A toolbox for secondary school teachers to support implementation of physical activity in the classroom

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ABSTRACT

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Activity levels among adolescents are decreasing, whereas the number of young people with overweight and obesity is rising rapidly. This results in severe health problems that occur at an increasingly younger age. Schools can play a crucial role in promoting active lifestyles by implementing physical activity interventions. Due to their compulsory nature, schools can reach out to children from all different backgrounds and risk groups. Many physical activity interventions so far have been conducted in primary school environments, creating the need for an intervention designed for secondary schools.

Using Educational Design Research, this study designed a Toolbox for secondary school teachers, with activities to increase the level of physical activity in classrooms. The Toolbox is a website, and consists of two parts: Powerbreaks (videos of short physical activities) and Active Learning activities (to integrate movement and academic content). Two teachers from a Swedish-language secondary school in Finland have tested the intervention, with the data collection focusing on usefulness, ease of use and motivation towards the use of ICT material. The results show that the Toolbox was found useful in increasing levels of physical activity in the classroom, easy to use because of the videos and helped teachers to offer a necessary active break for students. This suggests that practical material available online, could be a great resource for teachers to develop their active teaching methods. Further development is however necessary to ensure a continuation of these positive outcomes, as well as to address several limitations that have been found.

Keywords: physical activity, active breaks, active learning, healthy lifestyle.

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1 INTRODUCTION

Going to primary school usually is an exciting event, especially the first time. New friends to make, teachers to meet, content to learn and material to discover, all the while being in an environment that is quite different from the one you are used to at home. Luckily, the majority of primary school teachers know that their students cannot sit still for hours a day, giving them the opportunity to walk around, work in different areas, have active breaks either inside or outside, and participate in physical education at least two times per week. This is the case in most primary schools in the world, though we can see differences between countries, regions and individual schools as well.

After a certain amount of years, usually around the time the child enters their adolescent stage (11-13 years old), the step to secondary school needs to be taken. Coming from primary school, where most of the day is spent in the same classroom with the same students and the same teacher, it is a big change to go to a school where there is a need to switch between classrooms, every subject has a different teacher and the classes can be mixed as well. Important to note is that in this case we talk about "traditional" forms of secondary school, where students sit at a desk and study a certain subject for about an hour before moving on to the next subject. And there lies the problem: students go from an environment with relatively many movement opportunities, to an environment where sitting is the standard. Breaks are spent sitting and talking with classmates, physical education is performed once a week if students are lucky, and in a lot of countries transport to and from school happens by bus or car, eliminating any movement opportunities there as well.

At the same time, various research points out that activity levels among adolescents are decreasing, whereas the number of children and youths with overweight and obesity problems is rising quickly (i.e. Biddle, Gorely & Stensel, 2004). The trend of an inactive lifestyle is progressing, resulting in severe health problems that start at increasingly earlier ages. This goes not to say that sedentary behaviour in schools and inactive transport there are the single reasons for this

dramatic increase of health problems, but it can be stated that these factors do not help make matters better either. However, schools can play a crucial role in promoting active lifestyles, implementing physical activity interventions, and due to their compulsory nature, reaching children from all different risk groups (Bugge, Tarp, Østergaard, Domazet, Andersen & Froberg, 2014). Interestingly, these interventions often take place in primary schools and less regularly in secondary schools. Though physical activity is important for all different age groups, and it can be said that starting at a young age results more likely in active lifestyles later, the fact that there are little physical activity interventions in secondary schools could very well be detrimental to the effect of interventions in primary school years.

The attention to the subject of physical activity for children and adolescents comes from a wide range of fields, showing in the different journals that publish related articles (Preventive Medicine, Journal of Sport Sciences, Public Health, Sports Medicine, Journal of Physical Education, Journal of School Health, and Educational Psychology, to mention some). In addition, the attention can also be found in the statements governments worldwide make in their policies, which support the urgent nature of finding effective interventions in order to promote a physically active lifestyle to prevent health risks. Physical activity does not only benefit physical health, but can have positive effects on psychological well-being and cognitive performance as well, which will be further explained in my research.

With this information in mind, I see a clear opportunity to step in with my research. Focusing on providing secondary school teachers who work in a classroom setting, with tools to create more physical activity opportunities during their lesson, I hope to attempt at closing this gap between primary and secondary school movement levels. Having personally experienced the boredom of sitting in class all day and the joy of having an opportunity to move regularly, the positive effects it can have on overall well-being and academic performance, as well

as the struggle teachers in classrooms go through in order to make their lessons more active without losing control of the group, I hope to offer practical possibilities for movement implementation. Thus, the goal of this research will be to design a toolbox with practical videos of active breaks and ideas for movement integration in the academic content that can be used by both students and teachers in the secondary classroom. A secondary goal is to theoretically investigate the need for an increase of physical activity for children and adolescents, along with possible benefits of doing so, as well as risks that could be the result of an inactive lifestyle.

2 IMPORTANCE OF PHYSICAL ACTIVITY

Physical activity seems now even more important than ever. With the increase of automation and use of robots, manual labour is fast on its way to become a thing of the past, whereas sedentary jobs take over the lives of adults, resulting in more health issues caused by inactivity. According to the World Health Organisation (2017a), regular physical activity can reduce the risk of hypertension, heart diseases, strokes, diabetes, breast cancer and depression in adults, as well as improve bone structure, functional health, energy balance and weight control. This does not only apply for adults, as we will talk more about the effect on children and adolescents in chapter three as well. Before diving further into the benefits of physical activity and the risks inactivity carries, a clear definition must be set of what physical activity entails and what can be considered sufficient for health purposes.

2.1 Defining Physical Activity

Physical activity is in literature defined as any bodily movement that is performed by skeletal muscles and requires energy expenditure above a resting level (World Health Organisation, 2017a; National Heart, Lung and Blood Institute, 2016; Centres for Disease Control and Prevention, 2010). Not to be mistaken with Physical Education, which is a field in education where physical activity can be implemented in order to contribute to the development of the whole child, both physical and mental (Sibley & Etnier, 2003). Other misconceptions are that physical activity is synonymous for exercise and sports, whereas both of these are only subcategories of physical activity (World Health Organisation, 2017a).

Among the subcategories of physical activity, we find activities that are repetitive, structured, purposeful and planned (being exercise, such as fitness or hiking); leisure-based (such as gardening); sports-oriented (like football or basketball); work-related (manual labour); or connected to transportation (biking or walking to work or school) (Centres of Disease Control and Prevention, 2010). A

further distinction in physical activity can be made between acute exercise, being single short-term exercises of between 10 and 40 minutes; and chronic exercise, which includes activities as part of a program of multiple weekly sessions for a longer period of time (Verburgh, Königs, Oosterlaan & Scherder, 2014).

Research has suggested that physical activity plays an important role in the prevention of obesity and various lifestyle diseases (Bugge, Tarp, Østergaard, Domazet, Andersen & Froberg, 2014), which will be further explained in chapter three. In the light of the expected positive effects, it is however interesting to take a look at what are suggested to be sufficient levels of physical activity for health and well-being, recommendations that are often translated into movement goals.

2.2 Movement goals

Many different countries state national physical activity recommendations in the form of movement goals, hoping to inspire children and their parents to lead a sufficiently active and healthy lifestyle. Unfortunately, however, countless children and adolescents all around the world fail to meet such recommendations these days (Castelli & Beighle, 2007). As far as a comparison of several national physical activity recommendation documents can tell, the World Health Organisation (2017b) is the leading inspiration for setting movement goals, stating that children and adolescents between the ages of five and seventeen should engage in at least 60 minutes of moderate-to-vigorous-intensity physical activity each day. This amount of time should be spread throughout the day and the performed physical activity should at best include aerobic activities, as well as some muscle and bone strengthening exercises (Centers for Disease Control and Prevention (CDC), 2015). The activities could include play, games, exercise, active transportation or sports, which could be done in the context of family, school or community (World Health Organisation, 2017b). Most importantly, the physical activity should be enjoyable and age-appropriate.

Children and adolescents with certain medical conditions or disabilities are also encouraged to try to achieve 60 minutes of physical activity daily, as far as their limitations allow them to. However, with these children (as well as with children who have been increasingly inactive) it is important to look for a gradual increase of the duration and intensity of the physical activity (World Health Organisation, 2017b). In the light of preventing health issues and diseases for a lifetime, encouraging an active lifestyle for children and adolescents with 60 minutes of daily activity does not appear to be too taxing. However, are the effects of physical activity on health and well-being as strong as they are suggested to be?

3 EFFECT OF PHYSICAL ACTIVITY

Researching the effect of physical activity on health and well-being is a fairly uncertain practice, as often the results come out as unconvincing as to the benefits of physical activity (Biddle, Gorely & Stensel, 2004). However, that goes not to say that the effect is negative, rather that promoting a physically active lifestyle is desirable as it could have a beneficial effect up to a certain level. Recent trends show that many young people are active, but that these numbers decline with age, being taken over by more inactive and sedentary lifestyles (Bugge et al., 2014; Biddle et al., 2004). Furthermore, overweight and obesity levels in children and youths are rising, a trend that persists into adulthood and can cause serious health issues (Bugge et al., 2014; Biddle et al., 2004). Considering this, it could be suggested that even though physical activity might not always show extremely positive results on health and well-being in research, its unconvincing positive data is in any case better than the apparent negative results of an inactive lifestyle. We will now dive a little deeper into both sides of the equation.

3.1 Positive effects on health and well-being

As mentioned above, the results of research on the positive effects of physical activity are often unconvincing. That does not imply that there are no positive effects to be found. On the contrary, physical activity, when participated in on a regular base, can be seen to lead to a more normal body weight, improved self-concept and possible higher levels of physical fitness in adolescents (Castelli & Beighle, 2007). Furthermore, physical activity can help "build healthy bones and muscles, improve muscular strength and endurance, reduce the risk for developing chronic diseases […] and reduce stress and anxiety" (CDC, 2010).

It has also been suggested that youths partaking in physical activity tend to show better mental health than less active youth (Gorely & Stensel, 2004). Besides that, it could possibly have a beneficial effect on academic performance (CDC, 2010), which will be further discussed in chapter 3.1.2. Most importantly, to make sure physical activity has any positive effects on health and well-being, it is necessary to adopt an active lifestyle already during childhood, increasing the likelihood of participation in physical activity when reaching adult ages. This has shown to improve quality of life and decreasing the chance of risk factors related to serious diseases (Castelli & Beighle, 2007).

3.1.1 Relationship between physical activity and cognition

Many educationalists have tried to look at the relationship between physical activity and cognition in order to find ways of increasing cognitive function through movement. Different learning styles, interdisciplinary work and various kinds of constructivist teaching styles are examples of these exploits. But what are they based on? The idea that physical activity increases cognitive performance in a positive way is not wrong. The Centers for Disease Control and Prevention (CDC, 2010) reviewed 43 studies on the topic and discovered that of the

251 associations between physical activity and academic performance, 112 indicated a connection to cognitive skills, of which 50.5% was tested to be a positive connection (CDC, 2010, p.14).

Looking into what it means for physical activity to have an effect on cognitive function, we can distinguish two categories: physiological mechanisms and learning/developmental mechanisms. The first category consists of physical changes in the body that occur when a person exercises, "such as increased cerebral blood flow, alterations in brain neurotransmitters, structural changes in the central nervous system, and modified arousal levels" (Sibley & Etnier, 2003, p. 244). The category of learning/developmental mechanisms is based on the conception that movement provides learning experiences that help develop cognitive skills (Sibley & Etnier, 2003). Skills learned in physical activity could be transferred to other concepts of learning.

Especially the first category (physiological mechanisms) gets support from other research, as for example Tomporowski, Davis, Miller & Naglieri (2008) in their research also mention the alteration of the brain functions underlying cognition through physical activity. Biological responses in the muscles, that in turn modify and regulate the brain, can be seen in recent research, as will be more thoroughly explained in chapter 3.1.2 below. Though this has been tested mainly on adults, it is assumed that the implications of exercise will be the same with children as a result of their similar reactions to exercise (Tomporowski et al., 2008).

Another interesting thing to notice here is that the type of physical activity that is necessary to inspire bodily changes, appears to be practically non-significant, indicating that any type of physical activity can benefit cognitive performance (Sibley & Etnier, 2003). However, further research on the subject is necessary to strengthen these findings, as well as the fact that it could now be assumed that all types of physical activity would benefit people all ages in the same way. Which mechanism is more prevalent when increasing cognitive functions as a result of physical activity, can therefore not be made conclusive just yet.

