A school-based intervention to increase physical activity in 13-14 year-old adolescents through increased peer support: GoActive, a clustered RCT

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Scientific summary

Background

Most adolescents are not sufficiently active and are at risk of poor heath as a consequence of inactivity. Physical activity declines throughout childhood and adolescence. The increasing autonomy which occurs during adolescence, in addition to the growing importance of peer social support, makes this a promising time for health promotion. The vast majority of adolescents attend school, which is a convenient way of reaching a large number of individuals from a range of diverse backgrounds. Few physical activity promotion programmes target adolescents older than 13, and few school-based promotion programmes are effective. We developed GoActive based on behaviour change theory, evidence and participatory work with the target group. GoActive is a peer-led physical activity promotion programme which aimed to increase physical activity through increased social support, self-efficacy, group cohesion, friendship quality and self-esteem. GoActive is delivered to whole year groups, aiming to reduce stigma associated with focusing on particular at risk groups.

Objectives

The overall objective of this cluster-randomised controlled trial was to assess the effectiveness and cost-effectiveness of the GoActive intervention in increasing daily moderate-to-vigorous physical activity in 13-14 year-old (Year 9) adolescents.

The specific aims of the project were:

1. To assess the post-intervention and 10-month effectiveness of the GoActive programme to increase average daily acceleterometer-assessed moderate-to-vigorous physical activity among 13-14 year-old adolescents.
2. To assess the effect of GoActive on the following secondary outcomes:
    a) Accelerometer-assessed sedentary time, light physical activity and overall physical activity during school time, weekday evenings and weekends;
    b) Student-reported physical activity participation, self-efficacy, peer support, self-esteem, friendship quality, and wellbeing
    c) Body composition.
3. To assess short term (within-trial) and potential long term cost-effectiveness of the programme.
4. To assess programme acceptability, uptake, maintenance and dose.
5. To investigate potential moderation of intervention effects (by gender, socio-economic status, ethnicity, Baseline activity level, weight status), and potential mechanisms of effect by proposed mediators, including peer support, friendship quality, self-efficacy and self-esteem using a mixed-methods approach.

Methods

Intervention

Older adolescent mentors and in-class-peer-leaders were trained to encourage classes to select two new activities each week (of 20 available). At least one period of tutor (class) time a week was allocated to participate in these activities. Students gained points and rewards for activity in and out of school; points were offed on an individual account on the GoActive

website. During the first 6 weeks (of 12 weeks), a facilitator (health trainers employed and funded by local councils) worked with schools.

Study design

We report on a two-arm cluster randomised controlled trial in 16 secondary schools to compare the GoActive intervention (8 schools) against a usual care control condition (8 schools). A mixed-method process evaluation was conducted simultaneously in addition to an assessment of cost-effectiveness. Ethical approval was obtained from the University of Cambridge Psychology Ethics Committee.

Inclusion criteria

All state-maintained co-educational schools including Year 9 students located in Cambridgeshire or Essex were eligible for inclusion. All Year 9 students in participating schools were eligible for participation in the study.

School & participant recruitment

All eligible schools (n=103) were invited. Those that expressed interest were provided with further information and 16 schools agreed to participate. All Year 9 students in participating schools and their parents/carers, were provided with study information and were invited to participate in the study. Year 9 participants provided written informed assent and parents provided passive consent (opt-out). All those involved in assessment of intervention delivery (mentors, teachers, facilitators) provided informed consent.

Measures

Measurements were taken at four time points:

Baseline: Early in Year 9 (September 2016–January 2017)

Mid-intervention: Six weeks after intervention start (April to May 2017)

Post-intervention: 14-16 weeks after intervention start (May to July 2017)

10-month follow-up: 10-month after end of intervention (April-July 2018)

Outcome assessments using identical procedures were undertaken at Baseline and 10-month follow-up, these included accelerometer-measured physical activity for seven days (wrist worn Axivity; primary outcome), anthropometry (measured), questionnaires regarding secondary outcomes including self-reported physical activity, social support, self-efficacy, friendship quality and self-esteem. Participant demographic characteristics were additionally included in questionnaires at Baseline. Questionnaire-based measures relating to process evaluation were also assessed at Mid-intervention, Post-intervention and 10-month follow-up. Secondary outcomes and accelerometer-based physical activity assessment were additionally conducted at Post-intervention. Trained measurement staff, blinded to allocation, conducted measurements using standardised protocols and instruments.

