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Rationale and study protocol for the 'Active Teen Leaders Avoiding Screen-time' (ATLAS) group randomized controlled trial: An obesity prevention intervention for adolescent boys from schools in low-income communities

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ABSTRACT

Introduction: The negative consequences of unhealthy weight gain and the high likelihood of pediatric obesity tracking into adulthood highlight the importance of targeting youth who are 'at risk' of obesity. The aim of this paper is to report the rationale and study protocol for the 'Active Teen Leaders Avoiding Screen-time' (ATLAS) obesity prevention intervention for adolescent boys living in low-income communities.

Methods/design: The ATLAS intervention will be evaluated using a cluster randomized controlled trial in 14 secondary schools in the state of New South Wales (NSW), Australia (2012 to 2014). ATLAS is an 8-month multi-component, school-based program informed by self-determination theory and social cognitive theory. The intervention consists of teacher professional development, enhanced school-sport sessions, researcher-led seminars, lunch-time physical activity mentoring sessions, pedometers for self-monitoring, provision of equipment to schools, parental newsletters, and a smartphone application and website. Assessments were conducted at baseline and will be completed again at 9- and 18-months from baseline. Primary outcomes are body mass index (BMI) and waist circumference. Secondary outcomes include BMI z-scores, body fat (bioelectrical impedance analysis), physical activity (accelerometers), muscular fitness (grip strength and push-ups), screen-time, sugar-sweetened beverage consumption, resistance training skill competency, daytime sleepiness, subjective well-being, physical self-perception, pathological video gaming, and aggression. Hypothesized mediators of behavior change will also be explored.

Discussion: ATLAS is an innovative school-based intervention designed to improve the health behaviors and related outcomes of adolescent males in low-income communities.

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Abbreviations: ATLAS, active teen leaders avoiding screen-time; BMI, body mass index; RCT, randomized controlled trial; PALs, physical activity leaders; MVPA, moderate-to-vigorous physical activity; SDT, self-determination theory; SCT, social cognitive theory; SPANS, schools physical activity and nutrition survey; ICC, intraclass correlation coefficient; SES, socio-economic status; SEIFA, socio-economic indexes for areas

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1. Introduction

The development of youth obesity is driven by a number of complex and interacting factors [1]. While non-modifiable mechanisms are partly to blame, there is strong evidence for the influence of modifiable factors such as physical activity, sedentary behavior and dietary intake in the genesis of youth obesity [1]. Worldwide, there is an estimated 170 million children classified as overweight or obese, with a number of countries reporting combined overweight and obesity prevalence in excess of 20% and as in the US, up to 36% [2]. Similarly, approximately 25% of Australian youth are overweight or obese with higher rates found among those from economically disadvantaged communities [3]. Gender appears to be an additional risk factor, as the prevalence of overweight and obesity among Australian males is higher than females in both adolescents [3] and adults [4]. Consequently, male youth living in disadvantaged communities can be considered a particularly vulnerable group for the development of obesity.

Physical activity confers numerous physiological and psychological benefits during youth including increased bone mineral density, reduced adiposity and higher self-esteem [5]. Furthermore, evidence indicates a dose–response relationship between physical activity and health, in which greater benefits are achieved with increasing levels of activity [5]. Adolescence is a stage during which physical activity declines sharply [6] and global data suggest that 80% of adolescents are not accumulating sufficient activity to accrue associated health benefits [7]. Moreover, physical activity levels are substantially lower among disadvantaged youth [3].

Compounding a reduction in physical activity during adolescence is the amount of time spent in sedentary behaviors. Sedentary behavior is distinct from lack of physical activity and is considered a unique behavioral construct that has an independent relationship with health [8]. The term sedentary behavior incorporates a range of behaviors that require minimal energy expenditure and generally involve sitting or lying down [9]. Of the various sedentary behaviors, screen-based recreation (screen-time) contributes the most to leisure-time sedentary behavior among youth [10]. International guidelines recommend limiting screen-time to less than 2 h per day, but 83% of Australian [11], 71% of English, 64% of Canadian and 54% of US adolescent boys exceed these guidelines [12]. Reducing screen-time has been identified as an important strategy for preventing the development of obesity and improving the psychosocial health of young people [13,14].

Schools have been identified as important institutions for the promotion of health behaviors because they have access to almost all youth and the necessary facilities and personnel [15]. However, school-based obesity prevention interventions targeting adolescents have had mixed success [16]. Our understanding of the factors that contribute to successful interventions is still developing; however, it has been recommended that interventions be designed and evaluated among those most at risk [17,18] such as youth from low-income communities. Furthermore, as both the determinants and the prevalence of obesity are moderated by gender [19], gender-specific programs may be more suitable and efficacious [20–22]. Methodologically rigorous trials targeting economically disadvantaged groups and tailored for specific genders are clearly warranted. The aim of this paper is to provide the rationale and study description for the 'Active Teen Leaders Avoiding Screen-time' (ATLAS) program, an innovative obesity prevention intervention for adolescent boys living in low-income communities.

2. Methods/design

2.1. Study design

The ATLAS intervention will be evaluated using a cluster randomized controlled trial (RCT) (Fig. 1). The 8-month intervention will target adolescent males in Year 8 (second year of secondary school) in 14 co-educational, public secondary schools in New South Wales (NSW), Australia. Assessments were conducted at baseline [November–December (Term 4) 2012], and will be repeated post-program [July–September (Term 3) 2013] and at 18-months post baseline [April–June (Term 2) 2014]. Follow-up data collection for the hypothesized mediators will occur during term 2, 2013 (May–June). These data were collected prior to post-program assessments in recognition that for true mediation to occur, the change in cognitions should precede the change in behavior. The design, conduct and reporting of this cluster RCT will adhere to the Consolidated Standards of Reporting Trials (CONSORT) guidelines for group trials [23]. Ethics approval for this study was obtained from the Human Research Ethics Committees of the University of Newcastle, Australia and the NSW Department of Education and Communities. School principals, teachers, parents and students provided informed written consent.

2.2. Sample size calculation

A power calculation was conducted to determine the sample size required to detect changes in the primary outcomes (i.e., body mass index [BMI] and waist circumference) at the primary end-point of 9-months [24,25]. Based on the existing literature, a difference of 0.4 kg m^{-2} was considered to be clinically meaningful in the study sample. Power calculations were based on 80% power with alpha levels set at $p < 0.05$ and assumed a school clustering effect of 0.03 (an intraclass correlation coefficient [ICC] of .03 was observed in a similar school-based obesity prevention trial) [26]. Baseline post-test correlations ($r = .97$) and standard deviation (SD = 1.1 kg m^{-2}) estimates were taken from our pilot study [20]. It was calculated that a study sample of N = 280 students (i.e., 20 students from 14 schools) would provide adequate power to detect a between-group difference of approximately 0.4 kg m^{-2}. Similarly, the proposed sample size would be adequately powered to detect a between-group difference of 1.5 cm in waist circumference ($r = .96$, SD =11.6 cm). Considering potential drop out among participants of 20% at the primary end point of 9-months [20,21], we aimed to recruit 350 participants from 14 schools (i.e., 25 from each school).

2.3. Setting and participants

The Socio-Economic Indexes for Areas (SEIFA) of relative socioeconomic disadvantage was used to identify eligible secondary schools. The SEIFA index (scale 1 = *lowest* to 10 = *highest*) summarizes the characteristics of people and

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