3.1.2 Brain studies in education

Geake (2008) describes that the central characteristic of brain function, indicating the complex working of the brain, is neural functional interconnectivity. Different areas of the brain provide different brain functions, which have to somehow be combined in order to perform all acts of intelligence, including the ones related to domain-specific learning in school. There are no specific modules in the brain that link directly to a subject in the school curriculum, making it necessary for the brain to interconnect the different brain functions involved. To make it more insightful, Geake provides examples of brain functions important to learning, such as working memory (present in the lateral frontal cortex), decision-making (orbitofrontal cortex), conceptual and motor rehearsal (cerebellum) and long-term memory (among other areas in the hippocampus).

However, in itself this does not provide any information about the importance of physical activity, as brain interconnectivity exists on its own. What physical activity does, is alter the brain's physiology by increasing "cerebral capillary growth, blood flow, oxygenation, production of neurotrophins, growth of nerve cells in the hippocampus, neurotransmitter levels, development of nerve connections, density of neural network, and brain tissue volume" (Trudeau & Shephard, 2008, in CDC, 2010, p. 9). This does show the connection with aforementioned neural interconnectivity, as increasing these factors has a direct effect on the speed and efficiency with which the brain connects the different areas necessary for learning (Mullender-Wijnsma et al., 2015). Improvement of attention, information processing and coping, as well as reduction of feelings of craving and pain, are possible practical results (CDC, 2010).

Some important connotations are that different levels of physical activity can have different effects on the brain functions. Especially physical activity on a moderate-to-vigorous intensity level has the most beneficial effects, with short term results due to immediate chemical changes in the brain including enhancement of attention and cognitive performance; and "morphological" changes (more permanent alterations in brain structures) in brain regions related to learn-

ing, being an effect in the long run (Mullender-Wijnsma et al., 2015). Thus, evidence suggests physical activity is beneficial for cognitive functions, though that does not mean that targeting specific spots on the body will activate particular brain areas (Geake, 2008). Furthermore, like with skeletal muscles (however, on a more complex level), the brain needs a period of rest after a period of stimulation, in order for supercompensation (physiological changes) to take place (Trudeau & Shephard, 2008).

A practical result of these brain studies is the concept of embodied cognition, specifically in reading comprehension. This concept suggests that for a person to fully understand what he is reading, a sensorimotor action can be valuable or even necessary as a support. For example, when reading about a movement (kicking a ball), performing the action or having the ability to relate the words to a previous performance of the action, helps comprehend what is written, as it does not only activate the brain functions related to reading comprehension, but the ones related to physical activity as well (Beilock, 2008). Besides this notion, however, various misconceptions of brain functions related to learning exist as well. This is problematic in education, for in relation to physical activity, they could do more harm than good. These will be discussed in chapter 4.2.1.

3.1.3 Effects on cognitive function and academic performance

With children and adolescents in mind, the effect of physical activity on cognitive function is mainly interesting for schools in the light of the academic performance that follows. Therefore, it is good to look at research aimed at physical activity and its possible outcomes on academic performance. Before starting with that, it is important to realise that academic performance is a broad subject, which can include several different factors. For this research, we will include three primary areas as proposed by the Centers for Disease Control and Prevention (CDC, 2010):

1. **Cognitive skills and attitudes**, including cognitive abilities or functions (such as memory, attention, executive functioning and verbal understanding), and attitudes and beliefs influencing academic performance (such as motivation and self-concept).
2. **Academic behaviours**, including behaviours that could have an impact on academic performance, such as on-task behaviour, attendance, planning and organisation.
3. **Academic achievement**, including scores on standardized tests, classroom test scores and other formal assessments.

Another consideration that should be made when researching the effect of physical activity on cognitive function and academic performance, is whether we speak of acute physical activity (a one time, short bound of exercise) or chronic physical activity (a longer period of exercise or exercise spread over a longer period of time). Research results suggest that executive functioning (defined as higher cognitive processes such as planning, initiation and self-regulation, that manage basic cognitive functions like visual-spatial perception) could be enhanced by acute physical activity, whereas the effect of chronic physical activity on executive functioning is not yet researched sufficiently (Verburgh, Königs, Oosterlaan & Scherder, 2014).

We will now look into the effects that research has proven there are to be. In this, we consider academic performance a combination of the three abovementioned areas, with particular focus on cognition being the specific brain functions that underlie academic performance. The distinction between acute and chronic bouts of physical activity will only be made when specifically mentioned in the research used to investigate the effects of physical activity.

Positive relationships between physical activity and cognitive function and academic performance have been found in various studies (for example: Bugge et al., 2014; Verburgh et al., 2014; Tomporowski et al., 2008; Castelli & Beighle, 2007; Sibley & Etnier, 2003; Tomporowski, 2003). Especially students' attention in class

has been mentioned multiple times as benefitting from physical activity. Willis (2006, in Mancini-Becker, 2016) explains this as a result of increased blood flow and oxygen to the brain, which in turn increases the release of dopamine and serotonin, substances that aid in sustaining attention and concentration. Donnelly & Lambourne (2011) support this by saying that fit children perform better when it comes to tasks requiring great amounts of attention and cognitive control, such as planning, organising, abstract problem-solving and motor control.

Interesting to see is the discovery in the research of Sibley & Etnier (2003) that states that in particular middle school students (in the ages of eleven to fifteen) react positively to physical activity in relation to their academic performance. This is suspected to occur because of higher stress and anxiety levels of the students, due to many changes: physical changes when starting puberty, changes in school structure when transferring from primary schools, as well as social changes in the form of peer pressure. Physical activity could for this group decrease anxiety and/or increase self-esteem, resulting in better cognitive functioning and academic performance (Sibley & Etnier, 2003). However, more research is necessary to confirm this notion. Nevertheless, the fact that deliberate physical activity, delivered by competent professionals, can have positive outcomes for academic performance still stands (Smedegaard, 2016).

Besides greater attention as a possible result of physical activity, other positive effects can be found in children and adolescents as well. Smedegaard (2016) suggest that physical activity during school hours could address problems such as student boredom, motivation and concentration in a positive way. The question arises what type of physical activity inspires the greatest benefits. Some research shows that acute, short bouts of physical activity inspires immediate improvement in on-task behaviour (Mullender-Wijnsma, Hartman, de Greeff, Bosker, Doolaard & Visscher, 2015), whereas others find more beneficial effects after a complete physically active lesson, combining learning and exercise (Kibbe et al., 2011, in Mullender-Wijnsma et al., 2015a). The intensity of the physical activity could also be in question, though Mullender-Wijnsma et al.'s (2015a) research summarizes that "an increase in time-on-task after physically active academic

lessons and physical activity of moderate to vigorous intensity seems to be an important prerequisite in order to find positive effects" (p.2), whereas vigorous activities (defined as time spent on an activity that goes above the target heart rate zone) could possibly have a detrimental effect on cognition (Mullender-Wijnsma et al., 2015a).

A last note to make in the light of positive outcomes of physical activity is that research suggests that acute bouts of physical activity could only have a short-term positive benefit on student behaviour and cognitive functions (Tomporowski, 2003). The long-term positive effects have not yet been sufficiently researched as of now. A positive notion, however, is that the beneficial results of physical activity appear to be present in both students without clinical disorders, as well as students who have difficulties with their attention and/or control of impulsive actions (Tomporowski, 2003).

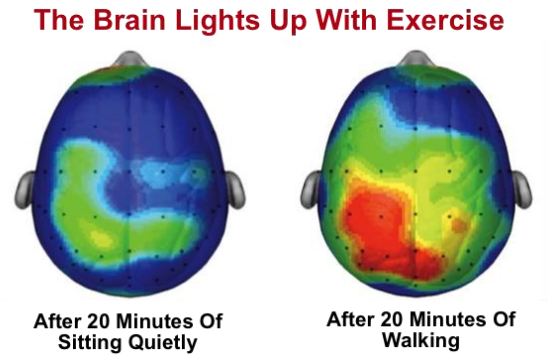

IMAGE 1: The effect of Physical Activity on the brain, red showing the most brain activity (retrieved from www.phitamerica.org on 12.04.2018).

Even though above studies have shown positive effects of physical activity on cognitive function and academic performance, many studies have indicated **no significant** or only very modest correlations (summarised by Daley & Ryan, 2000). Important to note in the light of pursuing research towards increasing physical activity in academic settings, is that there can also not be found **any detrimental or negative effect** of physical activity on academic performance (Hunter, Abbott, Macdonald, Ziviani & Cuskelly, 2014; Tomporowski et al., 2008; Sibley & Etnier, 2003). Time taken off the formal curriculum to spend on physical

activity does not negatively affect academic performance in most cases (Hunter et al., 2014). It might even enhance development of certain types of processing that are necessary to meet both academic and worldly challenges (Tomporowski et al., 2008), if not for all students, then at least for a number of them. Furthermore, both intentional physical activities and less intentional movement (such as standing or walking around the classroom instead of sitting) could be beneficial to on-task behaviour during the lesson, showing also that no significant relationship between the intensity of the physical activity and the academic performance afterwards, could be seen (Mullender-Wijnsma et al., 2015a).

To summarise, physical activity can be seen to have some positive effects on cognitive function and academic performance. However, most research shows no significant correlation between the two, whereas it is made clear that no negative effect can be found in most cases either. This means that even though the positive effects might not be clear, physical activity could benefit certain students, or students in certain situations, and the importance of physically active academic lessons should therefore not be understated just yet.

3.2 Risks of inactivity

Similar to the difficulties faced when researching the possible benefits of physical activity on cognition and academic performance, researching the benefits of physical activity on physical health in children and youth appears non-conclusive as well. Whereas in adults the evidence of physical inactivity contributing to the increasing prevalence of obesity and type II diabetes is available in convincing amounts, this does not stretch to the evidence when it comes to children and youth. What we do know, is that in recent years the prevalence of obesity and type II diabetes in these groups has been rising at a staggering speed, being a genuine cause for concern. Taking the benefits for adults into account, as well as the positive link between physical health and an active lifestyle in childhood,

leading to a more healthy and active life in adulthood, one can suggest that encouraging physical activity in the early years in order to prevent disease is recommended (Biddle, Gorely & Stensel, 2004). In order to comprehend the implementations of a lack of physical activity, the occurrence of inactivity, sedentary behaviour, and the involved health risks, will be discussed here.

3.2.1 Defining inactivity

To illustrate the seriousness of inactivity, let us look at the research from the World Health Association (2017a). In there it is stated that physical inactivity (defined as the lack of physical activity) "has been identified as the fourth leading risk factor for global mortality (6% of deaths globally). Moreover, physical inactivity is estimated to be the main cause for approximately 21-25% of breast and colon cancers, 27% of diabetes and approximately 30% of ischaemic heart disease burden." (World Health Organisation, 2017a).

The review of several studies by Biddle, Gorely & Stensel (2004) has revealed that in the late 1980s and early 1990s in the Western countries, at least 50% of children and adolescents were not physically active enough to be considered healthy. This trend appears to continue until now. Furthermore, these studies show that often girls are less active than boys are, with evidence suggesting both become even less active as they grow older (Cothran, Hodges-Kulinna & Garn, 2010; Biddle, Gorely & Stensel, 2004; Dollman, Norton & Norton, 2003). This evidence is mainly seen in a decline in leisurely walking and cycling among children (Dollman, Norton & Norton, 2003), and dramatically decreasing active modes of transport to and from school (Biddle, Gorely & Stensel, 2004).

Another report that shows the progressing trend towards inactivity among children and adolescents is written by Dollman, Norton & Norton (2003) and shows the most preferred activities for boys and girls. Whereas this still appears to be playing sports, indoor activities and less active pastimes have started to take up more and more time in their daily lives. Watching television, for example, was the 13th most preferred activity for boys in 1974, climbing up to a 4th spot in 2000, showing an equally high increase for girls from at 10th to a 2nd place. High tech

entertainment (such as video games) does even better, with a 2nd place for boys and a 3rd place for girls in 2000. What alarms researchers even more is that activities as playing, walking and practicing sports have been taken over by activities as eating and sleeping, which also rank up in the top 10 of these most preferred activities (Dollman, Norton & Norton, 2003, p. 895). Inactivity and sedentary behaviour are on a rise.

