Utilising active play in schools to improve physical activity and fundamental movement skills in Scottish children

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ABSTRACT

It is widely accepted that children in Scotland, as in other high-income countries, are not engaging in sufficient moderate-to-vigorous intensity physical activity (MVPA), the consequences of which can be adverse for health and wellbeing. In this paper, it is contended that active play (a form of gross motor or total body movement in which children exert energy in a freely chosen, fun, and unstructured manner) has potential to redress this deficit in MVPA. This paper reflects on lessons learned from active play interventions in Scottish schools, providing recommendations for schools on how to encourage more active play. It is argued that promoting active play during school break times and in the after-school period, and participating in active play interventions are promising ways of increasing children’s MVPA and improving their fundamental movement skills.

KEYWORDS: Active play; physical activity; moderate-to-vigorous physical activity; fundamental movement skills; children

INTRODUCTION

Active play is "a form of gross motor or total body movement in which children exert energy in a freely chosen, fun, and unstructured manner" (Truelove et al. 2016: 164). It can be promoted in a variety of ways, across a number of settings including at home, in school and within the wider community (Scottish Government 2013). Active play can provide children with a range of social, physical, emotional and cognitive benefits (Janssen & Leblanc 2010; Timmons et al. 2012) and is recognised in Scottish policy as an important way to increase children’s physical activity levels, improve health outcomes, enhance learning and develop social and emotional skills (Scottish Government 2018; Scottish Government 2008; Scottish Government, n.d: 11).

In Scotland, active play is facilitated through provision (e.g. the expansion of outdoor childcare) and opportunity (e.g. having access to a safe environment to play outdoors), although there is a wider environment that is already conducive to supporting active play (Reilly et al. 2016a). In a recent national survey, the vast majority of parents (91%) reported that their children had at least one place to play...
and two thirds of parents (64%) reported that they thought it was ‘very or fairly safe’ for their children to play at a park with two or three friends (Scottish Household Survey 2015). However, the affordance of the everyday outdoor environment to facilitate active play is not universal; significantly more parental safety concerns were expressed in areas of deprivation with far fewer parents perceiving that it was safe for their child to play at the park with two or three friends compared to the Scottish average (52%, versus 64%) (Scottish Household Survey 2015).

This paper draws on lessons learned from a school-based Active Play intervention to determine if participation increased children’s physical activity levels and improved their fundamental movement skills (FMS) (Johnstone et al. 2017; Johnstone et al. 2018; Johnstone et al. 2019). By way of introduction, the paper summarises the benefits of engaging in active play, before progressing to appraise the Scottish school-based Active Play intervention, highlighting some promising working examples in which active play is being delivered in Scotland. It concludes by providing recommendations for Scottish schools.

MAKING THE CASE FOR ACTIVE PLAY

Moderate-to-vigorous activity (MVPA) is understood to be the most health-enhancing mode of physical activity (Janssen & Leblanc 2010; Timmons et al. 2012). In Scotland, as in the rest of the UK, it is recommended that children and adolescents (5-18 years) should engage in at least 60-minutes/day of MVPA across the week and, that they should minimise the amount of time spent in sedentary behaviour² (Department of Health 2019). However, most children in Scotland are not reaching this recommended minimum amount of MVPA (Hughes et al. 2018).

FMS are the basic skills in which children should be competent, such as throwing, catching, running, and skipping (Lubans et al. 2010; Stodden & Goodway 2008). Children who demonstrate better competency in FMS are more capable of engaging in increased levels of physical activity (Lubans et al. 2010; Stodden & Goodway 2008). FMS are typically poor in Scottish children (Johnstone et al. 2017; Johnstone et al. 2019), an observation that has also been drawn for children from other high-income countries (Hardy et al. 2012). Poor FMS might partly explain the low levels of physical activity among Scottish children (Hughes et al. 2018).

