Promoting Physical Activity Among Adolescents: Recommendations From Correlation Research

La promoción de la actividad física entre los adolescentes: recomendaciones a partir de la investigación correlacional

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Abstract. Adolescents are not meeting physical activity (PA) guidelines for health and, although there has been much PA intervention research for this age group, most studies have had only a small effect on teens’ PA. Many have observed that teenagers’ PA is determined by a complex array of intrapersonal, interpersonal, and family, school, and community environmental factors. We sought to update previous reviews of correlates of adolescent PA, focusing exclusively on modifiable correlates of adolescents’ PA to suggest avenues for PA promotion intervention design. Based on our findings from twenty studies exploring correlates among international samples of adolescents, we suggest that parent and peer PA and support of adolescents’ PA are important influencing factors to consider when designing PA promotion interventions for teenagers. Moreover, limited work suggests the potential importance of physical environment modifications.

Keywords. physical activity, adolescent correlates, review.

Resumen. Los adolescentes no están cumpliendo con las recomendaciones de actividad física (AF) para la salud y, aunque ha habido mucha investigación en la intervención de AF para este grupo de edad, la mayoría de los estudios han tenido sólo un pequeño efecto sobre la AF de los adolescentes. Muchos han observado que la AF de los adolescentes está determinada por una compleja serie de factores intrapersonales, interpersonales, del contexto familiar y escolar y de la comunidad. Hemos tratado de actualizar las revisiones previas de los correlatos de la AF en los adolescentes, centrándonos exclusivamente en los correlatos modificables de AF de los adolescentes para sugerir ideas en el diseño de intervenciones de promoción de la AF. En base a los resultados de veinte estudios que exploraron las correlaciones entre muestras internacionales de adolescentes, se sugiere que la AF de los padres y los compañeros y el apoyo de ambos a la AF de los adolescentes son factores de influencia importantes a considerar en el diseño de intervenciones de promoción de la AF para los adolescentes. Por otra parte, algunas investigaciones sugieren la importancia potencial de modificaciones en el entorno físico.

Palabras clave. actividad física, adolescentes, correlatos, revisión.

Introduction

Worldwide, adolescents are not meeting physical activity (PA) guidelines for health (Colley et al., 2012; Ekelund, Tomkinson, & Armstrong, 2011; National Institute for Health and Care Excellence, 2009; World Health Organization, 2004). Although there has been much PA intervention research for this age group, most studies have had only a small effect on teens’ PA, in particular their PA outside of school (de Meester, van Lente, Spittaels, Lien, & De Bourdeaudhuji, 2009; Dobbins, De Corby, Robeson, Husson, & Tirilis, 2009). Notably, a systematic review of 24 school and non-school based PA Randomized controlled trials found that while there was no conclusive evidence of an effect on teen PA for programs restricted to the school setting, there was strong evidence of an effect for those involving the family or community (van Sluijs, McMinn, & Griffin, 2008). Similarly, the European adolescent PA promotion literature indicates multi-component programs extending beyond the school setting have generally resulted in larger effect sizes than those focused exclusively on the school (Crutzen, 2010).

The precise reasons for this are, as yet, unknown, but many have observed that teenagers’ PA is determined by a complex array of intrapersonal, interpersonal, and family, school, and community environmental factors (Ommundsen, Klasson-Heggebo, & Anderssen, 2006; Sterdt, Liersch, & Walter, 2014). To design and implement PA promotion interventions susceptible to increase adolescents’ participation in PA, developing an understanding of modifiable correlates of their PA is warranted. Literature reviews, including three reviews of reviews, have explored the issue. With respect to the modifiable correlates of adolescents’ PA examined, two reviews of reviews note consistent evidence of relevant articles, coding each identification criterion as ‘1’ for ‘yes’, ‘0’, for ‘no’, and ‘2’ for ‘unsure’. To determine agreement regarding studies to move to selection phase, we met to discuss divergent codes. When
we disagreed, discussions pertained to the codes, more so than the abstracts. We then read the selected full text papers, coding the selection criteria and retaining papers or discussing and resolving disagreements in the same manner as for the identification phase.

