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The potential yield of active play in the prevention of cancer

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Abstract

Literature has shown that participation in physical activity is associated with a reduction in the incidence of certain cancers. Physical activity levels across the life course are low. Since cellular damage from an inactive lifestyle accumulates over time, promoting physical activity from childhood is fundamental for cancer prevention. To date, interventions to promote physical activity in children have been unsuccessful over the long term. Physical activity can be accrued through several domains including sport and active play. Research suggests that sport participation and not active play tracks from childhood to adulthood. Active play is easier to promote because it does not necessitate a certain level of skill or competency, and is enjoyable. The purpose of the present paper is to encourage more research into all areas of active play to increase population physical activity levels across the life course and thus aid in the prevention of specific cancers.

Key words: Active play, Physical activity, Cancer prevention, Sport

Introduction

The purpose of the present paper is to encourage more research into all areas of active play (one domain of physical activity) to aid in the prevention of specific cancers. Before discussing active play *per se* we must firstly define physical activity and highlight its importance in the prevention of cancer.

Physical activity and cancer prevention

Physical activity is defined as any bodily movement produced by skeletal muscle that results in energy expenditure (Caspersen et al, 1985). Across the life course regular participation in physical activity may benefit psychological health by aiding in the reduction of anxiety and depression and contributing to the improvement of self-esteem (WHO, 2010). Moreover, physical activity benefits the health of young people and adults by aiding in the prevention of non-communicable disease and risk factors (Penedo & Dahn, 2005; Strong et al, 2005). Over 100 epidemiological studies have found that routine physical activity is associated with the reduction in incidence of some cancers (e.g. breast and lung; see reviews by Monninkhof et al, 2007 and Tardon et al, 2005) and The World Cancer Research Fund highlights physical activity as a key behaviour in the role of cancer prevention. There is strong evidence that being physically active reduces the risk of colon, breast, and endometrial cancers, and emerging evidence for a reduction in risk of prostate and lung cancers (Friedenreich, 2002; Im, 2003; Monninkhof et al, 2007; Tardon et al, 2005; Winzer et al, 2011; Wolin et al, 2009). For example, those who are physically active have about a 30-40% reduction in the risk of developing colon cancer, compared with inactive people (National Cancer Institute, 2015). Proposed mechanisms through which physical activity reduces the risk of these cancers include a reduction in inflammation, enhanced immunity, improved insulin profile, and

increased gut motility (CRUK, 2015; Moore et al, 2010; Wolin et al, 2009; Wu et al, 2013). Since cellular damage from an inactive lifestyle likely accumulates over time, promoting physical activity from an early age is fundamental for cancer prevention. The UK physical activity guidelines state: “All children and young people (aged 5-18 years) should participate in moderate-to-vigorous intensity activity for at least 60 minutes and up to several hours every day”; “Adults (19-64 years) should aim to be active daily. Over a week, physical activity should add up to at least 150 minutes of moderate intensity activity (<https://www.gov.uk/government/publications/uk-physical-activity-guidelines>).” However, population levels of physical activity across the life course are currently low. For example, a study reviewing activity levels in 122 countries reported that approximately a third (31.1%) of adults were physically inactive (defined as not meeting physical activity guidelines) and the proportion of 13 to 15 year olds not meeting recommendations was 80.3% (Hallal et al, 2012).

Active play and sport participation across the life course

Young people can accrue physical activity via several domains including exercise/sport, active travel, and of course through active play. For the purpose of this paper, play is defined as engagement in activity for enjoyment and recreation rather than for a serious or practical purpose. Active play is defined as play that yields levels of physical activity above that of a light intensity and can take two forms; free play (playgrounds etc.) and structured play (organised non-sport games). Research has shown that certain activity behaviours are more likely to track across the life course than others (Smith et al, 2014; Smith et al, 2015a; Smith et al, 2015b). For example, in a study of 6458 children, those who participated in sports at 10 years old were significantly more likely to participate in physical activity at age 42 (RR 1.10;

95% CI 1.01 to 1.19). However, active outdoor play at age 10 was not associated with participation in physical activity at age 42 (RR 0.99; 95% CI 0.91 to 1.07; Smith et al, 2015a). One possible explanation for the different associations of outdoor play and sports engagement is that, unlike participation in sport, outdoor play is considered a childhood behaviour; adults do not 'play' in the outdoor environment in the same way as do children. Children engage in outdoor play as a form of entertainment, rather than to achieve the health benefits conferred by being physically active. Whereas sports enjoyed in childhood may form lasting preferences that persist into adulthood, preferences for active outdoor play formed during childhood may fade as a child ages, as preferred and normative sources of entertainment shift away from "playing outside" to for example, playing video games. Alternatively, opportunities for play during adolescent and adulthood are likely to be fewer than during childhood. However, these hypotheses remain untested.

