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Doping prevention through anti-doping education and practical strength training: The Hercules program

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ABSTRACT

There is a paucity of well-controlled anti-doping interventions. We developed and evaluated the efficacy of a doping prevention program for adolescents – the Hercules program. The program is different from most anti-doping interventions in the combination of theoretical lessons with practical strength training and inclusion of three groups of participants. A total of 202 high school students (females = 98) aged 15–21 years (mean = 16.9) were randomised to the three groups: control (n = 50), theory only (n = 88), and theory with workout (n = 64). Participants completed baseline and posttest questionnaires including demographic, doping use, and psychophysical items/measures. Data were analysed using chi-square tests and mixed between-within analysis of variance. From baseline to posttest, the theory with workout group gained a higher knowledge of anabolic–androgenic steroids (AAS) and their harmful effects as well as a higher increase in strength training self-efficacy. The Hercules program seems valuable in providing adolescents knowledge on AAS and their harmful effects as well as positive strength training skills. The program elucidates the benefits of combining anti-doping education with practical strength training in doping prevention.

1. Introduction

Although users of doping substances experience some positive effects (Evans, 2004), doping use has been linked to negative consequences such as increased aggression and criminality, premature death and suicide, increased transfusion of blood-borne viruses, cardiovascular pathology, liver disease, dependence and polypharmacy, hirsutism and menstrual disorders in females, as well as gynecomastia and sperm motility in males (Darke, Torok, & Duflou, 2014; Gårevik, Rane, Björkhem-Bergman, & Ekström, 2014; Hope et al., 2015; Klötz, Garle, Granath, & Thiblin, 2006; Pope et al., 2013; Robles-Diaz et al., 2015; Sagoe et al., 2015a). Doping use has also been found to negatively impact societal perception of a user's personality or social image (Sagoe, Huang, Molde, Andreassen, & Pallesen, 2015). Indeed, doping users have been found to experience stigmatisation from health providers (Yu, Hildebrandt, & Lanzieri, 2015).

All major international sports bodies have banned the use of doping substances by professional athletes, and these substances such as anabolic-androgenic steroids(s) (AAS) are illegal or controlled in most countries (World Anti-Doping Agency, 2015). Non-medical use of AAS is considered an issue of public health concern with an overall global lifetime prevalence of 3.3% and a lifetime prevalence of 2.3% for high school students (Sagoe, Molde, Andreassen, Torsheim, & Pallesen, 2014). It is estimated that about 30% of AAS users initiate use before age 20 (Pope et al., 2014). Accordingly, concern has been expressed regarding the use of AAS among adolescents and high school students as, apart from the debilitating effects delineated above, adolescent AAS users may experience stunted growth together with possible irreversible cognitive, emotional, and neurological impairment (Cunningham, Lumia, & McGinnis, 2013; Hildebrandt, Langenbucher, Flores, Harty, & Berlin, 2014; Kicman & Gower, 2003).

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The efficacy of some anti-doping interventions, particularly targeting adolescents and high school students, has been evaluated (Elliot et al., 2004, 2008; Goldberg, Bosworth, Bents, & Trevisan, 1990; Goldberg, Bents, Bosworth, Trevisan, & Elliot, 1991; Goldberg et al., 1996a, 1996b, 2007; Nilsson, Allebeck, Marklund, Baigi, & Fridlund, 2004; Ntoumanis, Ng, Barkoukis, & Backhouse, 2014). One of the most comprehensive anti-doping interventions is the Athletes Training and Learning to Avoid Steroids (ATLAS) program (Goldberg et al., 1996b). The program comprised seven classroom sessions as well as seven strength training sessions. The classroom segment of the program consisted of discussions and information about nutrition, exercise alternatives to AAS, information about the effects of AAS, and role-playing sessions on how to resist pressure to use AAS. It was found that the intervention group increased their belief in their own athletic abilities, had more knowledge about AAS and muscle resistance training, better nutrition, did more exercise and had a lowered intention to use AAS compared to a control group.

The preventive benefits of the ATLAS program have been confirmed (Goldberg et al., 2000) although most of these benefits were not corroborated in another investigation (Fritz et al., 2005). In addition, many interventions focusing on negative health risks or fear appeals have been criticised for exaggerating the dangers associated with doping use and not reflecting the experiences of most doping users who appear healthy (Petróczi, Dodge, Backhouse, & Adesanwo, 2014). A more balanced and level-headed information strategy has therefore been recommended (Backhouse et al., 2014; Berning, Adams, & Stamford, 2004; Hoffman & Ratamess, 2006; Petróczi et al., 2014) as studies of campaigns aimed at preventing substance use in general appear to show that many of these fail to achieve their goal (Foxcroft, Ireland, Lister-Sharp, Lowe, & Breen, 2003).