3.2.2 Sedentary behaviour

One leading example of inactivity is the adoption of increasingly sedentary behaviour. According to the Institute of Medicine (2013, in Webster et al., 2015), sedentarism includes "time spent other than in sleep or in light, moderate or vigorous physical activities" (p. 692). This is important to note, because sedentary behaviour is often used to describe watching television or playing videogames, whereas the term includes much more than those activities. While it cannot be denied that engaging in too many sedentary activities could lead to health risks, pointing out only some of these pursuits as being the main reason for inactivity would be a false judgement (Biddle, Gorely & Stensel, 2004). The notion often arises that nowadays the seated consumption of media by children and youths is increasing steadily. However, contrary to this belief, research shows that while the content of the media is different now from what it was before, the volume of the consumption has remained relatively stable over the cause of the past decade. This suggests that the conclusion that sedentary behaviour leads youths to being inactive is not necessarily true or becoming more true, showing on the other hand that young people can balance both activity and inactivity in their lives (Biddle, Gorely & Stensel, 2004).

However, this is only part of the problem, as we established that the pursuit of certain sedentary activities such as watching television does not paint a complete picture of what sedentary behaviour includes. While the consumption of media might have stayed fairly steady over the years, the time spent in sedentary activities has been increasing. Looking only at schools and the amount of time children spent there in a seated position can be a cause for concern (Donnelly &

Lambourne, 2011). Therefore, it is important to understand not only what is included in sedentary behaviour and the amount of time spent on this pursuit, but also why and how children and young people engage in these sedentary activities and what could be done to encourage more physically active lifestyles (Biddle, Gorely & Stensel, 2004). The focus of increasing physical activity is often placed on moderate-to-vigorous physical activity, in order to achieve an active lifestyle with the most health benefits, but the effect of light physical activity (meaning not engaging in sedentary activities) should not be underestimated (Webster et al., 2015).

3.2.3 Diseases related to inactivity

After having talked about the possible benefits of physical activity and the general risks of being inactive, it is important to also take a look at the more specific effects inactivity and sedentary behaviour could have. The conditions and diseases described below are often not caused suddenly, but are the result of a longer unhealthy lifestyle. While many of these diseases occur in adulthood, an alarming increase of prevalence of these conditions can be detected in children and adolescents nowadays as well (Biddle, Gorely & Stensel, 2004), making it an urgent matter to address.

Overweight and obesity are often the first conditions that spring to mind when talking about the effects of inactivity, though there is lack of evidence supporting the fact that inactivity does indeed lead to obesity in children and adolescents, while that link is visible in adults (Biddle, Gorely & Stensel, 2004). Nevertheless, it is supported that in many countries around the world the amount of children and adolescents with obesity is rising, due to quite possibly a bad diet and lack of exercise (Biddle, Gorely & Stensel, 2004). With childhood obesity being a strong indicator for adulthood obesity and other health problems (Biddle, Gorely & Stensel, 2004), and no evidence suggesting that the rising numbers of overweight and obese children are declining (Dollman, Norton & Norton, 2003), taking action to increase physical activity and energy expenditure now is essential.

Besides overweight and obesity problems starting during childhood and adolescence and carrying on into adulthood, also **cardiovascular disease (CVD)** is a result of insufficient physical activity. While only becoming apparent in middle-aged people, CVD is developed early on in life, making it urgent to try to limit the development of this disease as much as possible during childhood. Problematically, research does not offer proof that increasing physical activity during childhood will prevent CVD from occurring in adulthood. While studies suggest that physical fitness in adolescence decreases the risk of CVD later in life, and that exercise has beneficial effects on lowering lipids and blood pressure (when elevated indicated as being risk factors for CVD), no real link between childhood/adolescent fitness and protection from CVD during adulthood can be detected (Biddle, Gorely & Stensel, 2004).

Another disease typically occurring in adulthood, but being reported in children and adolescents more and more over the past years, is **type II diabetes**. Likely to be related to the increased appearance of childhood obesity (Rocchini, 2002 in Biddle, Gorely & Stensel, 2004), type II diabetes shows to become an imminent health risk for young people. While exercise is seen to help prevent and treat type II diabetes in adults, and the same is expected when implemented with children, there is no evidence available as of now to support this assumption (Biddle, Gorely & Stensel, 2004).

Furthermore, **skeletal health** is also partially under influence of physical activity. While peak bone mass is mainly controlled genetically, diet and physical activity play an active role in maximizing bone development and preventing osteoporosis (increased bone weakness). Especially exercise that puts weight on the bones is seen as an effective means for children and adolescents to increase their bone mineral density (Biddle, Gorely & Stensel, 2004). Speculations presented in Biddle, Gorely & Stensel's (2004) paper suggest that specifically early puberty would be an optimal period for bone development under the influence of exercise, though insufficient evidence to support or refute these speculations is currently available.

Lastly, besides physiological problems that can arise as a result of lack of physical activity, some **psychosocial outcomes** could be detected as well. Physical activity is seen as having positive effects on mental health (predominantly for self-esteem) and psychosocial well-being, suggesting that a lack of physical activity could negatively affect these areas. However, whether the positive effects for mental health are due to the physical activity itself, or rather the psychosocial climate and social interactions present when engaging in physical activity, remains to be researched (Biddle, Gorely & Stensel, 2004).

In conclusion, it could very well be that several physiological and psychosocial problems are a result of a lack of physical activity. Though maybe not the dominant factors in causing such problems, lack of physical activity is seen as a serious problem when it comes to facing these diseases and conditions. And while research is still unclear on the positive effects of physical activity, often the tentative conclusion is drawn that it does not make matters worse and could potentially benefit the person in risk of these diseases. Links between inactivity in childhood and adolescence, and health problems in adulthood might be available, though insufficient research is available to support this at this moment.

3.3 Perceived barriers to physical activity

Physical activity is beneficial for the health and well-being of children, adolescents and adults; this remains the general consensus, though research cannot fully support this claim yet. Why then is there a rapidly increasing number of all three groups that is insufficiently active for health? Allison, Dwyer & Makin have researched this phenomenon back in 1999, coming up with perceived barriers for physical activity, which decrease "the likelihood of engaging in preventive health practices, especially if perceived barriers outweigh the perceived benefits of doing so" (p. 608). Perceived barriers can be divided into two categories: external barriers, like environmental factors such as lack of time, low resources (money, equipment, space), lack of support from friends or family, and lack of services;

and internal barriers, reflecting more individual and psychological factors such as lack of confidence or motivation, fear of injuries, fear of public activity, and other interest being more important (Allison, Dwyer & Makin, 1999). Self-efficacy (the confidence in oneself to behave in a certain way under particular circumstances) seems to be an even more important indicator of physical activity participation than the barriers mentioned above (Allison, Dwyer & Makin, 1999).

Some interesting trends can be spotted when looking into the perceived barriers to physical activity. For one, women and girls often indicate higher levels of perceived barriers than men and boys (Allison, Dwyer & Makin, 1999). Especially in the adolescent stage, these barriers seems to increase, which could be explained due to the bodily changes young people go through that can increase their self-consciousness and embarrassment, as well as time constraints due to the amount of homework, other academic responsibilities or jobs (Biddle, Gorely & Stensel, 2004).

Both the internal and the external perceived barriers indicated above could be seen as relatively personal. They could be changed by the person him or herself, though some might be a bit harder to change than others. Besides these personal barriers, some more physical barriers have emerged over the past years as well. Called "activity toxic environments" (Dollman, Norton & Norton, 2005; Biddle, Gorely & Stensel, 2004), these environments restrict free movement in children, especially among the more disadvantaged groups in developing countries (Dollman, Norton & Norton, 2005). For example, dangerous grounds around the schools, unsafe neighbourhoods, and the lack of good playgrounds and open spaces or nature to play in, can be called activity toxic environments. This does not contribute to increasing the motivation in children and adolescents to be physically active.

4 PHYSICAL ACTIVITY IN EDUCATION

After having stated the possible positive and negative effects of respectively an increase in physical activity and inactivity, the tentative conclusion can be drawn that increasing physical activity for children and adolescents is desirable. While the results might not always be mind-blowingly positive, it is clear that in most cases more physical activity cannot do damage either, making the possible positive results outweigh the reasons for a lack of physical activity. Continuing from this point, it is good to look at what can be done to increase physical activity for children and adolescents. Since formal education is compulsory for children and youths, schools have an optimal position when it comes to reaching all young people with health- and physical activity initiatives (Webster et al., 2015).

However, it should be mentioned immediately that in order to increase physical activity in children and adolescents, a change in behaviour towards physical activity is necessary, a change that cannot be achieved through school-wide activity programs alone (Biddle, Gorely & Stensel, 2004). Increasing physical activity is not just an individual problem, but can be seen as a societal problem where a multi-sectoral approach including schools, family and community is necessary to have a sufficient impact (World Health Organisation, 2017a). Even though children and adolescents spend a good part of their day in schools, most of the physical activity still occurs outside of school hours, making family and community even more important in stimulating an active lifestyle (Biddle, Gorely & Stensel, 2004). This being said, formal education does offer possibilities in helping to increase physical activity and the motivation towards an active lifestyle that should not be underestimated. It is however important to look for connections towards other parts of children's lives to make an active change.

4.1 Possibilities for physical activity in educational context

Schools as an educational context offer a wide range of possibilities for increasing physical activity, being one of the institutions with the most influence on children in the first eighteen years of their lives (Riso, Kull & Hanno, 2014). As mentioned, schools have a huge advantage when it comes to encouraging a healthy lifestyle and implementing physical activity interventions, without stigmatizing children who are at risk with their health (Bugge et al., 2014). They represent a place where students spend a big part of their daily lives, as well as a place where students of all different groups gather (including children at risk of health problems due to inactivity (Smedegaard, 2016; Riso, Kull & Hanno, 2014)), and one where qualified educators are used to integrating a level of health and well-being in their lessons (Smedegaard, 2016). Furthermore, literature suggests that the proximity of educational resources in schools helps increase the beneficial effect of physical activity on academic performance, as oppose to taking part in sports in other contexts (Trudeau & Shephard, 2008). To address the potential of schools, first of all the possibilities of school-wide physical activity will be discussed, after which the focus will be zoomed in on classroom settings specifically.

4.1.1 School-wide physical activity

Physical education (PE) is the first thing that comes to mind when talking about physical activity in the school environment (Orlowski, Lorson, Lyon & Minoughan, 2013). This innately active part of the curriculum in most schools around the world provides children in compulsory education with opportunities for physical activity, as well as introducing them to different sports, offering possibilities to connect with their peers and creating an inspiring basis for an active lifestyle. However, it is researched that physical education alone does not provide sufficient physical activity in order for students to achieve the recommended movement goals (Biddle, Gorely & Stensel, 2004). While increasing time for physical education is highly desirable, school budgets and lack of support for

PE often do not allow the achievement of such a goal (Orlowski et al., 2013; Cothran, Hodges-Kulinna & Garn, 2010).

Alternative suggestions for implementing more movement in the daily school-lives of children come from various angles. Increasingly popular are school-based physical activity interventions and healthy school initiatives, helping to increase the levels of physical activity (Smedegaard, 2016; Riso, Kull & Hanno, 2014; Orlowski et al., 2013; Biddle, Gorely & Stensel, 2004). Examples of physical activity interventions in schools are "additional PE lesson [where possible], active recess, activity breaks and changes in school environments" (Riso, Kull & Hanno, 2014, p.21). More details about school-based physical activity interventions will be given in chapter five. In conclusion, the fact that students spend a great deal of their time in schools, and that with school-wide physical activity interventions (reaching out to all students) can be assured that all children are physically active during their day, offers fertile ground for any health and well-being benefits physical activity can bring.

4.1.2 Classroom physical activity

While the school is definitely a good place to start when it comes to increasing physical activity, it is the classroom where students spend most of their time within the school environment, making the classroom teacher a key player in supporting and integrating physical activity in the classroom routine (Orlowski et al., 2013; Cothran, Hodges-Kulinna & Garn, 2010). The problem, however, is that many teacher feel strong pressure from curriculum demands and high-stakes testing, while also having to ensure students well-being on social, physical and academic level, leaving them with little room to play with the thought of increasing physical activity (Orlowski et al., 2013). Even though the potential benefits of classroom-based physical activity include improved mood, energy levels and learning (Orlowski et al., 2013), prioritizing physical activity appears challenging.

When talking about possibilities for implementing physical activity in the classroom, several options appear. Most commonly named are the active breaks in or between lessons, the integration of physical activity in the learning activity (movement integration), and the implementation of physical activity in transitioning periods (Webster et al., 2015). Focusing on the first two, active breaks can be defined as short breaks from the academic instruction during which a type of physical activity (static or game-like) is being performed (Donnelly & Lambourne, 2011). These breaks can be designed either to stand apart from the academic content, or to connect with the academic instruction, making it easier for teachers to save time and not having to choose between academic activities and extra PE (Mullender-Wijnsma et al., 2014; Donnelly & Lambourne, 2011). This combining of physical activity and academic content leads towards what is called Movement Integration, which is not meant to replace PE, nor as just an active break, but should be seen as a teaching or instructional tool that can be implemented during the regular lesson (Webster et al., 2015; Orlowski et al., 2013).

