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Physical activity over the life course: whose behavior changes, when and why?

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Abstract

Physical activity tends to decline from childhood into adulthood. The maintenance of high levels of physical activity throughout life is therefore an important public health objective. Relatively little is known about changes in physical activity behavior over the life course, the domains of physical activity in which they occur, the characteristics of those whose physical activity declines and the factors associated with such changes. In future, the incorporation of more accurate measures of physical activity in large population studies would help to establish more accurate estimates of associations in this area. Determinants of behavior change, including the effects of socioeconomic position and social mobility on physical activity and fitness, are likely to change constantly throughout life, but it is largely unknown which determinants are most important at each life stage, let alone whether and at what times those determinants change. Better evidence on determinants of behavior change throughout the life course would contribute greatly to our understanding of when and how to intervene in order to help create and sustain lifelong healthy behavior patterns in those who have most to gain from adopting them.

Keywords

Physical activity; determinants; behavior change; transition

Physical activity has been found to be positively associated with both physical and mental health in children as well as in adults [1-5] and maintenance of high levels of physical activity throughout life is therefore an important public health objective. However, throughout childhood and into adulthood physical activity levels appear to decline [6-8]. This observation is mostly derived from questionnaire-based measures of physical activity, but the decline during childhood is confirmed by a few prospective studies using objectively-measured physical activity in the United States and some European countries [9-11]. To date, relatively little is known about this decline, including whether it occurs in all domains of physical activity, the socio-demographic characteristics of those whose physical activity is most likely to decline, and what other factors are associated with declining physical activity. In order to develop public health strategies to prevent this decline in physical activity over the life course, and perhaps even to reverse it, these questions need to be addressed.

The current issue of the *American Journal of Epidemiology* includes a paper examining the influence of socioeconomic position and social mobility on the tracking of physical activity and fitness that contributes to the literature in this area. Cleland *et al* [12] found that persistently high socioeconomic position and upward social mobility were associated with increases in self-reported physical activity and objectively-measured fitness from childhood

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to adulthood in 2185 Australian adults aged 26 to 36 who had first been examined between the ages of 7 and 15. Upward social mobility (defined in this study as reaching a higher level of educational attainment than that of one's parents) was associated with a 38–49% greater likelihood of high physical activity in adulthood and a 90% greater likelihood of high fitness. A persistently high socioeconomic position from childhood to adulthood was also associated with a 58% greater likelihood of high physical activity in adulthood (in males) and an 89% greater likelihood of high fitness. Cleland *et al.* [12] therefore suggest that adult physical activity is more closely related to adult socioeconomic position and to social mobility between childhood and adulthood than to socioeconomic position during childhood.

Findings from previous cross-sectional studies investigating the relationship between physical activity and socioeconomic position tend to support this conclusion. Evidence for a positive social gradient in physical activity is more consistent in adults [13] than in children [14, 15], although the associations observed are by no means universal or straightforward. Most published studies have examined only leisure-time physical activity in relation to socio-economic position [13] and there is little evidence available with which to investigate whether this association varies for different domains of adult physical activity. In children, the findings of the 2003 Scottish Health Survey actually suggest a possible negative social gradient in physical activity, with girls in the lowest socioeconomic groups being more likely to meet physical activity recommendations than those in the highest, irrespective of which measure of socioeconomic position was used [16]. This direction of association with health behaviors is more commonly found in developing countries [17].

Cleland *et al.* [12] used participants' educational attainment and that of their parents as indicators of adult and childhood socioeconomic position, respectively. Although parental educational attainment was retrospectively reported, it is much more likely to have been recalled accurately than alternative retrospective measures such as household income. On the other hand, the meaning and discriminatory value of educational attainment as an explanatory variable may have varied over the course of the study, for example as a result of policies to increase access to higher education; if 'education' represents different constructs at each time point, this may affect the validity or interpretation of the social mobility variable. Clearly, the results of this study may not be generalizable to other markers of socioeconomic position, although it should be noted that previous studies have tended to find that physical activity is more strongly associated with education than with income or occupation [13]. In addition, a dose-response relationship could be hypothesized to exist between physical activity and social mobility (in other words, a social trajectory that involved crossing more than one level of socioeconomic position might be associated with an even greater change in physical activity or fitness). Unfortunately, it was not possible to investigate this hypothesis in this study.