Qualitative process evaluation data were collected from intervention schools only and included direct observations, purposively sampled, semi-structured individual and focus group interviews with students, and mentors. Individual interviews were also conducted with local authority-funded facilitators. Direct observations of two GoActive sessions at each school were conducted. Additional data were collected via participant questionnaires (completed by students, teachers, older adolescent mentors, and local authority-funded facilitators in all intervention schools), and website analytics.

A within trial cost-effectiveness analysis comparing the GoActive intervention with control was conducted from the perspective of the school funder. Cost per school and per participant was calculated based on facilitator and teacher time input, and materials. Quality Adjusted Life years (QALYs) were assessed using the UK Child Health Utility 9D (CHU-9D) at Baseline, Post-intervention and 10-month follow-up.

Data analysis

Quantitative analysis was conducted using appropriate descriptive statistics. Recruitment of schools and participants were presented as a flow chart. Summaries of the primary (accelerometer-assessed moderate to vigorous physical activity at 10 months post-intervention) and secondary outcomes were presented by intervention and control group by

school allocation using a complete-case analysis based on the intention to treat principle. The primary outcome was also analysed in the per-protocol population. The intervention effect, was Baseline-adjusted difference in change from Baseline between the intervention and control groups and was estimated using a linear regression model including randomisation group, Baseline values of the outcome (i.e. analysis of covariance), and the randomisation stratifiers (pupil premium, county). Robust standard errors were calculated to allow for the non-independence of individuals within schools. Sensitivity analyses were conducted to explore implications of missing data. Continuous secondary outcome variables were analysed using similar methods.

For the primary outcome and secondary outcomes, effect modification by (1) gender, (2) socioeconomic status (medium or lower vs. high according to family affluence score score), (3) ethnicity (white vs. any other ethnic background), (4) Baseline physical activity, (5) weight status (normal weight vs. overweight or obese) was tested with an F-test of the relevant multiplicative interaction parameter in the ANCOVA model. Subgroup analyses were performed within all categories defined by these variables. These models were repeated for physical activity secondary outcomes with subgroup analyses only conducted for significant interactions.

Mediation of primary outcome (moderate to vigorous physical activity) and wellbeing was assessed using linear regression models stratified by gender (adjusted for age, ethnicity, language, school, BMI z-score, Baseline values), assessing associations between (1) exposures and mediators, (2) exposures and outcomes (without mediators) and (3) exposure and mediator with outcome using bootstrap resampling.

Qualitative data were analysed thematically using a six-phase approach. Data were organized into manageable segments of text and assigned codes. Patterns and connections among them were identified. All codes were compared, discussed, and agreed upon prior to coding all other interviews. Codes were revisited and abridged into broader themes.

Process evaluation related questionnaire data collected from all participating Year 9 students, mentors, teachers, and facilitators from schools who agreed to run the GoActive intervention (n=8), and qualitative data, were used to assess intervention delivery, provide information about the differential implementation rates of the intervention's essential functions, fidelity, enjoyment and satisfiability overall and for each individual school. Qualitative and quantitative data were merged in an integrative mixed methods convergence matrix, which denoted convergence and dissonance across datasets.

Results

Of 103 eligible schools approached, 16 agreed to take part. Of 3405 eligible students in participating schools, 84.1% were recruited (n=2862); 1319 were in the eight control schools and 1543 were in the eight intervention schools. 76% (n=2167) of 2862 students attended a 10-month follow-up assessment; we analysed the primary outcome in 1874 participants (65%). At 10 months, time spent doing moderate-to-vigorous activity did not differ significantly between adolescents at intervention schools versus those at control schools (Baseline-adjusted difference –1.91 min [95% CI –5.53; 1.70]; p=0.32).

In the per protocol population (285 students in intervention schools and 871 in control schools at 10 months), results were similar (Baseline-adjusted difference –1.87 min [–6.80; 3.06]; p=0.47]). Among controls weekday sedentary time was lower and light intensity activity higher at 10-months. Non-significant indications of differential impact were detrimental among boys moderate-to-vigorous/min/day (boys -3.44 [-7.42; 0.54], girls -0.20 [-3.56; 3.16]) but favoured adolescents from lower socio-economic backgrounds (medium/low 4.25 [-0.66; 9.16], high -2.72 [-6.33; 0.89]).

