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A Psychological Intervention Reduces Doping Likelihood in British and Greek Athletes: A Cluster Randomized Controlled Trial

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Abstract

Background. Current attempts to prevent doping through deterrence and education have had limited success and have been constrained to one country. Targeting psychological variables that have been empirically associated with doping likelihood, intention, or behaviour may help in developing interventions that are effective in preventing doping in sport.

Objectives. Guided by social cognitive theory and empirical research, the main purpose of this research was to develop an anti-doping intervention that targets three psychological variables (i.e., anticipated guilt, moral disengagement, and self-regulatory efficacy) and determine whether it is more effective than an educational intervention in reducing doping likelihood in British and Greek athletes.

Method. Eligible participants were identified via a screening survey administered to 934 athletes in the United Kingdom and Greece. A total of 19 sport clubs (208 athletes) across the two countries were randomly assigned to either the psychological or the educational intervention. Each intervention consisted of six one-hour sessions delivered to small groups of athletes over 6-8 weeks. Athletes completed measures of doping likelihood, anticipated guilt, moral disengagement, and self-regulatory efficacy pre and postintervention and at two-months follow-up.

Results. A multilevel piecewise growth model was used to examine changes in study outcomes. Analysis showed that the psychological intervention was more effective than the educational intervention in reducing doping likelihood from pre to post, but the effects of the two interventions were similar at follow-up. These effects were not affected by country. Both interventions reduced moral disengagement from pre to post, and these effects were maintained at follow-up. The psychological intervention was also more effective than the educational intervention in increasing anticipated guilt from pre to follow-up.

Conclusions. Targeting psychological variables in anti-doping interventions should aid our efforts to prevent doping in sport.

Keywords: anticipated guilt, moral disengagement, self-regulatory efficacy, social cognitive theory

A Psychological Intervention Reduces Doping Likelihood in British and Greek Athletes: A Cluster Randomized Controlled Trial

The use of prohibited Performance Enhancing Drugs (PEDs) and methods, also known as doping, can have significant adverse health consequences for athletes (see Quaglio et al., 2009). Doping is a major threat to the integrity and image of sport, undermines fair play, and contradicts the concept of the 'ideal man' proposed by Coubertin. Despite significant investment by governments worldwide on sophisticated methods to tackle doping, its prevalence remains at high levels in both elite (Elbe & Pitsch, 2018) and amateur athletes (Lazuras et al., 2017a). Recent studies have estimated that intentional doping in adult elite athletes ranges from 14% to 57% (de Hon et al., 2015; Ulrich et al., 2018). In addition, in a recent systematic review, Nicholls et al (2017) reported higher prevalence of doping among young males than young females and among athletes participating in strength-based sports, while the evidence regarding age and ethnicity was equivocal. The need exists, therefore, to tackle this important problem by developing effective interventions that focus on preventing rather than detecting doping.

Current Anti-Doping Interventions

Research in understanding and preventing doping in sport has traditionally viewed doping as just another unhealthy behaviour, thereby applying theoretical models and techniques that are popular in health psychology (see Blank et al., 2016). In a systematic review of 14 interventions aimed to prevent misuse of anabolic steroids, Bates et al. (2019) reported that interventions were predominantly educational, and applied a variety of behaviour-change techniques, such as information provision about health and social consequences, and persuasion. Examples of interventions focusing on information provision are ATLAS (Athletes Training and Learning to Avoid Steroids) and ATHENA (Athletes Targeting Healthy Exercise & Nutrition Alternatives) developed by Goldberg and Elliot (2005). A study evaluating the ATLAS programme (Goldberg et al., 2000) in a large sample of high school American football teams found that the experimental group did not differ in the intent to use anabolic steroids from the control group at the end of the

season and one year later at the school level of analysis. Research evaluating the ATHENA program in high school female student athletes from a variety of sports showed that, compared to a control group, the programme significantly reduced use of body-shaping substances such as anabolic steroids (Elliot et al., 2006). However, the decrease in post-test and long-term follow up intentions to use steroids compared to control participants was small, and there was no effect on steroid use at long-term follow up (Elliot et al, 2008; Ranby et al., 2009). These findings may be because these interventions did not target psychological variables, which have been empirically associated with doping in previous research.