Both activity breaks and movement integration will be supported by examples of physical activity interventions in chapter five. They also form the foundation of the practical part of this research. Before reaching that point, several barriers and challenges that can be presented towards increasing physical activity in schools, will be discussed, so as to form a thorough picture of the difficulties schools and teachers might face in spite of promising results.

4.2 Challenges in education

Presenting promising beneficial effects of increasing physical activity, as a result of extensive research in the field, is often not enough to convince school leaders and teachers to actually take the step. Various factors make it challenging for them to implement physical activity increasing strategies, some of which are out of their control. Think about school resources and attitudes of teachers, as well as the motivation of students to participate and the determination that is necessary to make sure an intervention is a success. But also when considering the different

learners and learning styles that are present in a class, as well as students with special educational needs, and the different approaches that might be necessary when it comes to interventions like these, plenty of challenges arise.

4.2.1 Neuromythologies

As described in chapter three, brain studies have shown important links between physical activity and academic performance through physiological changes in the brain that stimulate the necessary neural interconnectivity. This is a very positive result, one that can be of great importance when it comes to promoting the increase of physical activity among children and adolescents. However, it also comes with its own set of problems in the shape of what Geake (2008) calls "neuromythologies". These are (mis)conceptions that play (or have played) an important role in shaping curricula and teaching styles, and can actually have a negative effect on student learning. Three of these myths will be briefly discussed here.

The theory of Multiple Intelligences (MI) was created in 1983 by Gardner, and has been popular ever since. His constructivist views on education are reflected in his theory based on human potential, taking note of varying abilities and talents among students. He named these abilities 'intelligences' (such as verbal, visual, musical, and bodily intelligence) and suggests that, though all present in everyone, some intelligences dominate more than others (Franklin, 2006). The problem with this system is that it presents the brain as an organ with different rooms that can be addressed when a certain task has to be done. This segregated view of brain functions bypasses the neural interconnectivity that has been discussed in chapter three, which indicated the need for various areas of the brain to work together to complete a task (Geake, 2008). Rather than multiple intelligences being present in the brain, Geake (2008) indicates that it is better to speak of one general intelligence that has modules that are involved in many different functionalities the brain can perform.

Closely following (and often based on) the theory of MI, is the concept of **different learning styles.** The most commonly mentioned learning styles are the

VAK (visual, auditory, kinaesthetic) labels that suggest that students learn mainly through one of these three modes (Geake, 2008; Franklin, 2006). This concept reduces individual learning to a capacity instead of viewing learning as a process, stereotyping students as a specific type of learner and thus bypassing their full potential which includes all forms of learning, and possibly limiting the positive learning outcomes of the lesson (Geake, 2008; Franklin, 2006). Using these learning styles as a teaching tool could be beneficial when paired with an understanding of learning processes, but labelling students as a particular learner without seeing their individuality and potential in different areas can be dangerous for both their academic and psychosocial outcomes (Rayner, 2015; Franklin, 2006). An example of the use of a sole learning style is the implementation of Kinaesthetic Learning Activities (KLAs), described as short classroom-based physical activities (Begel, Garcia & Wolffman, 2004). However, it should be repeated that focusing solely on one type of learning does not have as many beneficial effects as combining different types of learning, seeing learning as a wholesome process.

The last neuromyth in education discussed here is the **theory of left- and right-brained thinking**. It is a common mistake that people believe either the right side of their brain (representing the more creative and sensitive brain functions) or the left side of their brain (representing more analytical and strategic functions) is more dominant in their learning. As was pointed out in the brain research in chapter three, in order to perform various brain functions, different areas of the brain have to work together (Geake, 2008). Also here, reducing students' potential by categorizing them as right- or left-brained thinkers can damage their learning process and have negative psychosocial outcomes as well.

4.2.2 Inclusive practices

In education nowadays, inclusion is becoming a more and more important practice. Focusing on including students with physical, social or learning disabilities in regular classrooms, this practice brings its own set of challenges, especially

when resources in schools remain similar to what they were before. Taking differences between students into account in a regular classroom is not an easy task, regardless of the fact that they have special educational needs or not. Physical activities in the classroom, for example the KLAs or activity breaks, misfire easily because of the limited target group they have, making them possibly socially inappropriate (by for example excluding shy students or students with disabilities), too challenging or difficult to manage for a teacher (Begel, Garcia & Wolffman, 2004).

However, more research suggests that implementing physical activity in an inclusive classroom can benefit all students involved. Trudeau & Shephard (2008), for example, reviewed several studies, showing that physical activity may increase attention in all students, decrease feelings of depression in students with hyperactivity, improve reading for students with reading disabilities, increase time-on-task focus of students with emotional and behavioural disorders, and possibly improve classroom behaviour and academic performance for students with learning disabilities. Similarly, Mullender-Wijnsma et al. (2015) state that physically active lessons could improve time-on-task behaviour of both socially disadvantaged children and children without such disadvantage. Furthermore, Tomporowski (2003) shows that periods of physical activity reduce self-stimulatory and disruptive behaviour in children with autism (though the time of the effect might be limited), as well as decrease disruptive behaviours in children and adolescents with behavioural disorders in general. These results suggest that bouts of physical activity especially help children with disorders characterised by problems with attention and impulse control in improving their behaviour and cognitive function (Tomporowski, 2003), as well as enhance executive functions in children who suffer deficits in that area (Verburgh, Königs, Oosterlaan & Scherder, 2014).

A need is expressed for creative ways of approaching learning and academic performance in an inclusive classroom (Skoning, 2008). Physical activity could be an interesting tool to consider, especially when looking for possibilities to make disruptive energy creative, using the undesired behaviour to turn it into

appropriate behaviour, thereby making students' movement valuable and benefitting cognitive function and academic performance in the process (Griss, 1994 in Skoning, 2008). Physical activity interventions with a low student-teacher ratio are suggested to increase the possibility of positive outcomes (Trudeau & Shephard, 2008), though the challenge remains how to make that happen in our current educational systems.

4.2.3 School resources

The lack of school resources is presented as a major problem in achieving an increase in physical activity during the school day. Many sources cite budget restrictions as an issue, as particularly PE (with its facilities, equipment, instructors and insurances) is a subject more expensive than most others, resulting in it being one of the first subjects where cuts are being made (Donnelly & Lambourne, 2011; Sibley & Etnier, 2003). Furthermore, it is often believed that as a result of an increasing emphasis on standardized test performances, more time needs to be dedicated to subjects such as mathematics, English and science, further decreasing the time spent on PE and physical activity (Donnelly & Lambourne, 2011; CDC, 2010; Tomporowski, Davis, Miller & Naglieri, 2008; Dollman, Norton & Norton, 2003; Sibley & Etnier, 2003). Though, at the same time, research suggests that including physical activity in the curriculum and academic lessons has no negative impact on students' academic performance (Tomporowski et al., 2008) and may even have a positive impact instead (CDC, 2010).

Organising physical activities that "do not require reconfiguration of the classroom yet provide adequate intensity and energy expenditure to impact fitness and fatness" (Donnelly & Lambourne, 2011, p. S38) is a challenging task, especially when limited resources (in equipment as well as expertise) are available. However, physically active academic lessons can be cost effective, not requiring extra preparation time by the teacher and can be enjoyable for all parties involved, possibly resulting in improved academic performance and engagement (Donnelly & Lambourne, 2011). Nevertheless, it does require the will of the school and the teachers to take action.

4.2.4 Teacher attitude

Which leads us to the following perceived barrier when it comes to implementing physical activity in education: the attitude of teachers towards the matter. Generally speaking, classroom teachers are not opposed to working with physical activity in their regular lessons, but feel they lack the training and support to make it happen (Russ, 2015). Nevertheless, a difference in willingness can be seen between newly qualified teachers and teachers that have been in service for many years already. Newly qualified teachers perceive higher barriers towards integrating physical activity, which mainly have to do with their low efficacy beliefs (the confidence that they can successfully integrate movement in their classroom), making them less willing to change their classroom routine (Webster et al., 2015; Webster, Erwin & Parks, 2013). Experienced teachers feel more confident in their classroom practice, expressing a higher willingness to implement movement (Webster et al., 2015).

However, certain barriers can be found that apply for both newly qualified teachers and experienced teachers alike. These barriers include increased preparation time for movement integration, lack of resources, lack of flexibility in the activities, lack of support from the school environment, time constraints, negative student response, and the obligation or permission to implement movement or not (Webster et al., 2015; Webster, Erwin & Parks, 2013). Providing teachers with ready-to-use material from PE teachers, newsletters or online sources (Russ, 2015) as well as showing them the positive effect of physical activity on students' development, and reminding them of their personal positive experiences with physical activity (Webster et al., 2015) are suggested ways of improving teacher attitude towards physical activity integration.

4.2.5 Student motivation

As briefly mentioned above, student motivation can be a barrier for teachers when it comes to implementing physical activity. Receiving a negative response

from students to an attempt at integrating physical activity in the academic lesson, might encourage teacher not to pursue the subject any longer (Webster et al., 2015). However, not only the effect of student motivation on teacher attitude is important when it comes to increasing physical activity in schools, the student motivation in general plays a significant role as well, resulting in the level of participation. Research shows that when it comes to physical activity in schools, students (especially girls) are mainly extrinsically motivated to participate due to pressure from the teacher, but see little point in participation (Biddle, Gorely & Stensel, 2004). At the same time, many young people see physical activity as an enjoyable and worthwhile pastime (Dollman, Norton & Norton, 2003), contradicting the aforementioned statement, suggesting more research towards motivation is necessary.

What can be shown, is that various factors directly influence motivation towards physical activity in children and adolescents, the most important one appearing to be parental support (i.e. parents encouraging positive perceptions of competence), as well as sibling physical activity in adolescents (Biddle, Gorely & Stensel, 2004). Furthermore, research suggests that students are more likely to have a higher motivation towards physical activity in schools if they are male, of young age, have a high perceived competence, a stronger intention, suffer from less depression, have many opportunities to exercise and have participated in previous physical activity/community sports (Biddle, Gorely & Stensel, 2004). Often only a small percentage of the students in a school meets these indicators, leaving a great percentage of the school population with a lower motivation.

5 PHYSICAL ACTIVITY INTERVENTIONS

The realisation that schools can play a great part in promoting and supporting the increase of physical activity in children and youth is one that many have become more aware of over the past decades. The potential of schools has been explored through a myriad of physical activity interventions, providing an equally diverse pool of results. Important in the design of such an intervention, is to keep the desired outcome in mind and structure the programme accordingly, for example: if the goal is lifelong physical activity, the programme should inspire children and adolescents to enjoy, continue and maintain physical activity so that it can carry over into adulthood (Biddle, Gorely & Stensel, 2004). Furthermore, a programme aiming to increase levels of physical activity in young people should stretch over multiple levels and places, offering a multi-faceted and comprehensive approach (Cothran, Hodges-Kulinna & Garn, 2010; Biddle, Gorely & Stensel, 2004). Whether the intervention includes basic exercises or more elaborate ones, whether it connects to the academic content or not, whether it stretches the entire school or just the classroom (Mullender-Wijnsma et al., 2015), a clear goal has to be kept in mind in order to be able to properly conduct the intervention and evaluate the results. After sharing data from the Classroom Physical Activity Studies Review (CDC, 2010) to indicate the value of these types of interventions, various examples of interesting interventions will be given, concluding with the one that lead to the design of this thesis study.

5.1 Classroom Physical Activity Studies Review

The Centers for Disease Control and Prevention conducted a research review in 2010, where they compared the results of nine different studies focusing on the way brief physical activities in the classroom could affect cognitive skills, attitudes, academic behaviours and academic achievement. The activities lasted 5-

20 minutes each session on a daily or regular basis, required no additional preparation time or special resources, and were instructed and supervised by trained teachers or facilitators.

Out of the nine intervention studies, four studies reported only positive relations between physical activity in the classroom and students' classroom behaviour and academic achievement. In general, all studies had either positive outcomes or non-significant associations (effects on some indicators, but not all, or no visible effects), meaning that no negative associations between physical activity and academic achievement and behaviour were found. Therefore, the review states that physical activity breaks can be included by classroom teachers "as a strategy to promote academic-related benefits for students" (p. 29) and as a possible way to increase overall levels of physical activity and health in students. Examples of possible beneficial physical activity interventions are activities that could be done as a station activity, movement-based learning techniques, or short exercise breaks, especially before working on a task that requires deep concentration.