Data collection
We extracted data pertaining to two aspects from each included study: (a) descriptive data about the study, and (b) results regarding modifiable correlates of physical activity (e.g., parental encouragement, opportunities for PA). All extracted data were entered into one excel spreadsheet. We did not extract data regarding PA behaviour correlates (e.g. participation in organised sports) because most included studies are cross-sectional and thus do not indicate the direction of the relationship between PA behaviour correlates and overall PA; a positive association may be indicative of the fact that physically active youth engage in sports. Given our objective is to identify modifiable correlates that may be addressed by programs or interventions that seek to promote PA to less active teenagers, it was logical to focus on correlates outside of the individual.

Synthesis
Using an ecological framework to guide our analysis, we categorised modifiable correlates according to social (school, home, community) and physical environment (school home, community) domains.

Results
We identified 785 unique records from the literature and selected 108 potentially relevant full-text papers. At the end of the selection phase, we retained 20 articles for inclusion in this review. As per the PRISMA flow diagram (Figure 1), inter-rater agreement for both identification and selection phases was moderate (Landis & Koch, 1977).

Description of included studies
Table 2 represents descriptive data for all included studies. Seven of the studies included 12-13 year old participants, nine studies included 14-19 year olds, and six addressed both age groups. Sample sizes ranged from 100-5250. A cross-sectional design was used in all studies except one (Viira & Raudsepp, 2003) and eleven of the studies were conducted outside North America (Deforche, Van Dyck, Verloigne, & De Bourdeaudhuij, 2010; Haug, Tonshheim, & Samdal, 2008; Kim & Cardinal, 2010; Kok Sonk, Loprinzi, & Trost, 2010; Loucaides, 2009; McMinn, van Sluijs, Wedderkopp, Froberg, & Griffin, 2008; Ommundsen, Klasson-Heggebo, & Anderssen, 2006; Raudsepp & Viira, 2000; Shokravash et al., 2013; Viira & Raudsepp, 2003; Wu, Pender, & Nourieddine, 2003). Only three studies (McMinn, van Sluijs, Wedderkopp et al., 2008; Sallis, Prochaska, Taylor, Hill, & Geraci, 1999; Young, D. et al., 2014) assessed physical activity objectively using accelerometers; all others used various self-report measures (Table 1). All studies examined correlates for boys and girls, except for three that looked only at girls (Bungum, Pate, Dowda, & Vincent, 1999; Ward et al., 2006; Young, D., Saksvig, Wu et al., 2014) and one that focussed on boys (Deforche, Van Dyck, Verloigne et al., 2010). Herein, we describe results according to social and physical environmental influences on teenagers’ PA. As sex differences in physical activity and its related psychosocial factors have been documented in previous studies (Beets, Vogel, Forlaw, Pietti, & Cardinal, 2006) where possible, we describe results according to boys and girls separately.

Social environment
In their extensive review, Fitzgerald, Fitzgerald, and Aherne (2012) found that peers and friends play an important role for youths’ physical activity among 10 to 18 year olds, and this holds true for the twelve (out of 23) studies included in this review that focused on adolescents. The following discussion complements this previous review as it examines teenagers exclusively, is more inclusive with respect to nationality of participants, and is based on a literature search that extended four years beyond that of Fitzgerald, Fitzgerald, and Aherne (2012).

Spink et al. (2006) examined correlates for participation in structured and unstructured activity and therefore used data only from teens who were considered sufficiently active (i.e., reporting energy expenditure of 8 kcal·kg⁻¹·day⁻¹ or greater and engaged in both types of activities). Similar to Cypriot and Norwegian studies (Loucaides, 2009; Ommundsen, Klasson-Heggebo, & Anderssen, 2006), the authors note that among older teens, friends’ PA and support were identified as correlates of PA by 55% of participants (although the association was greater for unstructured PA compared to structured PA). Moreover, in a Belgian sample of 17 year old boys, Deforche, Van Dyck, Verloigne et al. (2010) found that friends’ PA was positively associated with boys’ leisure time sports and an Estonian sample of 13 year old boys revealed that friends’ attitude for PA was associated with PA (Viira & Raudsepp, 2003). These results are corroborated by study that used accelerometer PA data (Sallis, Taylor, Dowda, Freedson, & Pate, 2002). Likewise, among 8th grade girls, positive associations between PA and friends’ support or friends attitude have been found (Raudsepp & Viira, 2000; Viira & Raudsepp, 2003; Young, D., Saksvig, Wu et al., 2014) and among 11th grade girls’ moderate-vigorous PA was associated with positive support from boys (Young, D., Saksvig, Wu et al., 2014). It is noteworthy, that in our sample, one study found no association between peer support and PA of Danish teens 14-16 years old (McMinn, van Sluijs, Wedderkopp et al., 2008). Differences in findings could be due to measurement error and limitations inherent in measuring PA among adolescents.