More recent interventions have focused primarily on educating athletes about prohibited substances and their health risks (and giving information about nutritional supplements), but also included information about psychological factors that are relevant to doping. For instance, Barkoukis et al. (2016) provided participants with information about the psychological determinants and moral aspects of doping (e.g., sport values and fair play); Sagoe et al. (2016) informed participants about the ethics of doping and how to resist peer pressure to dope; and Lucidi et al. (2017) and Mallia et al. (2020) implemented a media literacy intervention (e.g., discussed the way the media may disregard or minimize the moral implications of doping, the role of media messages, etc). These interventions changed participants' beliefs or attitudes about doping (Barkoukis et al., 2016; Lucidi et al., 2017), however, they did not produce (or report) a change in doping intentions, and they did not include a follow-up, thus we do not know their long-term effects. In addition, some interventions were delivered in high school or sport science students rather than competitive athletes, did not measure proxies for doping behaviour, such as doping willingness, intention, likelihood, or susceptibility, and in some cases, their findings were not replicated (e.g., Lucidi et al., 2017; Mallia et al., 2020).

Three recent interventions have addressed these issues *and* focused on psychological factors that are relevant to doping. Nicholls et al. (2020) delivered the "iplay clean" programme to a large sample of adolescent athletes and their parents and coaches. The athlete programme consisted of

10 modules (e.g., goals, motivation, playing fair, resisting temptations, making the right decisions, etc). Compared to a no-intervention control group, athletes who attended the iplay clean programme reported reduced doping susceptibility and less favourable attitudes toward doping, both right after the intervention and at the 8-week follow-up. Kavussanu et al. (2021) compared a "moral" intervention (which targeted moral identity, moral disengagement, and moral atmosphere) to a standard educational/knowledge-based intervention (which provided information about anti-doping rule violations, the harms of doping substances, the risks of nutritional supplements, etc) in young athletes recruited from the UK and Greece. In both countries, both interventions were effective in reducing doping likelihood from pre to post, and these effects were maintained at the six-month follow-up. Finally, Ntoumanis et al. (2021) taught coaches recruited from the UK, Greece, and Australia to adopt a motivationally supportive communication style when discussing doping-related issues with their athletes. Compared with athletes in the control group (who received standard information about doping issues), athletes in the intervention group reported greater reduction in willingness to take prohibited substances right after the intervention; however, this effect was not maintained at the two-month follow-up. Differences among the three countries were minor and inconsistent.

Social Cognitive Theory and Doping

A theory that has guided recent empirical doping research is the social cognitive theory of moral thought and action (Bandura, 1991), which is derived from social cognitive theory (Bandura, 1985). Elements of social cognitive theory have been considered in previous studies, however, to our knowledge, no anti-doping intervention has been grounded on this theory despite attempts to target individual constructs (e.g., Kavussanu et al., 2021). The theory considers emotion, a powerful motivator of behaviour, which is typically neglected by theoretical approaches to doping that focus primarily on cognitive variables (see Ntoumanis et al., 2014). Within the social cognitive theory of moral thought and action (Bandura, 1991), individuals are viewed as active agents in the decision-making process, making decisions that are informed by

their moral standards, which are formed over time via interaction with significant others. Via a self-monitoring process, behaviour is compared with what is expected based on moral standards, eliciting positive or negative affective self-sanctions, depending on whether the behaviour is in line with, or contravenes their moral standards (Bandura, 1991). These self-sanctions regulate behaviour anticipatorily: People do the right thing because they expect to experience positive emotions and refrain from bad behaviour to avoid self-condemnation. Thus, within social cognitive theory (Bandura, 1985, 1991), emotion is a central regulator of moral action.