5.2 Examples of interventions

As mentioned above, many different physical activity interventions can be found that have been implemented over the years. While some have a very strong research background, others rely on a more practical approach. Below several of these interventions are summarized to illustrate the diversity of the available resources and possibilities. The interventions are chosen at a random fashion, but with the classroom as the exercise environment in mind.

5.2.1 Total Physical Response (1966)

The oldest intervention in this list stems from 1966 and is called the Total Physical Response (TPR) by Asher. In line with information related to the workings of the brain in connection with physical activity, TPR describes a learning approach for language learning (Japanese and Russian in this particular study) where students

(both children and adults) are required to respond with a physical action to the word(s) that they hear. The study showed that when doing so, students retained the words they heard much longer than when they did not respond with a physical action. However, especially in the early years, this effect is not very visible, though that could be due to the short time the study was conducted. It is expected that when implementing acting-out as part of language learning for a longer period of time, students will not only retain the learned words better but will also show greater motivation and interest.

5.2.2 Activity Breaks (2007)

Castelli & Beighle (2007) conducted a study to explore the possibilities of short activity breaks in education. These breaks, lasting between 5-30 minutes, could include time being physically active during recess and time spent on activities in the classroom. They suggest that the best opportunities for an increase in physical activity for children in schools could be active recess (where activities and equipment should be provided), activity period intramurals (meaning "clubs" for students to be active together during the school day), and secondary drop-in activities (opportunities for students to be active during lunchtime). Castelli & Beighle conclude by pointing out that the schools' physical education teacher could play an essential role in organising and coordinating these extra physical activity moments, as well as in inspiring his colleagues towards the implementation of more movement, suggesting a role as the schools' activity director.

5.2.3 Physical Activity Integration (2010)

The study on Physical Activity Integration by Cothran, Hodges-Kulinna & Garn (2010) focuses on classroom teachers and their possibilities of implementing and integrating movement in their daily academic practices. Goals of the programme were to increase physical activity and knowledge about healthy living among students, asking teachers to find logical ways to integrate the programme's information in their lesson content. Participating teachers were volunteers, which showed in their increased engagement in their students' development and well-

being and their reasons for participating being mainly to want to positively impact their students wellness and health, as well as their academic engagement (more so than their academic achievement).

Teachers found that the implementation of physical activity increased the attentiveness of many students, however they were not able to theoretically support the connection, revealing a need for teachers to be educated on the learning links between brain and body in order to provide better physical activities. Furthermore, with the programme being implemented in both primary and secondary schools, it was discovered that secondary school teachers faced more problems in timing and planning the activities, as they only saw their students for a short period of the day. Regardless of the positive results and reactions of the study, these challenges still have to be addressed in order for teachers to be able to fully commit and implement physical activity.

5.2.4 My Classroom Physical Activity Pyramid (2013)

Created as a teaching tool for primary school teachers, the My Classroom Physical Activity Pyramid (MCPAP) by Orlowski, Lorson, Lyon & Minoughan (2013) offers a visual support with a simple tracking mechanism for teachers towards implementing movement in their classrooms. Working with three different levels, representing five different types of and occasions for physical activities, the MCPAP is an elaborate practical tool. Yet it manages to maintain a flexible structure so teachers can adjust the content to their personal goals and needs. Purposefully shaped like a pyramid, the tool aims to help insure 60 minutes of physical activity every day, by looking for organic ways to integrate movement in the classroom routine.

Level I targets everyday activities, such as doing tasks around the classroom or recess, making them more physical. Level II represents activity breaks directed by the teacher (consisting of short activities that are meant to energize without connecting to academic content), as well as integrated lessons where the physical activity and the academic content are combined. The big difference here

is the focus, which is on physical activity in the first level, and on academic content through physical activity in the second level of activities. Finally, Level III consists of physical education, as well as active games and celebrations, both being activities that take place more occasionally. The tip of the pyramid represents inactivity, something teacher should try to minimize during the school day.

5.2.5 Active Kids Active Minds (2014)

The article presenting the Active Kids Active Minds (AKAM) intervention done in Australia by Hunter, Abbott, Macdonald, Ziviani & Cuskelly (2014) offers a less practical, but more research-based overview of the study. The study comprised of four main components, being: 1) facilitating a physical activity increasing school-wide intervention to increase learning at a state primary school during two terms; 2) designing an intervention to ensure at least 60 minutes of physical activity every day; 3) completing initial and concluding data collection with methods focusing on cognitive assessment as well as student behaviour; and 4) validating the interventions fidelity with appropriate measures. Intervention groups spent 60 minutes on physical activity within the curriculum every day, as oppose to control groups spending 30 minutes of activity every day through other programmes. AKAM activities included running, games and relays with minimal instruction and little waiting time.

The data of this intervention shows similar results to the ones found in other research: no apparent improvement of cognitive function could be found after two terms of increased physical activity in the classroom. However, no detrimental effect on academic performance due to less time spent on the formal curriculum was found either. Although in this particular case the authors may have been unable to convince State education leaders of the importance of increased physical activity in schools, the positive perceptions of students and teachers taking part in the project could send a positive message to schools and parents, showing the potential of combining physical activity and a competitive curriculum.

5.2.6 LCoMotion (2014)

LCoMotion (abbreviation of Learning, Cognition and Motion) by Bugge, Tarp, Østergaard, Domazet, Andersen & Froberg (2014) targets combining these three factors in order to increase academic performance through movement. Consisting of three parts (active learning, physically active recess and physical activity homework), the intervention measured outcomes on cognitive function, academic skills and cardiorespiratory fitness, though unfortunately the article does not clearly describe the outcomes.

Looking at the active learning part of the intervention, it is said that participating teachers (primary school classroom teachers) received supplementary training to be able to deliver physical activities combined with their academic content. The training included practical tools to use in different subjects, as well as explanation of the use of an "activity watch" that could be hung in the classroom to measure the time spent on active learning.

5.2.7 The Walking Classroom (2016)

Mancini-Becker (2016) describes in her article one of many walking programs that have been developed to integrate group walking into the curriculum in schools, focusing on both physically and cognitively engaging students in their studies. The example mentioned in this articles describes an imaginary journey to Ghana, in which students (through walking with their class, as well as with family at home) could contribute to the kilometres it would take to reach Ghana from the United States, while learning about the Ghanese culture, history, geography and language.

Walking as a medium of implementing physical activity was chosen due to the many documented physical and mental health benefits, the flexibility such a programme provides, and also because walking is an easy activity that can be done and maintained by almost everyone. To illustrate the effect of a walking programme on children, Mancini-Becker links to research being done where 15-minute walks twice a day, at least three days a week, resulted in a significant reduction of the percentage of body fat of the students (Ford, Perkins & Saine,

2013, in Mancini-Becker, 2016). Further benefits of a walking programme include the requirement of collaboration and positive interdependence between students, cooperative learning possibilities, possible alignment with the curriculum, school-wide applicability and a perceived fun break from the school routine.

5.2.8 Movement in Education Denmark (2016)

The last intervention presented here is the ongoing project of Movement in Education (bevægelse i undervisningen) in Denmark, initiated by Løgstrup-Ottesen, Flaskager & Koch (2016). Similar to the Physical Activity Pyramid, this project presents different ways of implementing movement in the everyday school practices, divided into four different categories. The first category is 'Movement separated from the academic lessons' and consists of activities that can be incorporated in the school day, without attachment to academic content or lessons. Examples are morning runs or active recess. The last category is that of Physical Education, an integral part of most school curricula. The project focuses, however, on the two middle categories, being 'Movement **combined** with the academic lessons (Powerbreaks)' and 'Movement **integrated** in the academic lessons (Active Learning)'.

First of all, the Powerbreaks category is characterized by short activities that provide students with an active break from the academic material. The authors offer five different learning perspectives that can guide the teacher in choosing a focus for his physical activities, though joy of movement should be the main goal in all physical activities implemented. These learning perspectives (fig. 1) include **physical** focus (fitness, endurance, muscle strength); **motor skills** focus (coordination, balance, sense of direction); **cognitive** focus (awareness, understanding, creativity); **emotional** focus (motivation, will, courage, engagement); and **social** focus (cooperation, communication, responsibility), and can be used either separately or combined in an activity.

The category of Active Learning focuses on integrating movement into the academic content, making the lesson physical in itself. Also for this category, a

model is offered as a tool to guide teachers towards finding the appropriate physical activity for their content. The model (fig. 2) is comprised of: 1) **play activities** (games and play to develop specific skills by repetition and training); 2) **structured teaching** (tools to help teachers structure teaching so students get out of their seats); 3) **embodiment activities** (activities that help students 'embody' the content); 4) **situational exercises** (movement activities integrating local environment in subject specific situations); and 5) **creative and aesthetic learning activities** (movement activities with a particular focus on creative dimensions, such as theatre).

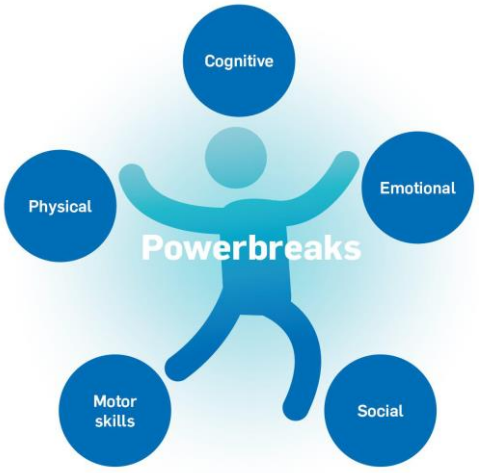

FIGURE 1: Powerbreaks categories (Løgstrup-Ottesen, Flaskager & Koch, 2016)

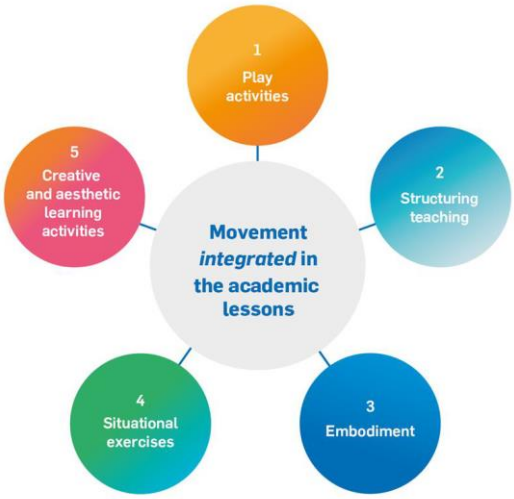

FIGURE 2: Active learning categories

Although this research project is still ongoing, thus not yet having many details as to the exact content, application or results of this material, the project provides an interesting view on physical activity in the classroom. Combining the findings of various different studies and offering practical tools for implementation, this research creates a good basis for the Classifit! Project and will be used to develop the material further. Mr. Løgstrup-Ottesen has given permission to use his material. The outcomes of this study will be shared with him afterwards.

6 RESEARCH TASK

As explained in the introduction and in the literature review, activity levels among adolescents are decreasing, whereas the number of children and youths with overweight and obesity is rising quickly (i.e. Biddle, Gorely & Stensel, 2004). The trend of an inactive lifestyle is progressing, resulting in severe health problems that are starting at increasingly earlier ages. This goes not to say that sedentary behaviours in schools and inactive transport there are the single reasons for this dramatic increase of health problems, but it can be stated that these factors do not help improve matters either. However, schools can play a crucial role in promoting active lifestyles, implementing physical activity interventions, and due to their compulsory nature, reaching children from all different risk groups (Bugge et al., 2014).

Though understandable in the light of wanting to reach children at a young age to get more positive outcomes towards active lifestyles, many interventions to increase physical activity in schools have been done on the primary level, often leaving out students in secondary school levels. This incontinuity of physical activity interventions could very well be detrimental to the achieved effect of the interventions in the primary schools. To fill this gap, this research will be aimed at reaching students at the secondary school level (age 13-16).

Based on the information offered here, in the introduction and in the literature review, the following research tasks can be noted:

1. Theoretically investigating the need for an increase in physical activity.
2. Providing teachers with useful tools to implement movement in their classrooms.

7 PREPARATION OF THE STUDY

In this chapter, a brief background of the design of the study will be given, by explaining the research approach in Educational Design Research, as well as the choices made in creating the practical Toolbox for the intervention. In chapter eight, the details of the intervention itself will be provided.