Promotion of physical activity

To date, interventions to promote physical activity in young people have been relatively unsuccessful, particularly over the long term (van Sluijs et al, 2007). Such interventions have mainly focussed on the school environment (Broekhuizen et al, 2014), which ignores the wider ecological influences acting on children's behaviours, including their family and local environment. In addition, interventions often fail to reach those who achieve insufficient levels of physical activity, thereby potentially widening health inequalities among less active groups. Promoting sports participation in young people is difficult, owing to numerous barriers such as existing negative perceptions and low self-efficacy. As a result, innovative interventions to promote physical activity (e.g. through active play) are required urgently. Promoting active play is potentially easier than promoting sport because it does not

necessitate a certain level of skill or competency, and is an enjoyable form of physical activity.

The outdoor environment and restraints on active play

Literature suggests that in westernised countries outdoor play (often active play) is in decline. Between 1981 and 1997 a study carried out in the USA reported a 25% decrease in time spent playing in children aged 6 to 8 years (Hofferth et al, 2000). One suggestion is that parents' fears of "stranger danger" may be limiting children's opportunities for outdoor activities (play). Carver et al. (2008) suggests that there are multiple manifestations of "stranger danger", for example unwelcome approaches by strangers, abductions, assaults, molestation or murder. McNeish & Roberts (1995) found that 60% of parents polled (n=1758) stated that they were very worried about their children playing out safely. Furthermore, Carver et al. (2008) found that with reference to their own childhood, parents believe that children now face increased risk, mainly from traffic and strangers. This worry may be caused by media reports and consequently parents may be reluctant to allow their children independence to play outside due to fear and social pressure. More research is needed in this area to inform interventions that promote greater independence in children to encourage higher levels of outdoor play. Moreover, active play interventions need to be developed to overcome this barrier to participation.

Carver et al. (2008) suggest that the physical outdoor environment is important for physical activity, particularly play, in young people for several reasons: (i) the time young people spend outdoors is correlated with physical activity levels (Cooper et al, 2010), (ii) "neighbourhoods" (one domain of the physical outdoor environment) provide opportunities for unstructured and more social physical activities (play), (iii) "neighbourhoods" provide

opportunities for inexpensive physical activities (play), and (iv) “neighbourhoods” are accessible to young people. To date, few activity interventions have utilised the neighbourhood environment. More research is needed to understand how to promote the use of neighbourhoods in order to engage residents in active play.

Promotion of active play

Interventions that target active play to increase levels of physical activity in young people have been successful in the short term (e.g. see Colabianchi et al, 2009; Farley et al, 2007). For example, Farley and colleagues (2007) carried out a study to evaluate the effect of providing a safe play space on the physical activity levels of inner city school children. The study found that when children were provided with a safe play space, a relative increase in their physical activity levels was observed. Colabianchi et al. (2009) examined physical activity levels at renovated compared to unrenovated school play grounds open for use outside of school hours. The study concluded that playground renovations may have the potential to increase the number of children using playgrounds outside of school hours and may increase the proportion of children who are vigorously active. However, over the long term, effects are likely to decline and potentially disappear owing to changing activity preferences as children transition to adolescence and then adulthood. Novel ways in which to promote active play as an acceptable and preferable activity across the life course are required. Such interventions, if successful, could aid in the prevention of several cancers via an increase in physical activity levels. These interventions may be most effective if they are family-inclusive thus allowing children, adolescents, and adults to participate. Types of active play that are promoted should not only be child focussed but both child and adult focussed, such games may include, for example, laser quest, or capture the flag.

Promoting active play to increase physical activity across the life course may overcome various barriers to participation in physical activity, particularly in adults. A review by Trost et al. (2002) summarised the evidence relating to factors associated with physical activity in adults. Many variables have been found to be associated with physical activity, for example, obesity, smoking, lack of time, past exercise behaviour, and the physical environment. Self-efficacy (a person's confidence in their ability to perform a certain behaviour) emerged as a strong and consistent correlate of physical activity behaviour, whereby higher levels of self-efficacy were associated with more physical activity. Play is not necessarily perceived in the same way as physical activity (sport, exercise). Therefore, active play may be more inclusive for individuals who have low levels of self-efficacy for such activities, and subsequently, through being active in play, self-efficacy to participate in physical activity *per se* may increase.

Summary

In summary, active play could be an important tool in the global fight against physical inactivity, and thus aid in the prevention of several non-communicable diseases, including the most common cancers (colorectal, breast, prostate). However, limited literature exists on how to effectively promote active play (that yields sufficient levels of physical activity) so it is sustainable across the life course. The authors of this essay are currently carrying out a multi-disciplinary project funded by the Cancer Research UK to design and pilot such an intervention (STEALTH: promoting physical activity across the life course through play). There is a need for research into all areas of active play.

Conflict of interest Statement

The authors declare that there are no conflicts of interest.

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References

Caspersen, C., Powell, K., & Christenson, G. (1985). Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Reports*, 100,126-131

WHO. (2010). *Physical Activity and Young People*. Switzerland: World Health Organisation.