The role of emotion in relation to doping has received much research attention (see Kavussanu, 2019). Specifically, researchers have examined guilt, a self-conscious moral emotion that has been inversely associated with unethical behaviour in non-sport contexts (Tangney et al., 2007). Athletes who dope may feel guilt because doping is against the rules of sport, and they know that by doping they break these rules. Indeed, qualitative studies have consistently shown that doping is regarded as cheating, seen as morally wrong, and is anticipated to lead to feelings of guilt and shame (e.g., Erickson et al., 2015). Guilt that athletes would anticipate feeling if they were to use prohibited performance-enhancing substances has been strongly and inversely associated with doping likelihood in athletes from a variety of sports and competitive levels (e.g., Boardley et al., 2017; Kavussanu et al., 2020; Ring et al., 2019). Anticipated regret, an emotion conceptually similar to guilt, has also been linked to doping predicting doping intention over and above the effects of past use of doping substances and nutritional supplements (Lazuras et al., 2017b). In light of the strong and consistent theoretical and empirical links between guilt (or regret) and doping, this self-conscious emotion needs to be considered in our doping prevention efforts. However, to our knowledge, to date no anti-doping intervention has specifically targeted the guilt athletes would anticipate experiencing if they were to use prohibited substances.

Although negative self-sanctions such as guilt operate to prevent transgressive behaviour, people do not always act as they should. They are able to selectively de-activate moral self-censure, thus minimizing negative emotions that typically ensue from transgressive acts, via a set

of cognitive mechanisms collectively known as moral disengagement (Bandura, 1991). For example, athletes may refer to doping as "juice" or "vitamins" (i.e., euphemistic labelling) so that the behaviour does not sound as bad; they can absolve themselves of responsibility by thinking that "everybody does it" or that their coach, medical personnel, or team captain told them to do it (i.e., displacement and diffusion of responsibility); they can ignore or distort the consequences of their behaviour for others (i.e., distortion of consequences); and they can contrast doping with worse behaviours, such as the use of illegal drugs (i.e., advantageous comparison), thereby making it appear less serious. The strong relationship between moral disengagement and proxies of doping behaviour has been supported in cross-sectional (Boardley et al., 2017; Kavussanu et al., 2016, 2020), longitudinal (Ntoumanis et al., 2017), and experimental (Ring & Hurst, 2019; Stanger & Backhouse, 2020), studies. Thus, moral disengagement is another important factor that should be targeted in our doping-prevention efforts.

A central construct in social cognitive theory (Bandura, 1997) is self-regulatory efficacy, which represents one's perceived capacity to cope with, or overcome, particular circumstances or situations that might be harmful to the self. Self-regulatory efficacy is important, because it affects behaviour by influencing how well we persevere in the face of adversity, our vulnerability to peer pressure, and the decisions and choices we make (Bandura, 1997). Studies have consistently shown an inverse relationship between self-regulatory efficacy to resist the temptation to dope and doping intention and use in athletes (e.g., Barkoukis et al., 2013; Lucidi et al., 2008; Ring et al., 2019). However, to our knowledge, no intervention study has measured self-efficacy to refrain from doping as an outcome, even though this variable was targeted in some interventions (e.g., Barkoukis et al., 2016). In light of the inverse link between self-regulatory efficacy to resist doping temptation and doping variables in several studies, an intervention that aims to strengthen this variable could be promising for our doping-prevention efforts.

The Present Research

In sum, researchers have traditionally conceptualized doping as unhealthy behaviour, and

applied to anti-doping interventions theoretical models and behaviour-change techniques, which have been successful in health psychology (see Bates et al., 2019; Blank at el., 2016; Ntoumanis et al., 2014); however, these interventions had limited success in reducing doping intention and behaviour. Although some interventions have considered psychological variables that have been empirically linked to doping, they have not shown decreases on proxies of doping behaviour or examined long-term effects (e.g., Barkoukis et al., 2016; Lucidi et al., 2017; Mallia et al., 2020).