7.1 Educational Design Research

For my thesis research, I have chosen to work with an educational design approach. Educational design research is a specific area within educational research, leading to a more practical way of researching a particular topic, in this case physical activity. In the book of Plomp & Nieveen (2013), Plomp has written an article where an introduction to educational design research is given, offering the following definition as to its core elements:

> "Design research: to design and develop an intervention (such as programs, teaching-learning strategies and materials, products and systems) as a solution to a complex educational problem as well as to advance our knowledge about the characteristics of these interventions and the processes to design and develop them, or alternatively to design and develop educational interventions (about for example, learning processes, learning environments and the like) with the purpose to develop or validate theories." (p. 15).

In this, two variants of educational design research can be distinguished: development studies and validation studies. In my case, I will focus on development studies, making it important to formulate a clear problem to which I will then attempt to find a solution by taking the first steps in educational design research. To properly conduct development studies within educational design research, several phases need to be followed:

- Preliminary research; being an analysis of the needs and context, literature review and development of a theoretical framework.
- Development phase; designing a first version of the intervention, concluded by formative evaluation and usually followed by improvement and refinement of the intervention. *In this case, I will limit my study to a single design and evaluation round.*
- Assessment phase; a certain point in the research when a (semi-) summative evaluation will be conducted in order to assess whether the intervention is successful, after which the study can either be continued or concluded. (Plomp, 2013, p.19).

Educational design research requires high-quality interventions in order to be effective. For interventions to be high-quality, Nieveen (1999, in Plomp, 2013) states that the intervention should be valid (address a need, be based on state-of-the-art knowledge and have consistent links between components), teachers should consider the intervention as usable, and that the intervention should be effective (resulting in the desired outcomes).

7.2 Designing the Classifit! project

Based on the aforementioned information about educational design research, I begin by briefly stating the background and goal of my study. As can be seen in the information in the literature review, the need for this study (and the accompanying intervention) stems from the increasing levels of inactivity among adolescents and the relatively few practical options there are for teachers in secondary schools to help solve these inactivity problems and with that promote a healthy lifestyle. The goal of my study was therefore to design a practical toolbox for secondary school teachers who work in a classroom, in order to combine (powerbreaks) and integrate (active learning) more movement into their academic lessons, and to understand which tools work for them so as to achieve the increase in physical activity.

A full cycle of educational design research includes data collection both before and after the intervention. Because of lack of resources, I made the decision to limit this study to data collection after the intervention, using the material from Mr. Løgstrup-Ottesen, the self-determination theory, personal knowledge and informal conversations with teachers to develop the Toolbox beforehand. The data collection took place after the first round of implementing the Toolbox, in order to understand what worked for teacher and what did not. This decision leaves room for potential follow-up of this research in the future.

7.3 Toolbox content

With a focus on movement integration as a way to increase physical activity levels among youth in schools, the content of the Toolbox can be divided into two sections: Powerbreaks (stand-alone, short movement activities to break up sedentary time) and Active Learning (activities integrating movement with the academic content) (Webster et al., 2015). Based on the categories mentioned by Løgstrup-Ottesen, the Powerbreaks side presents ten different categories (Balance, Strength, Reaction, Aerobics, Concentration, Rhythm, Coordination, Cooperation, Flexibility, and Endurance) with two levels of difficulty each. This connects to the self-determination theory, which states that in order to motivate students for participation, a teacher should try to increase the students' feelings of autonomy, competence and relatedness (Niemiec & Ryan, 2009; Ryan & Deci, 2000a; Ryan & Deci, 2000b). The exercises, therefore, are chosen based on their potential for cooperation between students (increasing relatedness), the challenge they offer without being too hard (touching on students' competence), and the possibility for students to do the exercises by themselves without teacher guidance (increasing feelings of autonomy). Furthermore, the exercises could increase students' perceptions of voice by offering them choices in their daily lesson (Niemiec & Ryan, 2009; Ryan & Deci, 2000a; Ryan & Deci, 2000b).

Besides Powerbreaks the Active Learning part can be found, which consists of five different categories (Sharing, Quizzing, Acting, Creating, and Playing).

Based on the Movement Integration section by Løgstrup-Ottesen, this part is designed to offer various numbers of different activities in each category. These activities try to tie in with the academic content by offering a physical alternative to standard teaching methods. In order to be applicable to teachers from different subjects, the activities are as open as possible, offering general inspiration for teachers to implement movement. Both the Powerbreaks and the Active Learning activities were chosen for their ease of implementation, not requiring much additional preparation time, little to no material, and being easy to explain to students, as well as being engaging and enjoyable. To increase ease of use, the material is made available on a website, where the Powerbreaks are explained with a short, 30-second to 1-minute, video (giving students the option to work with them autonomously), and the Active Learning activities with a short written description (with the possibility for teacher to ask for more specific activities).

As the focus of this research went towards Swedish-Finnish secondary schools in Finland, the content of the website was offered in both English and Swedish, increasing the accessibility for both students and teachers wanting to work with the material. The website was created in a colourful, bold way, without distracting from the purpose. The menu-bar lead to the various pages with information and activities, trying to make it easy for users to find the required pages. Some screenshots of the website can be found in the Appendix, though it is highly recommended to visit the actual website as well on goclassifit.wordpress.com. The website will continue to exist, and might be updated in the future if the need arises.

8 IMPLEMENTATION OF THE STUDY

What follows is a written representation of the practical part of my study, offering information on the context, participants, process, research methods and data analysis.

8.1 Context of the Study

This study focused on teachers of classroom-based subjects in Finnish secondary schools (grade 7-9, students age 12-16). Four schools in Southern Finland were contacted for participation, schools where Swedish is the language of instruction. The schools were chosen based on that information, as the possibility was there to create the material in Swedish, as well as for the fact that I had contacts in those schools that could help with recruiting participants.

8.2 Participants and the Research Process

The principals of the four schools were contacted two weeks before the project was planned to start, with the request to share the information with their staff. Teachers were asked to volunteer for participation in the project, as the expectation was that volunteers would carry through the intervention to the end and show higher motivation towards movement integration. Two teachers (both working as language teachers) from one of the contacted schools stepped forward as volunteers, with no volunteers coming from the other three schools. There were no requirements as to the subject the teachers had to teach, as long as the subject was mainly taught in a standard classroom environment.

The two participating teachers were contacted one week before the start of the project and given information about the process. The participants were asked to implement material from the Toolbox for four weeks, at least two times a week, writing down their comments briefly in a personal diary after every implemen-

tation. The participants were free to choose when they would implement activities and what those activities would be (either Powerbreaks or Active Learning). Two weeks after the start of the project, the participants were sent an email containing information on the evaluation of the project. At the end of the four weeks, both participants took part in a semi-structured interview, where the option was given to conduct the interview in English or in Swedish to make the participants more comfortable. Furthermore, participants were given the opportunity to ask their students to leave feedback via the projects' website.

8.3 Research Methods

As two teachers volunteered for participation, the choice was made to conduct semi-structured interviews with each teacher individually, focusing on the usability of the Toolbox material, as well as the teachers' satisfaction and leaving room for other comments. The interview questions were based on the Technology Acceptance Model (TAM), developed by Davis in 1989 and remodelled by Edmunds, Thorpe & Conole in 2012. The TAM questionnaire was not used literally, but has been used as a guideline towards designing the interview questions, in which the questions were aimed to be of a more open format than the questions presented in the original questionnaire.

8.4 Data Analysis

The data was analysed using the TAM-questionnaire (Edmunds, Thorpe & Conole, 2012, p. 75 & 77) as a structure. For a more pointed data collection, this study focused mainly on the usability of the Toolbox material, using background information on the usability of ICT, as a website is the chosen means of distributing the Toolbox content. In the light of usability and user acceptance of the material, several determinants were important: performance expectancy (the degree to which the participant believed using the material would benefit their

work); effort expectancy (the degree of ease of use towards working with the offered material); social influence (the degree to which the participant felt supported by important others); and facilitating conditions (the degree to which the participant felt supported by organizational and technical infrastructures) (Venkatesh, Davis, Davis & Morris, 2003). Furthermore, interactivity between the user (participant of the study) and the material (the website, in this case), as well as between the teacher (participant) and the students, between students themselves, and between the students and the material, was an important factor towards determining the success of the intervention (Wang, 2008). Therefore, not only did the Toolbox have to be usable, it should also have meaningful and relevant content, encourage learners to change, enrich or explore the material in their own way, and facilitate communication with both the users and the interface – the website content (Wang, 2008).

A last important notion when it comes to usability of ICT was the distinction between utility and usability, with utility referring to the functionality of the system, and usability to the ease with which the system could be operated. In other words: an educational intervention such as this Toolbox, should include the functionalities necessary for achieving increased physical activity in an educational setting (utility) as well as be technologically usable, not making it difficult for teachers to use the material (usability) (Wang, 2008). A lack of fit, where the system is too demanding in use (technology-wise, or even time-wise), or where the system does not fulfil the occurring needs or posed goals, is reported to be the main factor for teachers not to use the available material (Al-Fudail & Mellar, 2008). Technology is more and more required in education, though the offered material should connect to the technological possibilities that already exist in the school, as to not require too much change or the purchase of extra hardware/software if there is no money to do so (Pelgrum, 2001). These factors have all been considered in the analysis of the collected data.

8.5 Ethical Solutions

Informed consent was obtained, as participants were asked to sign a form indicating their understanding of the purpose and practices of this study, as well as offering them full anonymity in the data collection. The participants in this study were drafted on a voluntary basis, with the possibility of leaving the study at any given moment. Potential benefits were discussed, and the participants were given contact information of the researcher in case questions should arise (Alasuutari, Bickman & Brannen, 2012). The collected data was stored on a password-guarded computer, with no link to the identity of the participants. Teachers were asked to offer their students the possibility to leave anonymous feedback via the website, though no students used this opportunity. In case data was collected via the website, this would have been kept anonymous and confidential as well. Furthermore, during the study, the participants were given the choice of which material to use and when to use it.

For the creation of the Powerbreaks videos, volunteers were recruited among students in the Master of Educational Sciences at the University of Jyväskylä. The students were given the freedom to choose in which activities to engage, as well as to drop out of participating at any time. All five of them signed a form stating their consent for me to use the videos as I saw fit, publishing them online for the Toolbox as well as possibly using them for further reference.

9 RESULTS

As mentioned in chapter 8.4 on the data analysis, the interview following the projects' intervention was constructed with the questions from the TAM-questionnaire as a guideline, structured according to three main categories: usefulness (including questions regarding performance expectancy), ease of use (regarding effort expectancy and usability), and motivation (including questions on social influence and facilitating conditions). As a result of the interview, a category regarding the practical implementation of the project was added, as well as a last category with other comments and general feedback.

9.1 Practicalities

Teacher A worked with the project with all six of her classes, though she at first planned to work with one particular group that needed the active break. Teacher B also implemented the activities with all six of her classes. Teacher A looked at all the material beforehand, whereas teacher B took one at a time because of time constraints. The timing of the project was not ideal, indicated teacher A, as November and December were very busy months and teachers were stressed with assignments. Though the project did not require much, it still expected you to implement and write some things down. Teacher B said that even though she did not have much time, she found this project easy to use. Teacher A was sad that she only worked with the material for two weeks instead of the required four weeks (due to circumstances at the school), but she appreciated the reminder after two weeks to get her back on the project. She also indicated that a time limit was a good way of assuring that teachers actually worked with the material.

The participants were asked to implement (parts of) the Toolbox material at least twice a week, which both participants indicated they did. Teacher A said that she worked with the material whenever she could fit it into her schedule, and teacher B implemented the material once in a while, with some groups more than with others. The instructions of the activities were clear to both of them,

though teacher A pointed out that the time indicated in the videos of the Powerbreaks did not properly reflect the time that was necessary for the activity (because time for instruction and getting ready should be included as well). Teacher B found the activities very activating and easy to use, especially when working with little and simple materials and teacher A agreed to that as a positive aspect. Both participants said that all their students took part, except for a student on crutches in one of teacher A's classes.

9.2 Usefulness

The questions regarding performance expectancy were aimed at discovering whether the offered material matched participants' expectations of them, as well as discovering the outcomes of the project towards students' learning and concentration. Both participants indicated that they saw a need in their students for some movement during the lecture, as a lecture of 75 minutes was a long time to sit still, but that they needed a push to actually start working with active learning materials. Teacher A had been experimenting with stretching and walking during the lesson before, but was happy to be able to get her hands on more practical tools. Teacher B indicated that with the renovation of the school building, new opportunities arose for a different classroom, like standing tables and gymnastic balls to sit on, but those did not sufficiently cater to the needs of the students and the teacher. Besides, they were not available in her particular classroom. This project came at a right time for her and offered more or less what she was expecting from a classroom physical activity project.