Active play might be a promising way of increasing Scottish children’s physical activity levels and FMS. It has been suggested that engaging in active play in the early years is both an effective way of improving these skills (Johnstone et al. 2017; Adamo et al. 2016) and an enjoyable way of doing so (Roach & Keats 2018). One complication of understanding and operationalising active play is that it shares many similarities to other types of play such as outdoor play and free play (Table 1.)

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¹ Sedentary behaviour is defined as “any waking behaviour characterised by an energy expenditure ≤1.5 metabolic equivalents (METs), while in a sitting, reclining or lying posture” (Tremblay et al. 2017, p. 5) and MVPA is defined as “physical activity with an energy cost of >2.9 but <6.0 times resting energy expenditure” (Ainsworth et al. 2011, p. 1576)
The particular focus of this paper is active play, although it is acknowledged that this may encompass some forms of free play and outdoor play. Active play can be promoted during the school, at home and in the community, which implies that if children engage in active play regularly, it could have a significant overall impact on increasing physical activity (Janssen 2014; Beets et al. 2016). Active play often takes place outdoors and time spent outdoors is consistently associated with increased levels of physical activity (Brussoni et al. 2015; Gray et al. 2015). In a study conducted in the UK, boys and girls (10-11 years; n=747) who reported engaging in active play five or more times per week achieved an average of 44 and 34 minutes of MVPA per day, respectively (Brockman et al., 2010). These findings suggest that engaging in active play on most days made a useful contribution to helping children achieve the targets set in the physical activity guidelines. Furthermore, when children participate in active play, they spend a higher amount of time in health enhancing MVPA compared to other types of sports and physical activities (Brazendale et al. 2015).

Despite the benefits of increased physical activity and improved FMS, on a typical day many Scottish children do not engage in daily active play. In Scotland only 26% of children and adolescents aged 2-15 years old participate in active play for two or more hours per day on a typical weekday (28% for boys, 24% for girls), rising to 40% at the weekend (42% for boys, 38% for girls) (Hughes et al. 2018). Therefore, interventions are required to support children to engage in more active play if it is to have a positive impact on their physical activity levels and FMS.

The benefits of active play extend beyond the physical; it also improves children’s learning and social and emotional skills (McMorris et al. 2009; Yogman et al. 2018). The combination of MVPA and FMS development (which could be achieved through active play) can improve children’s executive functions (particularly inhibition)\(^3\), which, in turn, is an important precursor to raising attainment, specifically maths (McMorris et al. 2009). When children play, they

\(^3\) Executive functions are, “the capacity to think before acting, retain and manipulate information, reflect on the possible consequences of specific actions, and self-regulate behaviour”; examples include inhibition, planning and attention among others. Inhibition has been defined as “the ability to withhold actions or modify behaviours” and is implicated in many areas of learning including, maths, literacy, reading and science (Tomporowski et al. 2015, p. 7).

### Table 1. Common Definitions of Play Types Related to Active Play

<table>
<thead>
<tr>
<th>Type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active play</td>
<td>“a form of gross motor or total body movement in which young children exert energy in a freely chosen, fun, and unstructured manner” (Truelove et al. 2017: 164).</td>
</tr>
<tr>
<td>Free play</td>
<td>“behaviour that is freely chosen, personally directed and intrinsically motivated”. (Scottish Government 2013: 18)</td>
</tr>
<tr>
<td>Outdoor play</td>
<td>“unstructured physical activity that takes place outdoors in the child’s free time” (Veitch et al. 2006: 3)</td>
</tr>
</tbody>
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engage in social interactions (Yogman et al. 2018), which implies working together and negotiating conflict. Such interaction mirrors many of the situations they will experience as they mature into adulthood, with its challenges of problem solving, cooperation and communication (Yogman et al. 2018). Research has found that children who are not given opportunities to play often exhibit higher levels of depression and anxiety as they mature into adulthood (Burdette & Whitaker 2005).