As with all cross sectional studies, the directions of these associations are unknown. However, those who have done path analyses found there is both a direct (Wu, Pender, & Nourieddine, 2003) and indirect (Sabinson & Crocker, 2008; Silva, Lott, Wickrama, Mota, & Welk, 2012; Wu, Pender, & Nourieddine, 2003) path from peer influences (social support, modelling & norms) to teenage boys’ and girls’ PA.

With respect to parents’ support, examining studies published prior to 2000, Sallis, Prochaska, and Taylor (2000) found parental support, direct help from parents, and support from significant others were consistently related to adolescent physical activity as was sibling physical activity. Yet, more recent work suggests a less certain relationship. A Danish study found no association with PA and parental support among older teens (McMinn, van Sluijs, Wedderkopp et al., 2008). Whereas, Spink, Shields, Chad et al. (2006) found that 40% of
them for guidance as compared to older teens who might be more influenced by their parents because they are younger teens is more influenced by their parents because they are more likely to look to them for guidance as compared to older teens who might be more impacted by their peer group. These results are consistent with those of de Vet, de Ridder, and de Wit (2011) who found that parent PA appears to be more important in childhood than adolescence.

With respect to boys, some have shown significant positive associations with parental support (Kim & Cardinal, 2010; Kok Sonk, Loprinzi, & Trost, 2010) and parents’ encouragement for PA for Caucasian and African American boys’ PA, compared to PA of Asian, Hispanic, and other race/ethnicity groups (McGuire, Hannan, Neumark-Sztainer, Cossrow, & Story, 2002; McMinn, van Sluijs, Wedderkopp et al., 2008). The mixed results regarding parental influences are not surprising given that previous reviews have indicated positive, unclear, or no associations with adolescent PA (Edwards & Gorely, 2010; Gustafson & Rhodes, 2006; Pugliese & Tinsley, 2007; Sallis, Prochaska, & Taylor, 2000). It is possible that these mixed results in previous reviews may be due to grouping of children and adolescents together. It is worth noting that the studies included in our review that found parental correlates to be important (Loucaides, 2009; Loucaides, Plotnikoff, & Bercovitz, 2007; Mulhall, Reis, & Begum, 2011; Ommundsen, Klasson-Heggebo, & Anderssen, 2006) tended to include teens 15 years or younger while studies that found no association included older teens. Perhaps PA of younger teens is more influenced by their parents because they are more dependent on them at this age and perhaps more likely to look to them for guidance as compared to older teens who might be more...
Recommendation 1. Although, this literature does not indicate definitive positive associations between parental support or modelling and adolescents’ PA, it does not point to any negative effects of this strategy. It can be expected that no one strategy will have the same effect on all teenagers, thus in line with Edwardson and Gorely (2010), we recommend that effective PA promotion programs for teens might include the promotion of PA opportunities for parents, as well as education for parents regarding the potential positive effects of their support of their adolescent’s PA practices (e.g., encouragement provision of transport to and from activities). Additional support for this recommendation stems from the ten adolescent PA promotion intervention studies that incorporated a family or parental component, most of which had a positive effect on participants’ PA (Cass & Price, 2003; Haerens, De Bourdeaudhuij, Maes, Cardon, & De Foreche, 2007; Haerens et al., 2006; Lubans, D. R., Morgan, Callister, & Collins, 2009; Peralta, Jones, & Okely, 2009; Ransdell, Robertson, Ornes, & Moyer-Mileur, 2004; Simon et al., 2008; Young, D. R., Phillips, Yu, & Haythornthwaite, 2006). Moreover, while the vast majority of teen PA promotion intervention studies have been school based (Bush, 2014) two systematic literature reviews found school-based interventions are effective in increasing the time adolescents are physically active during school hours, but not during leisure-time (de Meester, van Lenthe, Mileur, 2006). Moreover, while the vast majority of teen PA promotion intervention studies have been school based (Bush, 2014) two systematic literature reviews found school-based interventions are effective in increasing the time adolescents are physically active during school hours, but not during leisure-time (de Meester, van Lenthe, Mileur, 2006). Furthermore, while the vast majority of teen PA promotion intervention studies have been school based (Bush, 2014) two systematic literature reviews found school-based interventions are effective in increasing the time adolescents are physically active during school hours, but not during leisure-time (de Meester, van Lenthe, Mileur, 2006). Thus, extending PA promotion strategies into the home is warranted.