As for the effect of the activities on students' concentration, both participants said that they were not sure the effect was there. Teacher A said that it was not easier or more difficult than usual to get students' concentration back after an activity; whereas teacher B indicated that it depended on the class (some being quicker in getting their attention back than others). Both participants showed a positive attitude towards the project and said that it was a good intermezzo for students during a long lesson. Teacher A added that the physical activity became

a very natural part of the lesson, a moment to "clear the brain" before continuing with other, more academic, content. Especially when transitioning between two very different parts of the lesson, an activity that had nothing to do with academic content was found to be useful. Furthermore, teacher A pointed out that even though she expected to work on this project with one particular class (with very active students), she found that the active breaks had a positive effect on her other classes as well.

9.3 Ease of use

As for ease of use, both participants agreed that the material was very easy to work with and that it worked well. Teacher B said that it was "nice to notice how easy it was" and that it was clear how to work with the material. It did not require a lot of reading, making her able to implement the activities right away. The website was found easy to navigate and the addition of the short instructions before the Powerbreak videos, made that the participants knew immediately what the activity was about. Teacher A added that this was good, as she could then decide on the spot which activity would work at that moment, or which would not because she did not have the required material or space at hand.

Both participants said that they kept control most of the time, being the ones choosing the activities. Teacher A indicated that she occasionally showed the list to students to let them choose, while teacher B did not, but she admitted that she saw potential for students to work with the Toolbox autonomously should there be digital resources available for them. The activities offered were enough to choose from, though both participants stated that there could always be more. Teacher A elaborated that there should not be too many alternatives, because then it would take her too much time before every lesson to go through the activities in order to find one that fits the class. As the classes did not always have the same needs: "certain groups can today need this activity to calm down, but the others need something to get going", the right choice had to be made on the spot. Teacher B showed some concern in that she thought not all activities were

that physically active, though they did offer a nice break. Furthermore, teacher B stated that in order to keep working with this Toolbox, the activities would need to be either updated regularly or more activities should be added on a regular basis, in order to keep them interesting for students working with them. Although she also recognized that some students like to know the activities they do in advance. As she said that she herself finds it hard to come up with activities, it was good that there was an alternative, but it has to stay interesting to use without changing too much too fast.

As for which parts of the Toolbox the participants used, both teachers indicate that they mainly worked with the Powerbreaks, finding them easier and quicker in use. Teacher A was at first not aware of the existence of the Active Learning part of the Toolbox, as a stressful period at school kept her occupied. She expressed her interest in the Active Learning part and said she might have used those activities if she had taken more time to look at them. Teacher B did have the opportunity to try some of the Active Learning activities as well, though her preference went to the Powerbreaks activities because it "was so much easier in the moment, to choose one of these". The Active Learning required more preparation and thinking from the teachers, something that she did not always find time for, making the Powerbreaks more useful for her.

Both participants liked the categories that were offered, though teacher A indicates that some category names were a bit farfetched and did not immediately make sense to her in relation to the activities. The self-explanatory ones were preferred, because "that means we don't have to think about what it is that we're looking for, I can just see what it is about". Teacher B liked the fact that she could adjust the activity to the theme that she was working with in her classroom (for example, using Christmas music when music was required for an activity during the Christmas period) and also that the activities had an element of challenge in them. Both teacher indicated that the activities worked well for all grades (7-9), though teacher A had to put in slightly more effort to get the ninth graders going, as they struggled to combe the activities with their "cool" image. Nevertheless, they enjoyed the activity as they were doing it. Teacher B did not express

the need for more differentiation, as the offered activities worked for her students in the different grades and she liked that she could use the second level of difficulty in the Powerbreaks. Teacher A said that a bigger difference in the levels would be necessary, for some activities were even in level 1 too challenging for certain students. Students did not like to not be able to do an exercise, while everyone else can. More levels, or different levels, that are clearly defined from the beginning, should be added, keeping safety in mind (for with the Strength exercise she was a bit afraid the boys would get too excited in level 2 and hit each other on the head).

9.4 Motivation

Motivation included both social factors (reactions from students and colleagues) as well as facilitating conditions (space, equipment). Both participants indicated that students generally enjoyed the activities, especially when the teacher managed to choose a fitting one for the group, and they welcomed the change from sitting and listening. Students were very creative in finding ways of performing an activity when the required material was not immediately available, said teacher A. Though students, when given the choice, would prefer to sit slouched on a sofa, according to teacher B, and in a class of twenty students not everyone enjoys the activities as much, said teacher A, in general the reactions were positive and the activities thought to be cool. When inquiring whether students started asking for the Powerbreaks, teacher A said that they did get used to the concept and asked about what they were going to do. Teacher B supported this statement for one of her classes, who had been asking for a physically active break all year already, and was happy she was able to offer an alternative to their suggestions of running around the school, with the material from this Toolbox.

As for social support from the teachers' colleagues, both participants indicated that they did talk a little with their colleagues about the project. All teachers had gotten the information about the project, so teacher B mentioned in a meeting

that she was going to participate. She said that there had been talk about integrating more physical activity in the school day in many meetings before, inspired by the physical education teachers of the school, but not much came from that. Some teachers had plans to do something, and there had been some things going on, but nothing consistently. Teacher B concluded that it should be something the whole school does together and though not many colleagues asked her about the progress of the project, she would recommend using the Toolbox to them. Teacher A explained that she too talked with several colleagues about the project and that they showed interest in implementing more physical activity, but that the barriers of time, responsibility and stress from academic demands were taking the foreground.

As for the facilitating conditions, teacher A found no technological difficulties in using the Toolbox website, though that depended on the computers that were available at the workplace, she said. Sometimes computers needed to be rebooted, and that took away the time that could be spent on a Powerbreak. Though working with videos was, in her opinion, very simple because it just required watching a short clip and doing the activity. As the activities required little to no material, both participants were satisfied with that aspect of the project. Teacher B liked the fact that she could just use recycled paper for the activities that did require material, while teacher A's students would take their pencil cases when nothing else was available.

The space, however, could at points be challenging to work with. Teacher A said she was a little fooled by the space that was used in the video, indicating that even though the activities worked in her classroom for the smaller groups, she had to take up some hallway space with the bigger groups. For development, she suggested searching for activities that require even less space (for example, between two rows of desks), so teachers with full classrooms (with either students or material) could use the activities as well. Teacher B said that because the

activities did not require a lot of room, she managed well in her classroom. However, for development she also pointed out that the space should be taken into consideration.

9.5 Other comments

Here, several other comments and feedback that the participants gave during the interview that did not directly link to one of the aforementioned categories, are presented. One bigger concern was the social aspect for students, when working with the material from the Toolbox. Teacher A said that although she had very nice groups and no real problems occurred, she could sense that some activities might be challenging when working with a class where bullying is an issue. For her, working in pairs with most of the exercises worked because she used the pairs that she had already formed in the class, sitting next to each other. She knew which students not to put together, and changed the pairs every semester so they could cooperate with someone else. While not being extremely physically demanding, some activities required closer contact or even touching one another, something that teacher A suspected could be difficult for certain students. Furthermore, teacher B pointed out that there was one student with poorer social skills in one of her classes, and this student did not feel comfortable participating in these pair activities. She suggested that several individual activities could be included in the Toolbox in order to differentiate for these kind of situations.

Further feedback was that teacher A said the music in the videos could have had some more variation, that there should maybe be one or two new videos every month, that the activity for Rhythm should have a punishment for the loser, and that in Flexibility students should be able to use their entire body. Teacher B added that individual activities are a must, and that keeping the activities challenging is a good way to go. Her students particularly liked the Powerbreaks from Coordination and Aerobics, as well as the Snowball fight from Active Learning. She showed great enthusiasm for the physical activities and got creative with them.

10 DISCUSSION

Although the interest in the subject appears to be at an all-time high, the information provided in the literature review clearly indicates the difficulty of producing convincing results when studying the implementation of physical activity in a school setting. While not denying the possible positive effects on academic achievements and student well-being of a focus on increased physical activity, no significant proof can be delivered to strengthen the claim. This does not help convincing teachers of the importance of physical activity and pushing aside the barriers put up against the implementation of more movement in the daily routine. This study, having started with the assumption that physical activity could be beneficial in classrooms, does not help solve this issue, but has attempted to find an effective and easy way for teachers to integrate physical activity in their classrooms, bypassing the barriers. Below the results will be discussed, as well as the significance of this study and the challenges for continuing research.

10.1 Examination of the results

Overall, the reactions from both participants to the usefulness and ease of use of the Toolbox were positive. Both indicated that the website was easy to navigate and that especially the Powerbreaks with their instruction videos were nice to use, while the Active Learning activities required more preparation time and were thus less attractive for them to use. This connects with the information presented in the literature review about teachers' perceived barriers towards implementing physical activity. Limited time and stress caused by pressure on academic performance seemed to be the main reasons teachers did not engage in classroom physical activity. Resources was another limitation mentioned in previous research, so it was good to see that the two participants in this study pointed out the little material and space needed to engage in these activities as a positive part. However, space could still be an issue depending on the size of the

group and the layout of the classroom, making it important to keep the activities small enough without taking away movement opportunities.

While the focus of the interview went to usefulness, ease of use and motivation towards working with digital material, the main points of improvement indicated by the participants do not connect to these categories. Both teachers liked working with the website and thought it worked efficiently. When it came to the content of the Toolbox, however, there were some comments to be made. First of all, the availability of both Powerbreaks and Active Learning activities offered a good variety, though as mentioned above, teachers preferred to work with material that was ready to implement instead of having to prepare some more. This could be due to the fact that the teachers were not used to creating a physically active classroom. If teachers would see the Active Learning activities as just another teaching method and use them as such, instead of seeing them as something extra in their lesson, this problem could potentially be avoided. However, as teachers generally do not seem too keen on changing their teaching practices unless specifically required or necessary, Powerbreaks that offer a non-academic active break could be more desired. The added ease of videos as instruction, giving teachers the opportunity to press play and let the students watch the instructions without having to explain an activity themselves, appeared to cater well to their need for effortless and ready-to-go activities.

When looking at other points of interest, the social aspect when it comes to students was noted. Both teachers indicated certain challenges when working with these kinds of activities, whether it be students that did not like cooperation or students that took cooperation the wrong way. A need arose for the addition of activities that could be done individually, as well as activities that required less physical contact, while still remaining challenging and engaging. Potentially activities that could be done individually, but would contribute to a class-wide competition could be considered. When looking back at the information offered in the literature review, it was never said that physical activity should be done together, therefore the addition of individual exercises was a valid point. The

challenge, however, would to keep them active enough to contribute to daily movement goals, without taking up too much time, space or equipment.

An area of concern could be found in the teacher attitude towards implementation of physical activity. Not just the lack of time for preparation caused an issue here, but moreover the lack of drive from teachers to start and continue working with active material. While both teachers in the study indicated that they saw a need in their students for an active break during their lesson, and both concluded after the intervention that the reactions of themselves and the students towards the activities were generally positive, it was also said that they needed a push to start. If it had not been for the invitation to participate in this study, where readily made material was offered, and thus the feeling of responsibility for making it through the intervention period and meeting the research requirements, it may very well have been the case that neither teacher had started implementing active breaks. It would be interesting to see in a few months if there is some continuation of the project now that the official intervention has finished.

Securing continuation of the movement implementation could potentially be supported by responding to the teachers' need for updates of the Toolbox material on a regular basis. Creating a Toolbox where teachers can sign up and get a notification once every month or two months when a new activity is added, could possibly remind them of the potential importance of physical activity implementation and the available material. Furthermore, it would be interesting to explore the potential for students to work with physical activities themselves, without guidance from the teacher, in order to increase internal motivation towards movement and an active lifestyle. Both teachers in this study indicated that they could see students working with the material autonomously, though they seemed not comfortable at this point with giving the control to them. Perhaps additional support for the teachers could help change that.

10.2 Reliability of the study

When looking at the information provided by Plomp (2013) about Educational Design Research (EDR), we see the mention of 'guiding principles' that apply for all research including EDR, and 'criteria for quality' that ensure the reliability and validity of the study. The guiding principles indicate that EDR should: "pose significant questions that can be investigated, link research to relevant theory, use methods that permit direct investigation of the question, provide a coherent and explicit chain of reasoning, replicate and generalize across studies, and disclose research to encourage professional scrutiny and critique." (p. 15). These principles have been met by this study, as the posed objectives (investigating the need for an increase of physical activity, and developing practical tools for teachers) have been addressed, relevant theory is used to back up the research, and the theory has been explained in a coherent way. Furthermore, the designed material can be replicated and generalized (up to a certain extent, see chapter 10.3) and the study is open for scrutiny and critique. Thus, we can assume the study is reliable.