In summary, evidence suggests that engaging in daily active play might be important for increasing Scottish children’s physical activity levels, particularly MVPA, and improving their FMS. Increasing active play would have subsequent positive effects on their social, emotional and cognitive functioning, all of which are all important for improving attainment in school. It would contribute to achieving the health and wellbeing indicator of the Curriculum for Excellence. However, given that Scottish children are not adequately engaging in daily active play, active play interventions are needed to increase their MVPA and FMS.

ACTIVE PLAY INTERVENTIONS - GLOBAL EVIDENCE

There is a dearth of robustly evaluated, high-quality interventions to promote active play (Johnstone et al. 2018).

In Canada, one intervention targeted pre-school aged children in a childcare centre, in which staff provided more outdoor active play opportunities and attended workshops designed to increase their knowledge on the benefits of active play (Adamo et al. 2016; Goldfield et al. 2016). The aim of this study was to determine if the intervention had an effect on children’s objectively measured physical activity and FMS over a six month period. There was a significant increase in total physical activity and FMS score and percentile in the intervention group compared to the control, but MVPA did not significantly increase (Adamo et al. 2016; Goldfield et al. 2016). Total physical activity increased by 19 minutes/preschool day (Goldfield et al., 2016) and FMS score increased by 4.2 and percentile increased by 9.6 (Adamo et al., 2016) in the intervention group.

In Australia, Engelen et al. (2013) utilised a playground setting in a primary school, and provided loose parts equipment designed to encourage more active play in a thirteen week intervention. Among the loose part equipment provided were tyres, crates and plastic bottles. The aim of this study was to determine if the loose parts increased children’s MVPA. Findings suggested that there was no significant improvement in MVPA in the intervention group compared to the control (Engelen et al. 2013).

The school break offers an opportunity for children to engage in active play. A systematic review of nine randomised and non-randomised controlled trials determined the effect of school break interventions on children’s physical activity and MVPA (Parrish et al. 2013). The interventions included used different strategies such as loose parts, playground markings or adding physical structures. The authors concluded that four of the studies reported a significant increase in MVPA ranging from 4% to 13 %, with playground markings and equipment appearing particularly beneficial (Parrish et al. 2013).

Moving away from the school setting, a study conducted in England aimed to determine the effect of a ten-week community based active play intervention on young children’s (mean age 3.8 years) physical activity (O’Dwyer et al. 2012). The
intervention comprised educational workshops for parents and active play sessions for both parent and child. Findings suggested a significant increase in the intervention group compared to the control group, with a 4.7 minute increase in weekday physical activity and a 10.2 minute increase in weekend physical activity (O'Dwyer et al. 2012). This may suggest that there is more scope to increase physical activity during the weekend compared to weekdays.

In summary, studies conducted in countries outside of Scotland have targeted both the school and community settings using a variety of techniques (loose parts, parental education) to encourage more active play and have shown some potential in improving MVPA outcomes. This paper will now review findings from active play research conducted in Scotland.

AN ‘ACTIVE PLAY’ INTERVENTION IN SCOTLAND - A USEFUL CONTRIBUTION TO CHILDREN’S PHYSICAL ACTIVITY LEVELS AND FMS

In Scotland, a school-based ‘Active Play’ intervention was delivered and evaluated using high quality methodology in the form of a pragmatic evaluation and feasibility cluster randomised controlled trial (RCT). A pragmatic evaluation involves conducting research in ‘real world’ settings where resources may be limited and decisions about study design are often beyond the researcher’s control; for example, the researcher is not able to randomise participants. A feasibility cluster RCT is a much more robust design where schools are matched and randomly assigned to the intervention or control group.

