A review of mediators of behavior in interventions to promote physical activity among children and adolescents

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CRD summary
The review evaluated the effect of physical activity interventions on hypothesised mediators, examined whether the mediators affected physical activity in young people and identified possible mediators that were affected significantly by interventions. The limitations of the review prevented the formation of strong conclusions on which mediators were the most effective.

Authors' objectives
To evaluate the direct effect of physical activity interventions on hypothesised mediators and the relationship between such mediators and physical activity in young people (aged five to 18 years).

Searching
PubMed, EMBASE, PsychINFO and SPORTDiscus were searched for publications in English. Search dates were not explicitly stated, but searches appeared to be carried out to 2008. Experts in the field were contacted for missed studies. Selected journals were handsearched, including Psychology of Sport and Exercise, Journal of Sport and Exercise Psychology, Preventive Medicine and Health Psychology. The bibliographies of each retrieved article were handsearched. Search terms were reported.

Study selection
Studies that involved an experimental or quasi-experimental design of a physical-activity intervention in participants of primary or secondary school age (age five to 18 years) were eligible for inclusion. Included studies needed a quantitative assessment of potential mediators. Eligible studies also had to report the impact of the intervention on hypothesised mediators and report the relationship between the mediator and the physical activity after adjusting for the intervention effect. Review articles, cross-sectional studies, validity studies and longitudinal studies with no intervention were excluded.

The mean age of participants in included studies ranged from five to 18 years. It was not possible to summarise the sex of the participants: some studies were of boys, others of girls and some of both, and the last did not provide a breakdown by sex. Overall, there were more girls than boys. Most of the included studies were in developed countries. All took place in secondary schools.

Hypothesised mediators were organised into three groups: cognitive mediators; behavioural mediators; and interpersonal mediators. Self efficacy was the most commonly assessed mediator. Physical activity assessment occurred at baseline and three months to two years afterward (depending on the study). No specific details were given of eligible physical activity-related outcomes. Physical activity measurement was by questionnaire.

One researcher carried out the literature search and appeared to be responsible for the selection of the relevant papers.

Assessment of study quality
Methodological quality was assessed by three reviewers to give a formal quality score. Study quality criteria were assessed using a grade of 1 (yes) or 0 (no) to give a total study quality score out of 8. The following criteria were addressed: presence of a theoretical framework; study design to influence mediating variables; pilot studies conducted to test the effect of the intervention on mediators; objective measure of physical activity; psychometric characteristics of mediators reported and within acceptable range; power calculation reported and adequate; study with an experimental design; and post-intervention physical activity level adjusted for baseline level. Studies with a score of 0 to 3 were regarded as low quality, 4 to 6 were medium quality and those with 7 to 8 were considered high quality.

Data extraction
Specific numerical data related to physical activity levels were not extracted. Products of coefficients were extracted for four studies. The results of joint significance tests were extracted for the three remaining studies to identify potential mediators of behaviour. No quantitative information was reported, only the relative significance of results. The authors reported the type of data extracted, but not how data were extracted nor how many reviewers performed the extraction.

Methods of synthesis
The authors performed a narrative synthesis. Data were presented in tables. The authors summarised whether study interventions affected mediators and whether adding specific mediators modified the strength of the relationship between the intervention and outcome.

Results of the review
Seven relevant RCTs were identified (n=6,894, range 78 to 2,840), one of which had a quasi-experimental design (n=78). One study was of low quality and the others were of medium quality. Two studies appeared to be in the same cohort of participants. A summary of the individual criteria used for validity assessment for each study was provided. Two studies used confirmatory factor analysis to confirm that all scales were unidimensional. Two other studies reported that all their scales had acceptable psychometric properties based on Cronbach’s alpha and test-retest reliability. A fifth study reported acceptable internal consistency. A sixth study provided a reference for a scale validation study but did not report the psychometric properties used in the study. Four studies were reported to have adequate power. The studies were in four countries: Belgium, Iran, USA and UK.

Cognitive mediators:
Self-efficacy was assessed in seven studies. The intervention had a significant effect on self-efficacy in both boys and girls in two studies, only in girls in one study of both boys and girls, and in three studies of girls, but no significant effect in the remaining study of girls. Self-efficacy modified the strength of the effect of the intervention on physical activity in four or five of the studies, but significance was not given.

Four or five studies (unclear) reported on outcome expectancy/perceived benefits. Interventions in three of the studies had a significant effect on this mediator, but only one study was considered to provide evidence of a mediated effect on physical activity (significance not given). All three studies that reported on perceived barriers found that interventions had a significant effect on this mediator, but not always in the expected direction and the authors considered that the studies did not provide evidence for a mediated effect of perceived barriers on physical activity.

Enjoyment as a mediator was investigated in two studies: one found no effect; the other found the intervention had a significant effect on enjoyment and enjoyment of physical activity had a mediated effect on physical activity (but not enjoyment of physical education).

Behavioural mediators (two studies):
The intervention in one study had a significant effect on goal setting, but the changes were not related to changes in physical activity. Another study found the intervention had a significant effect on commitment to planning, stimulus control and counter conditioning; only commitment to planning had a mediated effect on physical activity.

Interpersonal mediators (five studies):
Five studies evaluated interpersonal factors (physical activity group norm, exposure to models, social support, interpersonal norms, peer support and social support). Only one study found the intervention significantly affected peer support, which did not appear to have a mediated effect on physical activity.

Authors’ conclusions
Few studies had investigated the effect of mediators of physical activity behaviour on interventions for youth. The small number of studies identified and the variability in study design and quality prevented the formation of strong conclusions on which mediators were the most effective.
The review addressed a well-defined question in terms of participants, interventions, study design and relevant mediators and outcomes. Relevant databases were searched and unpublished studies considered. The start date for eligible studies was not given and only very recent studies were included (from 2004 to 2008). Only publications in English were considered. Therefore, relevant studies may have been missed. Publication bias was not assessed. Study quality was assessed using suitable criteria. There was insufficient detail of the review process to assess whether it was performed with an effort to reduce error and bias. Relevant study details were reported, but no numerical data were provided for physical activity assessment or other outcome assessment. A narrative synthesis was provided and no meta-analysis was performed. There was no assessment of statistical heterogeneity. The authors were limited by the number of studies identified and were cautious in drawing conclusions. However, there were potential limitations with the review process and these should be borne in mind when interpreting their conclusions.

Implications of the review for practice and research

**Practice:** The authors stated that interventions to increase physical activity in young people should be guided by theories of behaviour change and involve rigorous mediation analyses to identify important mechanisms for behavioural change. Since most studies were of adolescent girls, the authors considered that most of the results should be applied only to girls.

**Research:** The authors stressed that future studies should not rely on self reporting of physical activity in young people, but should use a combination of objective and self-report measures. They identified a need for further studies of higher quality, particularly in boys, and that researchers should use and report their studies using CONSORT criteria. They advocated the development of behaviour change models for young people, since most models were developed for adults and may not be appropriate for children and adolescents. Models should use scales that demonstrate strong psychometric properties.

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