Commenting on the validity of the study, the criteria for quality as mentioned by Plomp (2013) can be used. These criteria include the attainment of the intended outcomes (making the study effective), the addressing of a need by the intervention, and the intervention being based on state-of-the-art knowledge that is linked to each other in a consistent way. In addition, the intervention should be considered by teachers to be usable and easy to use. Based on these criteria, we can call this study valid, as these criteria have been achieved. The intervention was intended to help teacher implement physical activity in their classroom, and according to the participants, it has done just that, meeting their need for practical material supporting their teaching. The participating teachers indicated that the Toolbox material was useful and easy to use, meeting another one of the criteria. Furthermore, the intervention was designed by using the material from Løgstrup-Ottesen as a guideline, supplemented by the best available activities for the purpose of the intervention and creating an organic link. Besides that, the study's

data collection was structured using the TAM-questionnaire as a background, an existing valid method for data collection on the ease of use and usability of ICT material.

Finally, the intervention can be repeated in a similar fashion with different participants at any time. The research methods are clearly described and were communicated with the participants before the start of the intervention, as well as summarized on the Toolbox website, giving outsiders the opportunity to try the Toolbox material and leave comments (this was not done, however, and would in any case not be used as part of the main data in this research).

10.3 Generalisability and limitations

Important to note before explaining any generalisability for this study, is that the findings in an Educational Design study are not intended to be generalizable. Plomp (2013) explains this as follows:

> "In design research, just as in case studies and experimental studies, the findings cannot be generalized to a larger universe – there is no statistical generalization from sample to population as in the case of survey research. […] …the researcher should strive to generalize 'design principles' to some broader theory or widen the domain of validity of the local instruction theory. […] Where design principles may have been supported by a number of replications, and a new context may be similar to the ones from which design principles have emerged, each context has unique characteristics that justify the use of design principles as 'heuristic' statements: these statements provide guidance and direction, but do not give 'certainties'." (p. 34).

This intervention, however, does present the opportunity for replication by keeping the activities, both in the Powerbreaks and in the Active Learning part, open and independent from any specific academic content, so that teachers in different

schools, teaching various subjects, could use this material. The activities are generally doable for students in the ages between 12 and 16, though some adjustments would be necessary in the levels in order to cater to a wider range of physical abilities. The fact that all the material is available in both English and Swedish, and can be adjusted to individual needs where needed, makes it implementable in many contexts. However, the language could at the same time be a limitation, for teachers whose native language is not English or Swedish might not want to go through the trouble of working with a second language.

Making the material available on a website, as well as posting the videos on YouTube, makes the use of the Toolbox open to anyone who would like to try. Minor issue here is that, from a research point of view, there is little to no control as to who uses the material and what they think of it. Therefore, inviting teachers personally to participate and communicating directly with them, proved to be a better approach for this study. Besides, people do not easily leave feedback when it is not specifically asked of them to do so, making the website not the most reliable source of feedback. However, targeting individuals for a research project, especially in practice in education, proves difficult as well, as teachers appear not eager to add any kind of project to their existing workload. This showed in this study, where of four contacted schools (with a combined total of about 120-150 teachers), only two participants volunteered.

As far as limitations of the study go, the language might have been a difficulty. Because I chose to offer the material in both English and Swedish, I made it possible for the teachers to do the interview in either language as well. One of the participants chose English as the spoken language, while the other one chose Swedish. Even though my Swedish is not bad, I am not fluent in the language, which resulted in an interview that might have a little less depth than the interview done in English. This also resulted in me transcribing and translating the Swedish interview into English, in which small errors could have occurred as well.

10.4 Challenges for further research

As finding participants for a research project such as this is always challenging, so this is not something to discuss further here. Concerning classroom physical activity, a challenge for further research could be to inspire teachers to work with integrated physical activities (i.e. Active Learning) more often, showing them natural ways to integrate movement in their academic routine without adding to their stress levels. Besides that, developing the Toolbox to have more variety in the Powerbreaks (different levels, individual activities) would be a valuable investment, though challenging in its own way when it comes to finding suitable activities requiring little space and equipment. Many resources for implementing movement can already be found in books and in online sources, but combining them into one place is not often done, especially not activities targeting secondary school students with their content. However, there is definitely potential in continuation of movement implementation projects.

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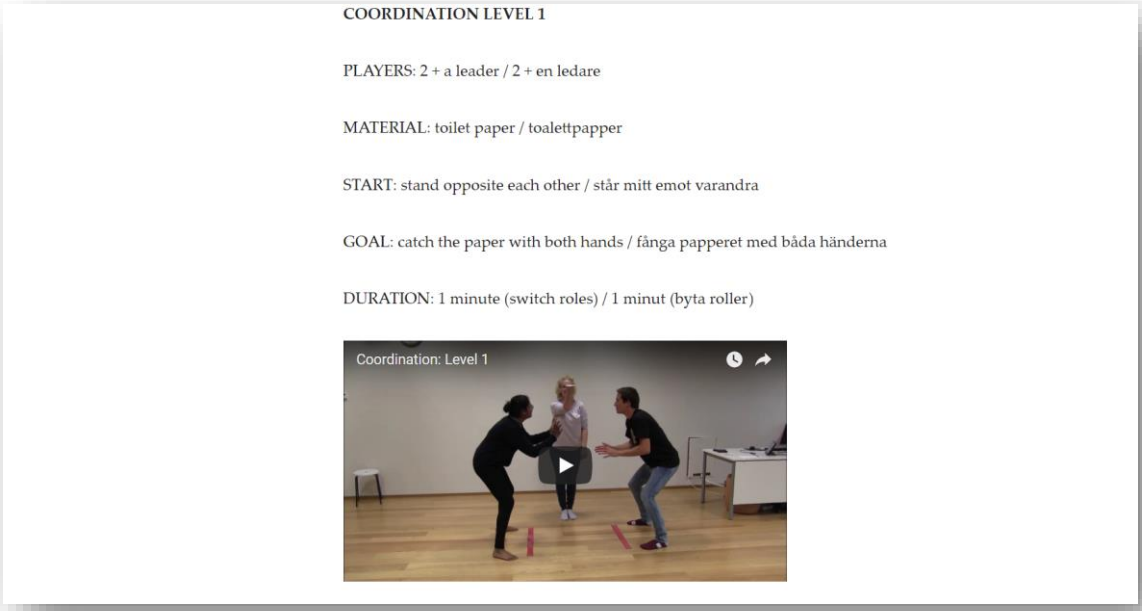
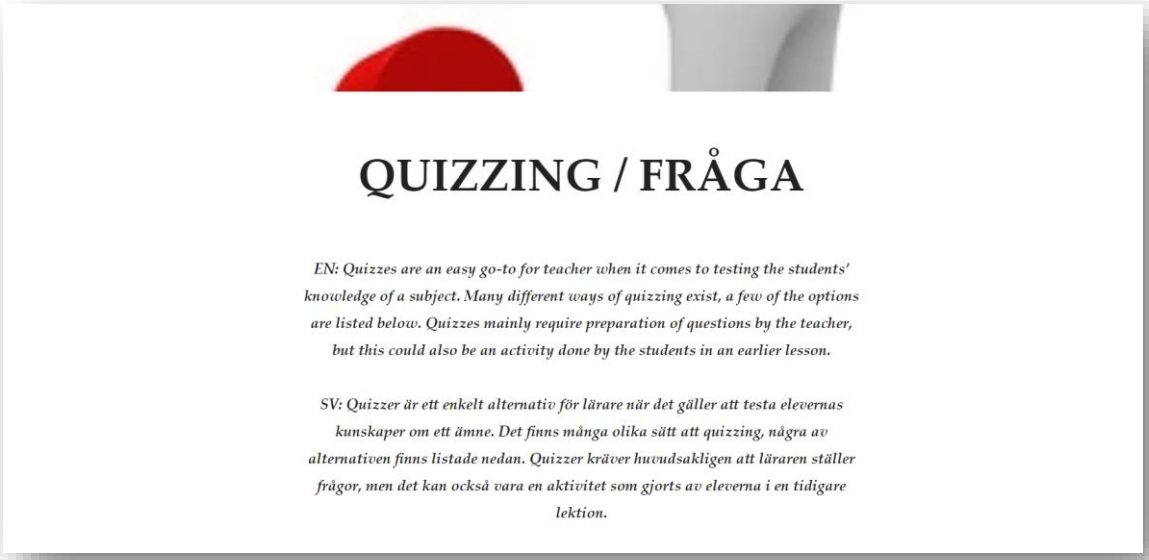
APPENDIX

Below, some screenshots of the Classifit! website can be found, to give an impression of the Toolbox created for and used during this study. Please visit https://goclassifit.wordpress.com/ for a complete view of the Toolbox material.

Up: Classifit! website banner and menu.



Up: Example of a Powerbreak (Coordination level 1).

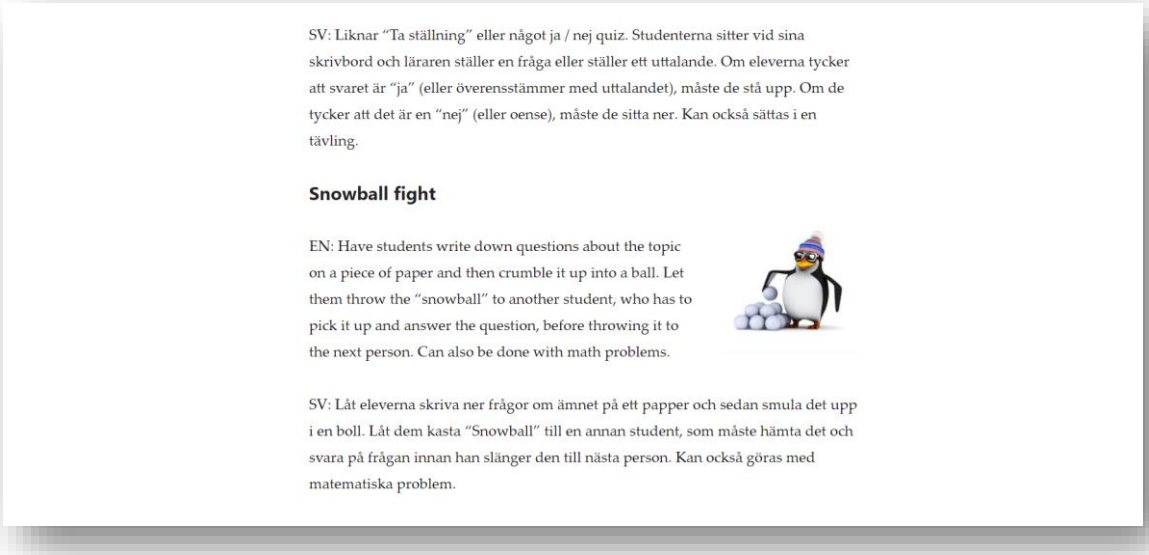


QUIZZING / FRÅGA

EN: Quizzes are an easy go-to for teacher when it comes to testing the students' knowledge of a subject. Many different ways of quizzing exist, a few of the options are listed below. Quizzes mainly require preparation of questions by the teacher, but this could also be an activity done by the students in an earlier lesson.

SV: Quizzer är ett enkelt alternativ för lärare när det gäller att testa elevernas kunskaper om ett ämne. Det finns många olika sätt att quizzing, några av alternativen finns listade nedan. Quizzer kräver huvudsakligen att läraren ställer frågor, men det kan också vara en aktivitet som gjorts av eleverna i en tidigare lektion.

Up: Example of an introduction to an Active Learning category (Quizzing).



SV: Liknar "Ta ställning" eller något ja / nej quiz. Studenterna sitter vid sina skrivbord och läraren ställer en fråga eller ställer ett uttalande. Om eleverna tycker att svaret är "ja" (eller överensstämmer med uttalandet), måste de stå upp. Om de tycker att det är en "nej" (eller oense), måste de sitta ner. Kan också sättas i en tävling.

Snowball fight

EN: Have students write down questions about the topic on a piece of paper and then crumble it up into a ball. Let them throw the "snowball" to another student, who has to pick it up and answer the question, before throwing it to the next person. Can also be done with math problems.

SV: Låt eleverna skriva ner frågor om ämnet på ett papper och sedan smula det upp i en boll. Låt dem kasta "Snowball" till en annan student, som måste hämta det och svara på frågan innan han slänger den till nästa person. Kan också göras med matematiska problem.

Up: Example of an Active Learning activity from the category Quizzing ('Snowball fight' was popular with Teacher B and her students in this study).