Description of the Active Play intervention

The ‘Active Play’ intervention was introduced in 2014 and involved a collaboration between Inspiring Scotland⁴, who manage the programme, Actify⁵, who provide training and support to the playworkers and class teachers, and a number of local play charities who deliver the intervention. It has been delivered in a number of Scottish local authorities, including Glasgow, Highland (city of Inverness) and Dundee. Much of the research has been conducted in Glasgow, with Possibilities for Each and Every Kid (PEEK) Project⁶, Jeely Piece Club⁷ and Family Action in Rogerfield & Easterhouse (FARE)⁸ delivering the intervention to 118 primary schools across three school years (2016-19).

The intervention consists of a one-hour outdoor active play session involving 30 minutes of facilitated games and 30 minutes of free play (Johnstone et al. 2017). During the facilitated section, the playworkers lead and join in on games designed to develop children’s FMS. During the free play section, children are free to use the equipment provided to choose what they want to play (Johnstone et al. 2017). The delivery principles of the Active Play sessions are that they should be Fun, Inclusive and Active (FIA), which, it is hypothesised, should encourage high levels of MVPA and FMS development. Teachers are encouraged to participate in the

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⁴ Online at: www.inspiringscotland.org.uk
⁵ Online at: https://www.actify.org.uk/activeplay
⁶ Online at: www.peekproject.org.uk
⁷ Online at: https://www.jeelypiececlub.org.uk/
⁸ Online at: https://fare-scotland.org/
sessions with the children and the playworkers with the aspiration that they may continue to deliver the intervention beyond the programme. The one-hour session involves the use of basic equipment (such as balls, bean-bags, skipping ropes), is simple and inexpensive to deliver, i.e. it does not require any special equipment.

**Pragmatic evaluation of the Active Play intervention**

The pragmatic evaluation involved the collection of baseline data during September and October 2015, with follow-up data collected during February and March 2016. Participating children were aged seven years from schools serving deprived areas in central Scotland (Johnstone et al. 2017). A total of 172 children (mean age= 7.0 years) from seven primary schools (eleven classes) were compared to 24 children who did not receive the intervention. The aim of the pragmatic evaluation was to determine if participation in the Active Play intervention (which lasted 5 months) increased children’s physical activity levels (measured objectively by accelerometry) and FMS (measured using the Test of Gross Motor Development-2) (Ulrich 2000).

Findings suggested a decrease in sedentary behaviour (-19%; 56 minutes/school day), and an increase in light intensity physical activity (+16%; 55 minutes/school day) and MVPA (+3%; 10 minutes/school day) during an average school day for the intervention group. The comparison group (children in this group who did not receive the intervention) showed no change in their behaviours from baseline to follow-up. One concern of wearing an accelerometer is that individuals may be aware that it is measuring physical activity, which might change their behaviour (i.e. increase their physical activity). However, a recent study found that wearing an accelerometer did not influence participants physical activity (Vanhelst et al. 2017).

Total FMS score (also known as Gross Motor Quotient) increased by 10 points for the intervention group and by 4 points for the comparison group. However, the intervention group’s total FMS score after the intervention was ‘only’ 93 on average (36th percentile), which is lower than the expected age and sex-normalised value of 100 (Ulrich 2000).

**Feasibility cluster randomised controlled trial of the Active Play intervention**

The pragmatic evaluation was limited as the number of children in the comparison group was small and the groups could not be randomised to either the intervention or the control condition. Findings from the pragmatic evaluation informed a second study, a feasibility cluster RCT (Johnstone et al. 2018). For the feasibility cluster RCT, the intervention was reduced to 1x1hour session per week for 10-weeks and was administered in eight of the 118 schools that participated.

The eight schools (one primary 3 class per school) were matched based on deprivation, school size and demographics and were randomised (intervention = four schools; control= four schools) prior to data collection. Baseline data collection was collected during August and September 2017 with follow-up data collected during November and December 2017. The aim of this study was to determine if the intervention was feasible to deliver in school and if participating in the intervention increased children’s physical activity levels (measured objectively) and...
improved their FMS. The MVPA content of the active play sessions was also collected (also measured objectively by accelerometry).

