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MORGAN

RUNNING HEAD: Physical self-perception and adolescent boys

SHORT COMMUNICATION

Improving physical self-perception in adolescent boys from disadvantaged schools: Psychological outcomes from the Physical Activity Leaders randomised controlled trial

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ABSTRACT

Objectives: To evaluate the effect of a school-based obesity prevention program on physical self-perception and key physical-activity related cognitions in adolescent boys from disadvantaged secondary schools. A secondary aim was to determine if any psychological changes were associated with improved weight status.

Methods: Participants (n=100, age = 14.3[0.6]) were randomized to the PALS (Physical Activity Leaders) intervention (n=50) or a control group (n=50) and assessed at baseline, 3- and 6-month follow up. Measures included BMI, BMI z-score and % body fat (bioelectrical impedance analysis). Students also completed the Children's Physical Self-Perception Profile and a physical activity-related cognitions questionnaire. The findings include secondary data analyses.

Results: Relative to the controls, the PALS group significantly increased their physical self worth ($p=.01$), perceived physical condition ($p=.02$), resistance training self efficacy ($p<.001$) and their use of physical activity behavioural strategies ($p=.02$).

Conclusions: A school-based obesity prevention program that targeted leadership skills improved psychological health in the physical domain in adolescent boys from disadvantaged schools.

Keywords: adolescent; obesity, physical self-perception school; resistance training.

Australia and New Zealand Clinical Trials registry (ACTRN12609000414213).

INTRODUCTION

Obesity prevalence in adolescents has been increasing worldwide over the past 20 years (1). Obesity is associated with both physiological and psychological health consequences (2). Arguably, the most concerning obesity consequences for adolescents are psychological. The aspects of psychosocial well-being that have been recognised as most adversely effected by obesity include a negative body image, a low self-esteem and less emotional well-being (3). Adolescence is a critical period for the development of self-concept (4) and physical self-perception has been identified as an important contributor to global self-esteem during this time (5) and an independent predictor of psychological health (6). Notably, the development of positive self-perceptions may be an important foundation for a healthy lifestyle (7). It has been recommended that interventions be designed and evaluated that focus on improving psychosocial health in adolescents (8).

A recent systematic review identified a dearth of quality studies evaluating the effects of school-based obesity prevention programmes on aspects of psychosocial well-being, and no studies were identified specifically targeting adolescent boys (8). We recently reported the efficacy of a 3-month school-based obesity prevention program (PALs - Physical Activity Leaders) for boys from disadvantaged secondary schools (9). The intervention resulted in clinically and statistically significant effects for BMI, BMI z-score and body fat at 6-month follow-up. The aim of this study was to evaluate the effect of the PALS program on physical self-perception and key physical-activity related cognitions in adolescent boys from disadvantaged secondary schools. A secondary aim was to determine if any psychological changes were associated with improved weight status.

METHODS

The PALs methods have been described in detail elsewhere (9). Briefly, this study was a prospective, two-armed randomized controlled trial. Low active boys from Grade 9 were recruited from four low

socio-economic status schools from the Hunter Region, NSW, Australia. Eligible schools were identified using the NSW DET Priority Schools Program (PSP) classification. The PSP was set up in 2006 by the NSW state government to identify disadvantaged schools and provide them with additional funding, staffing and consultancy to support students from communities with the highest concentrations of low SES families. The decision to include schools in the PSP is made by the NSW DET and is based on the level of employment, education, and Indigenous status of the schools' parents. All of the schools included in the current study had a Socio-Economic Indexes for Areas (SEIFA) score of relative socioeconomic disadvantage of 5 or less.

Physical education teachers at the study schools were involved in identifying and recruiting low-active boys. To be eligible for the study, students were considered by the teachers to be disengaged in PE and/or not currently participating in organized team or individual sports. Participants were randomly assigned to the PALs program or a wait-list control group. The original sample size was calculated to detect differences in the primary outcome, body mass index (BMI). Assessments were conducted at baseline, 3- and 6-month follow-up. Ethics approval for this study was obtained from both the University of Newcastle and the NSW Department of Education & Training. Written informed consent was provided by participants and their parents. The design, implementation and reporting of the PALs study conform to the Consolidated Standards of Reporting Trials (CONSORT) guidelines for randomized trials (10). The study was registered with Australia and New Zealand Clinical Trials registry (ACTRN12609000414213).