Even if a direct relationship between change in socioeconomic position and change in physical activity is confirmed and possible confounders ruled out completely, we do not yet know the mechanisms by which specific aspects of socioeconomic position or changes in socioeconomic circumstances might be translated into increases in physical activity. Cleland *et al.* [12] suggest that improving education may be the key, but this must be weighed against the finding that educational interventions alone tend not be effective in promoting physical activity in either children or adults [18, 19]. One therefore wonders whether improved education alone would be sufficient (and if so, at what age) or whether a more general improvement in socioeconomic circumstances would be required. In the Cleland study, baseline physical activity data were collected between 7 and 15 years of age, but factors operating before this age (such as the preschool home environment) could have had a substantial impact on a child's final educational attainment, perhaps independent of their

parents' educational level. Apart from education, the authors also raise environmental change as a possible strategy to overcome the adverse effects of low socioeconomic position, but assessing the likely impact of this approach is complicated by differences in the relationships of various individual- and area-level measures of socioeconomic position or deprivation with physical activity [20, 21].

Evidence for the tracking of fitness from childhood to adulthood was notably stronger than that for the tracking of physical activity. This is often the case [22] and almost certainly reflects a marked difference in the precision of the physical activity and fitness measures. Like many epidemiological studies, this study depends on self-report measures of physical activity that are neither precise nor free from liability to recall bias. In addition, although the same fitness measure was used at both time points, different physical activity measures were used in childhood and adulthood. In general, using relatively imprecise measures of physical activity is likely to have biased the estimates of associations towards the null, leading to an underestimate of the strength of the true associations [23]. Incorporating more accurate measures of physical activity in large population studies is admittedly challenging, since the accuracy of methods tends to be negatively correlated with their feasibility [24], but is now being done more frequently. In future, these data should help to establish more accurate estimates of these associations.

Physical activity behavior changes throughout the life course but it is relatively unknown whether those changes are gradual or initiated by key life events. Transition from primary to secondary school [25], from high school to college or university [26-29], marriage [28], becoming a parent [30] and retirement [31] have all been suggested as important periods for change in physical activity behavior. Individuals or groups may be more receptive to health promoting interventions around the times of these transitions [32], although it is currently unclear which lifestyle transitions are most important and what factors are associated with changes in physical activity at these times. The research on this topic is limited and of varying quality and therefore not conclusive, as highlighted in a recent review [33]. Only a limited number of transitions are covered by current research, mainly regarding adult lifestyle transitions, with the studies available often being secondary analyses of datasets from similar populations. Determinants of changes in behavior, including the effects of socioeconomic position and social mobility on physical activity and fitness, are likely to change constantly throughout life, as shown in this study. It is largely unknown which determinants are most important at each life stage, let alone whether and at what times those determinants change. The further distillation of the available evidence in youth and young adults from a broad range of backgrounds on determinants of changes in physical activity in general and around life transitions specifically is necessary to contribute to our understanding of when and how to intervene, and for whom, most effectively.

We have argued that there is a lack of longitudinal studies investigating the determinants of physical activity behavior change in young people and a continued need for research using high quality measures of both exposures and outcomes. The successful development, implementation and evaluation of interventions likely to bring about sustained positive behavior change in the population as a whole depends on extending current trends in epidemiological research in this field from cross-sectional to prospective studies, from studying correlates of behavior to studying its determinants, from studying individual determinants of behavior to studying its ecological determinants, and from purely observational studies to studies of the effects of interventions. It is, of course, encouraging that this study has found that a relatively disadvantaged background need not permanently hinder a person's lifelong health trajectory in terms of physical activity and fitness, but more work is required to understand how lifelong healthy behavior patterns can be created and sustained in those who have most to gain from adopting them.

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