Recommendation 2. With respect to peer support and modelling, among the eleven studies included in this review that examined these correlates (De Foreche, Van Dyck, Verloigne et al., 2010; Kim & Cardinal, 2010; Loucaides, 2009; McMinn, van Sluijs, Wedderkopp et al., 2008; Ooreumndsen, Klasson-Heggbo, & Andersen, 2006; Raudeopp & Viira, 2000; Sallis, Taylor, Dowda et al., 2002; Spink, Shields, Chad et al., 2006; Viira & Raudsepp, 2003; Wu, Pender, & Noureddine, 2003; Young, D., Saksvig, Wu et al., 2014) all but one (McMinn, van Sluijs, Wedderkopp et al., 2008) found positive associations with teens’ PA, and this, regardless of their age or sex. We, therefore, recommend that future intervention studies incorporate these strategies. Indeed, some have found that self-efficacy is an important correlate of PA among teens (Sallis, Prochaska, & Taylor, 2000) and that peer support indirectly influences teens’ PA via self-efficacy (Sabiston & Crocker, 2008; Wu, Pender, & Noureddine, 2003). Additionally, it is important that future PA promotion intervention research assesses the effects of such peer influences on teenagers’ PA as, to our knowledge, only four intervention studies have focused some attention on these influences, and none has assessed their specific effects on physical activity (Dzewalowskwi et al., 2009; Lubans, D. & Morgan, 2008; Lubans, David R. & Sylva, 2006; Peralta, Jones, & Okely, 2009).

Physical environment

In the literature published prior to 2000, Sallis, Prochaska, and Taylor (2000) found positive associations between adolescents’ PA and opportunities to exercise; yet, in their update to this review, Ferreira, van der Horst, Wendel-Vos et al. (2007) noted that availability and accessibility of exercise equipment were mostly unrelated to adolescents’ PA, and in another review, Van der Horst, Paw, Twisk et al. (2007) found no association between availability of facilities and adolescents’ physical activity. We found, an additional seven studies providing some evidence to indicate a positive association between teenagers’ PA and availability of spaces to be physically active in the neighbourhood or on school grounds (Haug, Torsheim, & Samdal, 2008; Loucaides, 2009; Ooreumndsen, Klasson-Heggbo, & Andersen, 2006; Spink, Shields, Chad et al., 2006; Young, D., Saksvig, Wu et al., 2014) and provision of PA equipment in the home (Kok Sonk, Loprinzi, & Trost, 2010; Ward, Dowda, Trost et al., 2006). Regarding adolescent PA promotion intervention research, few studies have examined environmental modifications making it difficult to understand whether such strategies as increasing opportunities to be physically active can increase PA in youth (Perry, Garside, Morones et al., 2012). Nonetheless, provision of additional physical activity opportunities, such as schools providing extra physical activity equipment out of class time, or partnering with community organizations to provide additional physical activities are strategies that have met with some success (Haerens, De Bourdeaudhuij, Maes et al., 2007; Haerens, Deforeche, Maes et al., 2006; Lubans, David R. & Sylva, 2006; Webber et al., 2008).