One of the key findings was that the children who engaged in an Active Play session returned a high level of MVPA. Children spent 39% (21 minutes) of the Active Play session in MVPA, 38% (9 minutes) in MVPA during the facilitated games section and 41% (12 minutes) in MVPA during the free play section. This means that each Active Play session is providing a substantial proportion of MVPA that was recommended in the guidelines. To put this into context, systematic reviews of research on other modes of physical activity have found that active commuting typically contributes around 17 minutes of MVPA per school day, recess typically equates to around 12 minutes of MVPA per school day, and a typical PE session contributes only around 12 minutes of MVPA (Martin et al. 2016; Reilly et al. 2016b; Hollis et al. 2016).

Findings for improvements in physical activity and FMS suggested that there were only small intervention effects. The intervention group were found to have only a small decrease in percent time in sedentary behaviour (- 2.1%; -6 minutes/school day), a small increase in percent time in light intensity physical activity (+ 0.7; +2 minutes/school day) and a small increase in MVPA (+ 1.4%; +4 minutes/school day) during an average school day. Similarly, there was also a small intervention effect in total FMS score; the intervention group only had a 3 point (+ 4.3 percentile points) increase in total FMS score, while the control group had no increase. Reinforcing the findings from the pragmatic evaluation, even at follow-up, the intervention group’s total FMS score was 91, which is once again below the expected value of 100 (Ulrich 2000).

Overall, the feasibility cluster RCT found that the intervention had only a small effect on school day physical activity levels and FMS. In conclusion, when the intervention comprises only one session per week for ten weeks, this is not enough to improve desired outcomes (Johnstone et al. 2018). On the other hand, given that each Active Play session provides 21 minutes of MVPA, it is possible that if more sessions were delivered each week and/or for longer than 10 weeks, more positive outcomes would emerge (Johnstone et al. 2019).

Active Play is designed as a one-hour session, to be delivered outdoors, and additional to PE. During the 10-week delivery period, although all sessions were delivered outdoors, few sessions returned fully one hour of active play (Johnstone et al. 2019). Teachers were often late in bringing their class to the sessions, due to getting children ready or transitioning between classes or break times (Johnstone et al. 2019). Sessions tended to last approximately 50 minutes, this meant that over the course of the 10 weeks, one hour and 40 minutes of delivery time was lost; this could also have lessened the positive impact.

**Impact of Active Play on teachers**

A key aim of the intervention was to encourage and enable teachers to continue to deliver the intervention beyond the 10-week intervention period. Anecdotal information collected by Actify and Inspiring Scotland highlighted that, initially teachers expressed concerns about timetabling the Active Play intervention into an already demanding curriculum. However, it transpired that teachers’ concerns shifted as the intervention progressed. Inspiring Scotland found that 78% of
teachers involved in year two (n=40 schools) of the Glasgow Active Play intervention planned to continue the intervention beyond the 10-weeks (FMR Research 2018). Furthermore, teachers reported a range of benefits from the Active Play intervention among the children in their classes. One-half of teachers cited improved relationships with children (53%), in particular with children who often disengage from a classroom-based setting (FMR Research 2018). Playworkers and teachers also observed that the children also had improved their relationships with each other, and enhanced their resilience, conflict resolution and communication capacities (FMR Research 2018).

Teachers provided suggestions on how they could continue the intervention beyond the 10-weeks of the intervention, although some teachers opined that they could only dedicate 30 minutes each week to Active Play. The difficulties that are encountered in incorporating the Active Play intervention within the school day raises the question of whether a hybrid model of delivery might be pursued in which provision shifts from within the school day to beyond it (after-school and/or weekend/school holiday provision).

