The success of the use of assistive technology devices may depend on teachers’ encouragement [44].

Another finding in the theme “A desire relieve an earlier experienced feeling” is that the majority of the participating adolescents earlier had tried a ball blanket and felt the need to experience the same sensation that the ball blanket had given them. That they felt a need to relive an earlier experienced feeling indicates the importance of opportunities for children and adolescents to try and experience new assistive technology devices. This finding also supports earlier research that found that children and adolescents need to have their own experiences to know whether a device is useful or not [42, 45]. Associated with this result, one could discuss what impact the fact that the majority of the adolescents had a positive experience of trying a ball blanket before had on how they experienced the ball vest. That the adolescents associated the ball blanket with the ball vest suggests that children and adolescents should get the opportunity to try a ball blanket before they try a ball vest. An implication could be to try a ball blanket before prescription. This also suggests further studies with more participants to get answers about if there is a correlation between these two interventions.

An interesting finding is that a delayed effect was discovered which was made use of preventively. One example is that the vest was worn during breakfast at home, to be able to enter school in a calm mood. Other examples are that the vest was worn for half an hour in the afternoons to prepare to socialize with the family and in advance of building a complicated Lego project to be able to carry the building plan out. A delayed effect of deep pressure treatment goes in line with earlier studies [29, 31]. This finding suggests that clinicians should inform ball vest users to try to wear the vest ahead of performing an important activity where they have to concentrate. Overall, it should be recommended that ball vest users themselves decide when and where to use their vest.

The present study supplies knowledge of how a ball vest can be useful to adolescents that need to relax to be able to focus and stay engaged in an activity. This supports earlier research on calming down using deep pressure which earlier was given by holding, stroking, hugging and swaddling [45]. The results revealed that the ball vest gave a feeling of confidence and was worn during stressful moments or to make one able to perform an activity or to just relax and calm down. The ball vest was described as giving a pleasant feeling and provided comfort when the balls squeezed, phrased as a kind of massage on the body. This finding shows that a ball vest can be an alternative to techniques used for stress reduction such as mindfulness meditation, which is used to find relaxation through cognitive and intention-based self-regulation [46]. Morrison [37] found in her review that the results of the articles were questionable or positive and concluded that the effectiveness of the weighted vests was limited, and further research using larger samples using standardized protocol and less homogenous groups is needed. The present study has a qualitative approach, and does not meet any of these proposals, but can serve as an important guide forward.

Limitations

The findings can be utilized as a guide to understanding what might occur in other situations and samples. Despite this, the following limitations need to be taken into account. This study sought insights into the adolescents’ experiences of using a ball vest in everyday activities, but it is common that when interviewing children, data is not as exhaustive as one intends [40]. Addressing the adolescents themselves to gather data was significant for the study. To also address their parents and teachers increased the trustworthiness. Another limitation was the eight-week-long period of using the ball vest, which means that the long-term outcome has not been studied. In this matter this study can be viewed as a pilot study.

CONCLUSION AND IMPLICATION

This qualitative study identifies an interesting hypothesis regarding how a ball vest can be experienced in relation to the performance of everyday activities at home and in the school setting for students with high activity levels and neuropsychiatric disorders. This study suggests that the participating adolescents themselves were conscious about the importance of their own activity performance and activity participation. An implication for practice and further use of ball vest includes that detailed information from the occupational therapist to the teacher and the school class should be given to create a friendlier climate for ball vest use. There is a need of structural information to the children and adolescents themselves. The occupational therapist and the teacher should also give more time for information and adaptation in the school setting.

In addition, the adolescents need to wear the ball vest in different contexts and activities to get experiences in which settings it was most useful, which seems to be of importance for the experience of benefit. Further research is needed to explain what factors are important and to influence the decision to wear a ball vest or not in
the school setting.

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