PALs was a multi-component school-based intervention that included enhanced school sport sessions with a focus on resistance training, physical activity and nutrition handbooks with home-based challenges, interactive seminars addressing key lifestyle physical activity and nutrition behaviors, leadership principles, and self-directed lunch-time exercise sessions. The boys were encouraged to become physical activity leaders in their schools and at home and accreditation was provided to students who complied with the program.

Height, weight and BMI were determined using standard methods. Percentage body fat was determined using a previously validated Imp™ SFB7 bioelectrical impedance analyser (11). The adolescent version (12) of the original Physical Self-Perception Profile was used to provide a measure of self-esteem in the physical domain and has been previously validated (13). The *Children's Physical Self-Perception Profile* consists of five 6-item subscales (Cronbach's alphas in this sample): *overall physical self-worth* ($\alpha = .83$), *sports competence* ($\alpha = .81$), *physical condition* ($\alpha = .82$), *body attractiveness* ($\alpha = .82$) and *strength* ($\alpha = .76$). Note, physical self-worth is made up of the four sub-domains. A four-choice structured alternative questioning format is used by the C-PSPP to minimise socially desirable responses. Physical activity-related cognitions were assessed using a number of validated instruments: *Resistance training self-efficacy* (5-item scale (14); $\alpha = .73$); *Peer support for physical activity* (5-item scale (15), $\alpha = .86$); *Physical activity self-efficacy* (8-item scale (16), $\alpha = .88$); and *Physical activity behavioural strategies* (6 item scale (17), $\alpha = .89$).

Analyses were performed using PASW Statistics 18 (SPSS, Chicago, IL, USA) and statistical significance set at $p < .05$. Linear mixed models were used to assess outcomes for the impact of group (intervention and control), time (treated as categorical with 3 levels) and the group-by-time interaction, these three terms forming the base model. To examine potential clustering of effects at the school level, school was nested within both the treatment and treatment-by-time terms as fixed effects and these terms were used in the final models. Analyses included all randomized participants. Effect sizes were determined using Cohen's d. Pearson's and Spearman's rank (non-normal data) correlations were used to investigate the association between changes in weight-related outcomes and changes in psychological outcomes. The findings include secondary data analyses.

RESULTS

All participants were born in Australia and spoke English at home. Additional baseline characteristics are reported in Table 1. Retention rate at 6-months was 82%. Table 2 displays intervention results. There were significant group-by-time interaction effects for BMI ($p < 0.001$, $d = 0.7$) and % body fat ($p = 0.04$, $d = 0.5$). Significant intervention effects were found for overall physical self-worth ($p = 0.01$, $d = 0.33$) and perceived physical condition ($p = 0.02$, $d = 0.45$). No treatment effect was found for the subscales perceived body attractiveness or perceived physical strength. Significant treatment effects were found for resistance training self efficacy ($p < 0.001$) and physical activity behavioural strategies ($p = .02$). No treatment effect was found for physical activity self-efficacy or social support for physical activity. An inverse association was found between change in physical activity behavioural strategies and change in BMI ($r = -0.29$, $p < 0.01$) and % body fat ($r = -0.21$, $p = 0.05$) and change in BMI and change in perceived physical condition ($r = -0.24$, $p = 0.04$). An inverse association was also found between change in % body fat and change in perceived body attractiveness ($r = -0.22$, $p = 0.05$), perceived physical condition ($r = -0.23$, $p = 0.05$) and self efficacy for resistance training ($r = -0.27$, $p = 0.01$).

DISCUSSION

The PALS intervention was unique in that it focused on school-based resistance training and novel leadership tasks to improve the competence and confidence of boys in the physical domain. The PALS program resulted in significant intervention effects for overall physical self-worth, perceived physical condition, resistance training self-efficacy and physical activity behavioural strategies. Additionally, the intervention effect for perceived sports competence was marginally significant. We also found that changes in weight-related variables were significantly associated with physical self-

perceptions, in particular the sub-domains of perceived physical condition and perceived body attractiveness.