The cost of delivering the intervention was estimated at £2520 per school compared with control schools. The average cost per student was £13.06. The mean QALYs accrued was 1.241 in the intervention group versus 1.244 in the control group (difference adjusted for Baseline data -0.006 (-0.017; 0.005)). The point estimates thus suggest GoActive was both more expensive and yielded fewer QALYs than control, that is it is dominated by control

(although we add the caveat that we did not detect a statistically significant difference in QALYs).

Focus groups (n=11 Years 9s, n=58 mentors) and individual interviews (Year 9s, n=16, facilitators n=7, teachers n=9) were conducted. Six schools had 2 direct observations; 2 schools had only one. Triangulation of process evaluation data, including observational data, and individual and focus group interview data, revealed that the GoActive programme was not consistently implemented. GoActive was implemented to some extent in all of the schools but reach was low; 39.4% of participants in intervention schools reported received the GoActive sessions. Facilitators to the implementation of the GoActive intervention included peer buy-in, school support, embedding a routine, and mentor and tutor support. Challenges negatively impacting implementation included school-level constraints, such as having limited space for physical activity, time, uncertainty of the roles subgroups played within GoActive, and sustaining Year 9 student engagement. Despite low implementation within and between schools, students, teachers and mentors mostly enjoyed GoActive (63%, 70% and 87% respectively).

Boys decided on the selection of GoActive activities more often than girls as they tended to lead class discussions around activity choice, and students in the class tended to follow the suggestions from boys. Boys (vs. girls) preferred class-based sessions; qualitative data suggested that this was because boys preferred competition, which was supported quantitatively. Questionnaire data suggested that boys enjoyed trying new activities more than girls; qualitative data indicated a desire to try new activities across all subgroups, but identified barriers to choosing unfamiliar activities with self-imposed choice restriction leading to boredom. Qualitative data highlighted critique of mentorship; students liked the idea, but older mentors did not meet expectations of the students.

Mediation analysis did not support the use of any of the included intervention components to increase physical activity. However, among boys, higher perceived teacher and mentor support were associated with improved wellbeing via various mediators. Among girls, higher

perceived mentor support and perception of competition and rewards were positively associated with wellbeing via self-efficacy, self-esteem and social support.

Conclusions

Despite GoActive being a rigorously developed school-based intervention it was no more effective than standard school physical activity at preventing declines in adolescent physical activity. The GoActive intervention was also not cost-effective. Physical activity declined in both the intervention and control groups in line with population level changes.

Low intervention fidelity has implications for the conclusions drawn. If the intervention was either not delivered or not engaged with by students as intended, then no matter how robust the trial design, methods and analysis, they only give certainty to the findings pertaining to a low fidelity intervention. So, in concluding that the intervention was not effective, there is a caveat that it was not effectively delivered.

Although successful at pilot stage, multiple challenges and varying contextual considerations hindered the implementation of the GoActive programme to multiple school sites. The mixed methods process evaluation provides important insight to understand the outcome results, and to guide future approaches to school-based physical activity intervention design and delivery. Barriers to implementation and upscaling have been identified, and ways to overcome them warrant in-depth consideration, and innovative approaches, when designing physical activity interventions.

The intervention component ‘mentorship’ was liked in principle but implementation issues undesirably impacted satisfaction; competition was disliked by girls and shy/inactive students. The detrimental impact among boys for average daily moderate-to-vigorous physical activity contrasts with higher intervention acceptability among boys; gender differences in intervention delivery did not manifest as expected regarding effectiveness possibly due to gendered attitudes and expectations regarding physical activity. Results highlight the importance of considering gender differences in preference of certain intervention components such as rewards, and the need for extensive mentorship training.

Mediation analysis did not support the use of any of the included intervention components to increase physical activity but if implemented well, mentorship could increase wellbeing among adolescents. Teacher support and class-based activity sessions may be important for boys' wellbeing, whereas rewards and competition warrant consideration among girls. Given the strong influence of peers and the social influence in this age group, developing successful interventions should look to include verbal persuasion, modelling and social support.

We need to find new ways for researchers to effectively work with schools to increase student physical activity. It will be important to involve stakeholders at all levels of the school system, including students, to help design better programmes.

Taken together with the existing evidence based on the effectiveness of school based physical activity promotion interventions, we recommend caution when designing, commissioning and proliferating school-based physical activity promotion strategies and suggest being realistic about expectations of effect.

Trial registration

Trial registered as ISRCTN31583496

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