There is a dearth of published well-controlled studies investigating anti-doping interventions (Backhouse et al., 2014). Accordingly, the European Union's Experts in Doping Prevention in Recreational Sports recently recommended national preventive interventions on doping targeting adolescents and young adults (Backhouse et al., 2014). Consistent with this recommendation, we examined the effects of a primary prevention program, the Hercules program, on recreational doping use in high school students. The program is named after Hercules, the Greek hero noted for his extraordinary natural strength and endurance. Like the ATLAS program, the Hercules program is based on social learning theory which suggests that norms related to drug use are learned through observation of models in an individual's environment (Bandura, 1977). Additionally, the program is founded on the health belief model which indicates that decisions concerning drug use are based on the perceived susceptibility to and severity of the effects of the drug (Janz & Becker, 1984). The program is also anchored in the theory of planned behaviour (Ajzen, 1985) which proposes that behavioural intention (e.g. concerning AAS use) is determined by attitudes, subjective norms and perceived control related to abstinence from AAS use.

The ATLAS program includes and compares two groups: control and theory with workout. This design advances a partitioning problem, raising difficulties in the identification of the unique effect of the theoretical education component in the intervention. In building on the ATLAS program, the Hercules program combines practical strength training and theoretical anti-doping lectures. However, to our knowledge, the present Hercules program is the first anti-doping intervention to include and compare three groups of participants: control, theory only, and theory with workout. Based on the literature reviewed above, we hypothesised that compared to the control, and theory only groups, the theory with workout group will from baseline to posttest have significantly: (a) higher knowledge of AAS and their negative effects, (b) lower prevalence of intent and actual use of AAS, (c) healthier nutrition behaviour, (d) higher strength training self-efficacy, (e) better skills to resist pressure to use drugs, (f) higher muscle appearance satisfaction, and (g) higher negative attitude towards the use of doping substances.

2. Method

2.1. Participants

From three schools located in Vestfold County, Norway, 12 classes and 324 high school students were invited to participate in the study. At baseline, 257 students from 11 classes enrolled in the study (response rate = 79.3%) with 202 of these participating in the posttest (dropout rate = 21.4%).

Participants were randomly assigned to one of three groups: control, theory only, and theory with strength training. The control group comprised 50 students (females = 29). Their ages ranged from 15 to 20 years (mean = 16.6, *SD* = .79) at baseline. The theory only participants were 88 students (females = 36) aged between 16 and 21 years (mean = 16.9, *SD* = .69). The theory with workout group consisted of 64 students (females = 33). At baseline, their ages ranged between 16 and 18 years (mean = 16.9, *SD* = .39).

The overall lifetime and current prevalence of AAS use was 1.5% (95% CI = 0.18 – 3.18) at baseline (males = 1.0%, females = 2.0%). Current prevalence was 0.0% at posttest. Moreover, 20.8% (baseline) and 20.3% (posttest) of participants reported personally knowing at least one former or current AAS user.

The theory with workout group consisted of a higher proportion of organised sports participants followed by the theory only group, and the control group [baseline: χ^2 (2) = 11.2, $p < .01$, Cramer's $V = .236$; posttest: χ^2 (2) = 9.2, $p < .05$, Cramer's $V = .214$] (see Table 1). Other baseline and posttest characteristics of the sample are presented in Table 1 and were not different across groups.

2.2. Measures

All participants completed an electronic questionnaire at baseline and after the intervention. The questionnaire consisted of the following elements.

2.2.1. Demography

This comprised questions about age, gender, living situation, number of siblings, and sports participation.

2.2.2. Physical strength

Self-rated physical strength was assessed with the question: "How would you describe your physical strength?" Response options were "far below average", "slightly below average", "average", "slightly above average", and "far above average" – 'compared with my peers'.

2.2.3. AAS use

Use of AAS was assessed with the question: "Have you ever used anabolic–androgenic steroids?" Response options were 'yes and currently', 'yes, but no more', and 'no'. Participants also indicated whether they personally knew a current or former AAS user (yes/no).

2.2.4. AAS knowledge

Due to the lack of established well-functioning scales assessing knowledge of AAS and their negative effects, we developed a multiple choice knowledge test in collaboration with Prof. Harrison G. Pope Jr., a leading expert in the field. The test comprises 21 items, each with four response alternatives whereof one of these represents a correct answer. An example item is: "What are anabolic