Strong, W.B.,Malina, R.M., Blimkie, C.J.R., et al. (2005). Evidence based physical activity for school-age youth. *Journal of Pediatrics*, 146, 732-737.

Penedo, F., & Dahn, J. (2005). Exercise and well-being: a review of mental and physical health benefits associated with physical activity. *Current opinion Psychiatry*, 18, 189-93.

Monninkhof, E.M., Elias, S.G., Vlems, F.A., et al. (2007). Physical activity and breast cancer: a systematic review. *Epidemiology*, 18, 137–57.

Tardon, A., Lee, W.J., Delgado-Rodriguez, M., et al. (2005). Leisure-time physical activity and lung cancer: a meta-analysis. *Cancer Causes Control*,16, 389–97.

Winzer, B., Whiteman, D., Marina, M. et al. (2011). Physical activity and cancer prevention: a systematic review of clinical trials. *Cancer Cause & Control*, 22, 811-26.

Wolin, K., Yan, Y., Golditz, G. et al. (2009). Physical activity and colon cancer prevention: a meta-analysis. *British Journal of Cancer*, 100, 611-16.

Im, L. (2003). Physical activity and cancer prevention. *Medicine & Sciences in Sport & Exercise*, 35, 1823-27.

Tardon, A., Lee, W., Delgado-Rodriguez, M. et al. (2005). Leisure-time physical activity and lung cancer: a meta-analysis. *Cancer Cause & Control*, 16, 389-97.

Friedenreich, C., & Orenstein, M. (2002). Physical activity and cancer prevention: Etiological evidence and biological mechanisms. *JN*, 11.

National Cancer Institute: <http://www.cancer.gov/about-cancer/causes-prevention/risk/obesity/physical-activity-fact-sheet#q4> Date accessed: 23/12/2015

Wu, Y., Zhang, D., Kang, S. et al. (2013). Physical activity and risk of breast cancer: a meta-analysis of prospective studies. *Breast Cancer Res Treat*, 137, 869-82.

Moore, S., Gierach, G., Schatzkin, A. et al. (2010). Physical activity, sedentary behaviour, and the prevention of endometrial cancer. *BJC*, 103, 933-38.

Cancer Research UK online: <http://www.cancerresearchuk.org/about-cancer/causes-of-cancer/physical-activity-and-cancer/how-physical-activity-prevents-cancer> Date accessed: 23/12/2015

Hallal, L.B., Andersen, F.C., Bull, R. et al. (2012). Global physical activity levels: surveillance progress, pitfalls, and prospects. *Lancet*, 380, 247–257.

Smith, L., Gardner, B., Aggio, D. et al. (2015a). Association between participation in outdoor play and sport at 10 years old with physical activity in adulthood. *Prev Med*. 74, 31-35.

Smith, L., Fisher, A., & Hamer, M. (2015b). Prospective association between objective measures of childhood motor coordination and sedentary behaviour in adolescence and adulthood. *Int Jr Behav Nutr Phys Act*, 12, 75.

Smith, L., Gardner, B., & Hamer, M. (2014). Childhood correlates of adult TV viewing time: a 32-year follow-up of the 1970 British cohort study. *J Epidemiol Community Health*. 69, 309–13.

van Sluijs, E., McMinn, A., & Griffin, S. (2007). Effectiveness of interventions to promote physical activity in children and adolescents: Systematic review of controlled trials. *BMJ*. 335, 703.

Broekhuizen, K., Scholten, A., de Vries, S. (2014). The value of (pre)school playgrounds for children's physical activity level: a systematic review. *Int Jr Behav Nutr Phys Act*, 11, 59.

Hofferth, S., & Sandberg, J. (2000). Changes in American Children's Time, 1981-1997, Center for the Ethnography of Everyday Life. <http://www.psc.isr.umich.edu/pubs/pdf/rr00-456.pdf> Date Accessed 24/12/2015.

Carver, A., Timperio, A., & Crawford, D. (2008). Playing it safe: The influence of neighbourhood safety on children's physical activity - A review. *Health & Place*, 14, 217-227.

McNeish, D., & Roberts, H. (1995). *Playing it Safe: Today's Children at Play*. Essex: Barnardo's

Colabianchi, N., Kinsella, AE., Coulton, CJ., et al. (2009). Utilization and physical activity levels at renovated and unrenovated school playgrounds. *Prev Med*, 48, 140-143.

Farley, TA., Meriwether, RA, Baker, ET., et al. (2007). Safe play spaces to promote physical activity in inner-city children: results from a pilot study of an environmental intervention. *Am J Public Health*, 97, 1625-1631.

Cooper, A., Page, A., Wheeler, B., et al. (2010). Patterns of GPS measured time outdoors after school and objective physical activity in English children: the PEACH project. *Int J Behav Nutr Phys Act*, 7, 31.

Trost, S., Owen, N., Bauman, A., et al. (2002). Correlates of adult participation in physical activity: review and update. *Medicine and Science in Sport and Exercise*, 34, 1996-2001.