Recommendation 3. The limited research makes it difficult for us to make any strong recommendations regarding environmental modifications. It may be that the provision of opportunities to be physically active is important but not sufficient to entice adolescents to engage in PA. Moreover, as with peer and parental support and modelling, it can be expected that such an intervention strategy may have a positive effect on PA for some teenagers in some contexts, and the literature does not point to any negative effect. Thus, we suggest that future intervention studies incorporate environmental modifications in the home and school environments and, importantly, that they study the effects of these strategies.

Recommendation 4. Regarding future research on correlations of adolescents’ PA, this updated review suggests recommendations of previous reviews (Edwardson & Gorely, 2010; Ferreira, van der Horst, Wendel-Vos et al., 2007; Sterdt, Liersch, & Walter, 2014) still stand. Specifically, for correlates of adolescent PA we are still lacking longitudinal studies, as well as studies that use objective measures of PA, explore parental and peer support in more depth (e.g., support vs encouragement, types of support), and explore physical environmental variables (e.g. opportunities to be active). Moreover, to date, studies have explored correlates of either overall PA (De Foreche, Van Dyck, Verloigne et al., 2010; Haug, Torsheim, & Samdal, 2008; Kok Sonk, Loprinzi, & Trost, 2010; Loucaides, 2009; McMinn, van Sluijs, Wedderkopp et al., 2008; Mulhall, Reis, & Begum, 2011; Raudsepp & Viira, 2000; Sallis, Prochaska, Taylor et al., 1999; Sallis, Taylor, Dowda et al., 2002; Shokravash, Majlessi, Montazeri et al., 2013; Spink, Shields, Chad et al., 2006; Viira & Raudsepp, 2003; Ward, Dowda, Trost et al., 2006; Wu, Pender, & Noureddine, 2003), leisure-time PA (Kim & Cardinal, 2010; Loucaides, Plotnikoff, & Bercovitz, 2007; McGuire, Hannan, Neumark-Sztainer et al., 2002; Ooreumndsen, Klasson-Heggbo, & Andersen, 2006), or various intensities of PA (Bungum, Pate, Dowda et al., 1999; Young, D., Saksvig, Wu et al., 2014). Clarifying any distinctions among correlates of these various types of PA may be warranted.

Limitations

We did not complete a critical appraisal of the studies we included and we acknowledge that this could be considered a limitation of this work. For instance, included studies used a variety of self-report measures, not all of which are validated (Table 1). Moreover, given study designs, the directions of the relationships reported are, for the most part, unknown. However, given our objective to shed light on what is known about modifiable correlates of teenagers’ PA and given that this area has not been routinely studied, we believed it was relevant to include all studies that reported correlates of interest. Indeed, in the context of this review we are inclined to side with Pawson (2006) that «[h]ere are often nuggets of wisdom in methodologically weak studies» (p. 127). In addition, we did not include theses or dissertations, published abstracts or presentations, and therefore this must be considered when interpreting results.

Despite its limitations, the current paper has several strengths. First, unlike other reviews (de Vet, de Ridder, & de Wit, 2011; Edwardson & Gorely, 2010; Ferreira, van der Horst, Wendel-Vos et al., 2007; Sallis, Prochaska, & Taylor, 2000; Van der Horst, Paw, Twisk et al., 2007), we highlight differences among subgroups of the adolescent population. Namely, younger and older adolescents and boys and girls. Second, whereas other reviews have addressed non-modifiable correlates together with modifiable ones (de Vet, de Ridder, & de Wit, 2011; Ferreira, van der Horst, Wendel-Vos et al., 2007; Sallis, Prochaska, & Taylor, 2000; Van der Horst, Paw, Twisk et al., 2007), we concentrate only on
modifiable. As such, we have been able to provide recommendations to help researchers and practitioners design effective interventions to increase PA among teens. Indeed, our findings lead us to suggest that future adolescent PA promotion research may consider designing interventions to modify teen’s social and physical environments. For instance, interventions may focus on promoting PA to parents such that they may model the behavior, or promote the importance of parents and peers being supportive of adolescents’ PA. In turn, such interventions may help to increase PA among teenagers.

References