Although there is limited evidence of the impact of school-based obesity prevention programs on psychological outcomes (8), a number of studies targeting physical activity improvements in adolescents have examined intervention effects on physical self-perception, albeit many in adolescent girls (18). Most of these have targeted aerobic activity and findings have been mixed. Our findings for physical self-worth are encouraging, given it is an important index of psychological health in adolescents (8). There is remarkably little evidence regarding the impact of resistance training exercise programs on physical self-perception of adolescents, despite the established physiological benefits of this form of training (19). It has been discussed that muscular strength and masculinity is particularly important for Western males (20) but evidence that resistance training may have a beneficial effect on psychological health in young people is limited (21). Yet our findings suggest this may be important for adolescent boys.

The PALS program was theoretically framed and operationalised key Social Cognitive Theory constructs (self efficacy, social support, outcome expectations, goal setting) to support health behaviour change in an at-risk sub-group of the population. The boys from the intervention group increased their use of physical activity behavioral strategies over the study period. They were provided with a pedometer and taught how to set goals to be more active using their baseline step counts and encouraged to self-monitor and record their pedometer steps and any additional exercises they completed. Dishman and colleagues(22) found that the use of behavioral self-management strategies mediated the relationship between self-efficacy and physical activity in adolescent girls, suggesting that they represent an opportunity for activity promotion in youth. Furthermore, a recent systematic review highlighted that pedometers are considered a useful strategy for increasing physical activity in adolescents (23).

In one of the only other studies that targeted resistance training in secondary school students and measured psychosocial outcomes, a treatment effect was found for girls and not boys (14). This disparity may be explained as the PALS intervention targeted boys only and focused on leadership tasks providing boys with opportunities to teach younger boys resistance training principles and skills, which may explain the intervention effect for resistance training self-efficacy.

While we found no change in perceived body attractiveness, it also has been argued that not worsening psychosocial aspects is a positive finding, particularly in populations that are not exclusively overweight or obese (8). The limitations of our study may have included limited statistical power for our psychosocial outcomes. Additionally, we did not collect extensive demographic information from students, however our study population is representative of the region in which the study was conducted. Future research should examine the effectiveness of PALS in a larger trial. In summary, a school-based obesity prevention program that targeted leadership skills and resistance training in adolescent boys from disadvantaged schools improved self concept in the physical domain.

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AUTHORS' CONTRIBUTIONS

- 1 PJM and DRL contributed significantly to this manuscript through conception, design and
- 2 implementation. All authors were responsible for data analysis and interpretation and the drafting of
- 3 this manuscript. All have read and approved the final version.

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Table 1 Baseline characteristics for physical self-perceptions and physical activity-related cognitions in adolescent boys randomized to the PALs intervention and control groups (Australia, June to December 2009)

	<i>Control</i>		<i>PALs Intervention</i>		<i>Total</i>	
	<i>(n = 50)</i>		<i>(n = 50)</i>		<i>(n = 100)</i>	
	<i>Mean</i>	<i>(sd)</i>	<i>Mean</i>	<i>(sd)</i>	<i>Mean</i>	<i>(sd)</i>
Age	14.2	0.4	14.4	0.7	14.3	0.6
BMI (kg/m ²)	22.4	4.9	21.8	4.3	22.1	4.6
% body fat	18.4	9.0	20.3	8.5	19.4	8.8
Physical Self Perception^a						
Physical self worth	2.68	0.61	2.57	0.54	2.62	0.58
Sports competence	2.71	0.47	2.48	0.64	2.60	0.57
Perceived physical condition	2.67	0.55	2.44	0.54	2.56	0.55
Perceived body attractiveness	2.29	0.57	2.31	0.50	2.30	0.53
Perceived physical strength	2.41	0.50	2.38	0.49	2.40	0.50
PA-related cognitions						
PA self efficacy ^b	3.63	0.77	3.52	0.61	3.57	0.69
Resistance training self efficacy ^b	3.57	0.64	3.47	0.62	3.52	0.63
Social support for PA ^c	3.31	0.75	3.08	0.94	3.20	0.86
PA behavioural strategies ^c	3.55	0.80	3.24	0.85	3.40	0.84

Abbreviations: sd = standard deviation; n = number; PA = Physical Activity; PALs = Physical Activity Leaders

^a each item is scored from 1 (low self-perception) to 4 (high self-perception).

