



## Review

# Review of the literature on negative health risks based interventions to guide anabolic steroid misuse prevention



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## ABSTRACT

**Background:** Despite the Internet and the WorldWideWeb providing ready access to information on the risks and health consequences of anabolic steroid (AS) misuse for all ages, AS use remains a public health concern. The aim of this narrative review is to examine the ability of negative health consequences information (NHCI) to prevent adolescent AS misuse in the era of the Internet information revolution.

**Methods:** A search of the literature published between January 2000 and March 2014, was conducted to identify studies that examined the effect of NHCI on AS use and other health-related social cognitive constructs and behaviour in adolescent samples.

**Results:** No empirical study was found that specifically investigated the isolated effect of NHCI on AS use. Other health-related intervention studies – involving adolescents – showed that the severity of the consequences tied to social disapproval can be more effective than the severity tied to health consequences. Relevance of NHCI can operate as a moderator or a mediator of the relationship between NHCI and social cognitive constructs and behaviour change. Pre-existing knowledge about negative health consequences functions as a mediator of the relationship between NHCI and social cognitive constructs and outcomes. **Conclusion:** The best way to understand the effect of NHCI on social cognitive constructs and behaviour is to consider it in a larger nomological network that includes perceived severity, vulnerability, relevance and pre-existing knowledge. The review highlights gaps in the literature and suggests directions for future research. Implications for prevention programmes are discussed.

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Following psychotropic drugs, performance and appearance enhancing drugs are among the most commonly studied drugs in adolescents (Dodge & Hoagland, 2011; Kuehn, 2009). Some substances – notably growth hormones and anabolic steroids (AS) – have gained popularity among the general public for their performance and image enhancing properties (Hoffman et al., 2009; Kanayama, Hudson, & Pope, 2008; Kanayama, Hudson, & Pope, 2010; Perls, 2009). AS are synthetic variants of the naturally occurring male hormone, testosterone (Saudan et al., 2006). There are a number of legitimate medical uses for AS (Basaria, Wahlstrom, & Dobs, 2001; Creutzberg, Wouters, Mostert, Pluymers, & Schols, 2003; Johns, Beddall, & Corrin, 2005), but the literature shows that some adolescents misuse (non-prescription use without medical supervision) or abuse (excess unsupervised use) AS to improve athletic performance, physical appearance or size (Cafri, Van der Berg, & Thompson, 2006; Hoffman et al., 2008; Miller et al., 2005). Misuse and abuse of AS is often associated with other substance use (Dodge & Hoagland, 2011). On average, documented global lifetime prevalence misuse of AS is 3.3% with higher prevalence among males (6.4%) than females (1.6%) (Sagoe, Molde, Andreassen, Torsheim, & Pallesen, 2014). Among adolescent samples, AS use is up to 3% for males and less than 1% for females (Dodge & Jaccard, 2006; Dunn & White, 2011; Lorang, Callahan, Cummins, Achar, & Brown, 2011; Mattila, Parkkari, Laakso, Pihlajamäki, & Rimpelä, 2010; Nilsson, Baigi, Marklund, & Fridlund, 2001; Pallesen, Jøsendal, Johnsen, Larsen, & Molde, 2006; Pope et al., 2013). While some studies have reported AS misuse at higher rates among male athletes than male non-athletes (e.g., Dodge & Jaccard, 2006) other studies have found a general reverse trend. For example, this reverse trend was noted in a German study where non-athletes reported higher rate of AS use than recreational or competitive athletes with the latter group reporting the lowest rates of use (Wanijek, Rosendahl, Strauss, & Gabriel, 2007). In contrast, involvement in sport does not differentiate between female AS users (Elliot, Cheong, Moe, & Goldberg, 2007). Across prevalence studies, sport has not been identified as an unequivocal risk factor for AS use, regardless of gender (Harmer, 2010); making AS use a wider public health problem that stretches beyond the sporting arena (Kanayama et al., 2008).

Research with adults has shown that misuse of AS can lead to a number of negative health consequences. In brief, these adverse effects include cardiovascular dysfunction (Lane et al., 2006; Nottin, Nguyen, Terbah, & Obert, 2006), liver dysfunction (Kafrouni, Anders, & Verma, 2007), reproductive difficulties (Knuth, Maniera, & Nieschlag, 1989) and suicide (Middleman, Faulkner, Woods, Emans, & DuRant, 1995; Pärssinen, Kujala, Vartiainen, Sarna, & Seppälä, 2000). A thorough analysis of the adverse effects of AS misuse is presented elsewhere (see Kanayama et al., 2008; Modlinski & Fields, 2006; Payne, Kotwinski, & Montgomery, 2004; Pope et al., 2014) and these analyses suggest the misuse of AS by adolescents may pose significant health consequences. Thus, there is general consensus in the medical and professional community that misuse of ASs by adolescents should be prevented (American College of Sports Medicine, 2004; American Academy of Pediatrics, 2005). Therefore, it is critical to identify effective approaches to prevent the misuse of AS.

Notably, anti-doping and AS use prevention do not necessarily target the same problem. Doping typically refers to an activity that is regulated by sport governing bodies and defined as the use of prohibited substance or methods, including attempt to hide of and assistance in doping use. Anti-doping rules intend to govern the conditions under which sport is played. As such, it involves athletes who engage in competitive sport. On the other hand, AS use is not exclusive to competitive sport. AS use has been demonstrated in fitness as well as amateur- and recreational sports, affecting people as young as 12 years old (Dunn & White, 2011; Kuehn, 2009; Sjöqvist, Garle, & Rane, 2008; Sagoe, Schou Andreassen, & Pallesen, 2014). The fundamental rationale behind anti-doping in competitive sports, namely promoting universal sport values, equality and fair play, may not apply to fitness and recreational sport. Therefore, AS prevention outside competitive sport may be unaffected by the fair play rationale and thus is likely to be primarily concerned with protecting health. The present review focuses on the latter, centering on health and encompassing all levels and spheres of sport when referring to AS prevention as ‘anti-doping’. Such phrasing is characteristic of the literature where the term ‘doping’ is often used to refer exclusively to AS.

## 1. Approaches to prevention

One seemingly logical approach to prevention is to inform adolescents about, or to emphasise, the potentially hazardous health consequences associated with AS misuse. The premise of this approach is that conveying such information persuades adolescents to refrain from misuse. Although this is appealing at an intuitive level, research in the past has shown the opposite effect (e.g., in Goldberg, Bents, Bosworth, Trevisan, & Elliot, 1991 specifically, in relation to anabolic steroids). Thus it is important to establish whether there is new evidence that may support such an approach today. Furthermore it is important to identify the intra-, inter- and extrapersonal factors that can moderate the effect of an information-based intervention emphasizing the risks and negative health consequences of AS misuse.

Another approach to prevention draws from the constructivist perspective. According to this perspective, the amount of information is not the only factor that must be considered when designing AS prevention programmes. Accepting that information does not equate to knowledge, and that knowledge is not independent of the knower, one must also consider the best way to transform information to knowledge and whether the knowledge can be accessed at critical points in the decision making process. While the constructivist approach to developing AS interventions may seem useful, empirical research is needed to develop evidence based programmes that are effective and bring about behaviour change.

Although there are no evidence-based AS prevention programmes that rely exclusively on a constructivist perspective, there are two prevention programmes that incorporate constructivist principles. These programmes fell outside the scope of the review but deserve mention here. They are ‘The Athletes Training and Learning to Avoid Steroids’ ([ATLAS]; Goldberg et al.,

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