Another consideration is the ability of the teachers to deliver the intervention once the charities have completed the 10 week programme. Staff within these play charities are experts in providing play opportunities for children and are therefore able to deliver high quality and high intensity sessions. Participating teachers exhibit varying levels of confidence and ability, with many requiring additional training to improve their delivery. Indeed, one in six class teachers (13%) self-reported that they lacked confidence in delivering the intervention at the end of the 10 weeks (FMR Research 2018). CPD opportunities are available (in Glasgow, Actify offer two sessions per year per school year) and maintain a website where teachers can access related resources to enhance their ability to deliver active play sessions. However, questions remain over the extent to which teachers and schools have the inclination and capacity to avail themselves of these further training and resources.

RECOMMENDATIONS AND TAKE-HOME MESSAGES – EMBEDDING ACTIVE PLAY IN SCOTTISH SCHOOLS

The evidence base for active play interventions needs to be strengthened if it is to provide a compelling narrative on the potential it may have on improving children’s MVPA and FMS. Active play has the potential to substantially increase MVPA as it can be engaged in 365 days of the year and at all times of the day (Janssen 2014; Beets et al. 2016). It is hypothesised that the effects of active play extend beyond MVPA and FMS, with benefits on learning and social and emotional outcomes, but further evidence is needed using robust study designs like RCTs.

The Scottish Government’s (2018) Physical Activity Delivery Plan highlights the importance of active play. Outcome 3 of the Active Scotland’s Outcome Framework recommends the “development of physical confidence and competence from the earliest age” (Scottish Government 2018: 21). It was recognised that promoting active play in the early years would have an important role in achieving this outcome, which is supported by the evidence presented in this paper. Similarly, the National Play Strategy for Scotland highlights the importance of the nursery
and school environment to promote active play and the role of the practitioner (early years, teacher etc.) to enable this (Scottish Government 2013).

If the nursery and school environment is to encourage active play, it is important to protect break times; they should not be cut short to increase teaching time. Furthermore, children should be encouraged to play outside, as this is strongly associated with increased physical activity levels (Brussoni et al. 2015; Gray et al. 2015). In Scotland, this may mean that a culture of playing outside in poor weather may also need to be created, for example by providing children with adequate clothing that enables them to do so. For every time children are kept indoors during break times, on average they are missing around 12-minutes of MVPA per school day (Reilly et al. 2016b).

However, beyond these play-facilitating practices around the existing school day, schools should be encouraged to provide additional active play interventions. These can be as simple as affording children more time outside (Adamo et al. 2016; Goldfield et al. 2016) or providing additional ‘loose parts play equipment’ in the playground to encourage more active play (Engelen et al. 2013). Raising awareness of readily available resources to support teachers must also be promoted, for example, Inspiring Scotland has developed a ‘Loose Parts Toolkit’ aimed at providing schools with simple advice on how to make their school break times more playful (Casey & Robertson 2019). The Active Play intervention described in this paper might also provide the means to increase children’s MVPA during the school day, particularly if it is modified to incorporate more sessions per week and is delivered over a longer period.

In Scotland, schools might consider making more use of the expertise that rests within the play sector. Throughout Scotland, there are a number of play charities that provide, and support others to provide, children with active play opportunities, during and outside of school hours. A large part of this work involves, ’street play’ where playworkers engage communities (typically in deprived locations) and encourage children to reclaim community spaces for play (streets, playgrounds and open spaces). Playworkers utilise equipment and loose parts, such as, balls, racquets, skipping ropes, and materials for den building which the children can use to create their own games and play active. These play specialists often work in collaboration with schools to provide a range of opportunities for children throughout the school day and during the after school period. They facilitate play around breakfast clubs, break times, after-school clubs and holiday clubs, promoting the importance of play for children and to supporting others to champion the child’s right to play.

To conclude, providing children with active play opportunities is in the best interests of children and those responsible for educating them. Active play has the potential to become an important way of supporting children’s physical activity and improving their health and wellbeing. It remains, however, a fledging field of interest and one that requires more playful exploration and robust appraisal by researchers, playworkers and educationalists, in partnership.

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