^b measured on a 5-point Likert scale (1= Strongly Disagree to 5 = Strongly Agree)

^c measured on a 5-point Likert scale (1= Never to 5 = Daily)

1 **Table 2: Changes in physical activity cognitions and physical self-esteem measures by**
 2 **treatment group at 3 and 6 months (ITT analysis) (n=100) (Australia, June to**
 3 **December 2009)**

Outcomes	Month	Treatment group		Mean difference between groups (95% CI) ^b	Group *	Effect
		Mean change from baseline (95% CI) ^a			Time	Size ^c
		Control (n = 50)	PALs intervention		<i>P</i>	(Cohen's <i>d</i>)
BMI (kg/m ²)	3	-0.0 (-0.2, 0.2)	-0.1 (-0.3, 0.1)			
	6	0.0 (-0.3, 0.3)	-0.7 (-1.0, -0.4)	-0.8 (-1.2, -0.3)	< 0.001*	0.7
% body fat	3	-1.4 (-2.5, -0.4)	-3.3 (-4.3, -2.2)			
	6	-4.9 (-6.0, -3.8)	-6.7 (-7.9, -5.6)	-1.8 (-3.5, -0.2)	0.04*	0.5
Physical Self						
Perception ^d						
Physical self	3	-0.17(-0.29,-0.05)	0.09(-0.03,0.21)			
worth	6	-0.14(-0.27,-0.02)	0.05(-0.08,0.18)	0.19(0.01, 0.37)	0.01*	0.33
Sports	3	-0.10(-0.20,0.01)	0.09(-0.02,0.20)			
competence	6	-0.04(-0.16,0.08)	0.10(-0.03,0.23)	0.14(-0.04,0.32)	0.06	0.25
Perceived physical	3	-0.04(-0.16,0.07)	0.18(0.06,0.30)			
condition	6	-0.11(-0.24,0.03)	0.15(0.01,0.29)	0.25(0.06,0.45)	0.02*	0.45
Perceived body	3	-0.02(-0.17,0.13)	-0.01(-0.16,0.15)			
attractiveness	6	0.08(-0.06,0.21)	0.10(-0.04,0.25)	0.03(-0.17,0.23)	0.96	0.06
Perceived	3	0.17(0.05,0.29)	0.27(0.14,0.39)			
physical strength	6	0.04(-0.09,0.17)	0.18(0.04,0.32)	0.14(-0.05,0.32)	0.33	0.28
PA-related						
cognitions ^d						
PA self efficacy	3	0.06(-0.07, 0.19)	0.03(-0.10, 0.17)			
	6	0.09(-0.04, 0.21)	0.04(-0.10, 0.18)	-0.05(-0.24,0.14)	0.88	0.07
Resistance training	3	-0.12(-0.26,0.03)	0.32(0.17,0.47)			
self efficacy	6	-0.03(-0.19,0.12)	0.44(0.27,0.61)	0.47(0.24,0.71)	<0.001*	0.75
Social support for	3	0.19(0.02,0.36)	0.12(-0.06,0.29)			
PA	6	0.13(-0.07,0.33)	-0.03(-0.24,0.18)	-0.16(-0.45,0.13)	0.52	0.19

PA behavioural	3	-0.12(-0.27,0.03)	0.18(0.03,0.34)			
strategies	6	-0.13(-0.34,0.08)	0.22(-0.01,0.44)	0.35(0.04,0.66)	0.02	0.42

Abbreviations: PALs = Physical Activity Leaders; - = minus; CI = confidence interval; PA = Physical Activity

^aTime differences were calculated as (3-months minus baseline) and (6-months minus baseline)

^bBetween group differences at 6-months [intervention(6-months-0-months) minus control(6-months-0-months)]

^ccalculated using mean differences (6-month-baseline) from the mixed model and the pooled standard deviation of the two groups at baseline ($d = (M_1 - M_2) / \sigma_{\text{pooled}}$).

^d N = 75

*p<0.05