To our knowledge, only two studies have focused on psychological factors *and* shown long-term effects on proxies of doping behaviour, such as doping susceptibility and doping likelihood (Nicholls et al., 2020; Kavussanu et al., 2021). Examining the long-term effects of an intervention is essential, particularly in light of evidence showing that anti-doping interventions do not always produce effects that persist over time. Indeed, a recent evaluation of the United Kingdom (UK) Athletics anti-doping education program showed that doping likelihood was significantly reduced from pre to post, however, this reduction was not maintained at the three-month follow-up (Hurst et al., 2020). Finally, with the exception of two studies (Kavussanu et al., 2021; Ntoumanis et al., 2021), interventions designed to prevent doping have been conducted in a single country. As doping in sport is a universal phenomenon, research is needed to determine whether the same intervention can be effective in athletes from different countries, thus contributing to the efforts of World Anti-Doping Agency, which aims to prevent doping globally.

In this research, our aim was to develop and evaluate an intervention grounded on social cognitive theory (Bandura, 1985, 1991, 1997) and determine whether it is more effective than a standard educational intervention in preventing doping in young British and Greek athletes. Our primary outcome was doping likelihood, while our secondary outcomes were anticipated guilt, moral disengagement, and self-regulatory efficacy. These three variables have been empirically associated with proxies of doping behaviour in numerous studies (e.g., Boardley et al., 2017; Kavussanu et al., 2020; Ring & Kavussanu, 2018), thus making them ideal candidates for an intervention aimed to prevent doping. We hypothesized that the psychological intervention would

be more effective than the educational intervention in reducing doping likelihood immediately after the intervention and two months later. We also expected that it would be more effective in increasing anticipated guilt and self-regulatory efficacy and in reducing moral disengagement and that these effects would be maintained two months later. We did not expect differential effects of the two interventions in the two countries (Kavussanu et al., 2021; Ntoumanis et al., 2021).

Method

Design

Our study was a parallel group, two condition, superiority cluster Randomized Controlled Trial (RCT) delivered in UK and Greece with a two-month follow up. The two conditions were the psychological intervention and the educational intervention.

Participants

In order to avoid floor effects (i.e., participants with too low doping likelihood), which have been observed in previous studies (e.g., Elbe & Brand, 2016; Elliot et al., 2004), first, we administered a screening survey to a large sample of athletes ($N = 934$) in the UK and Greece. Eligibility criteria were that participants were at least 16 years old, active athletes, and belonged to a sport club that scored at least 2 on the first item of our doping likelihood measure (described below). Participants were recruited from a variety of individual (e.g., judo, track and field, rowing) and team (e.g., rugby, basketball, football, field hockey) sports. A total of 19 sport clubs[1] and 208 athletes met these criteria, and their characteristics as a function of intervention can be seen in Table 1. Recruitment and follow up were conducted over a 12-month period. No unintended harms or consequences were reported. Optimal Design Software for cluster RCT, with person-level outcomes and repeated measures showed that with 19 clusters, an average cluster size of 11, and intraclass cluster correlation of .36 (for doping likelihood at baseline), we had power of .80 to detect a minimum detectable effect size of 0.48 for our primary outcome (i.e., a mean difference equivalent to 0.48 in units of the population standard deviation of the outcome). Bloom (1995) defines the minimum detectable effect size as “the smallest true effect that can be detected for a

specified level of power and significance level for any given sample size."

Interventions

Each of the two interventions consisted of six one-hour sessions, and each session focused on one theme. The interventions included stories of real athletes and their doping-related experiences to facilitate participant engagement and learning (Singler, 2015), and were identical in duration, mode of delivery, and activity type (i.e., interactive, included videos, encouraged group discussion). The intervention design was in line with suggestions by Backhouse et al. (2016) that the most effective interventions are those that are delivered over long periods (2 – 10 weeks), address a range of topics, and encourage active participation.

Psychological Intervention

The psychological intervention was guided by social cognitive theory (Bandura, 1985, 1991, 1997) and targeted constructs that have been empirically associated with doping likelihood in previous research (Kavussanu, 2019). Each session focused on a specific component of the theory and a single theme. In session 1 (moral agency), we introduced the concept of the ideal athlete and emphasized participants' *choice* to be like an ideal athlete. In session 2 (emotions), we contrasted the emotions (i.e., pride and happiness) experienced by athletes achieving success by competing clean with those who succeed with the help of banned substances (i.e., guilt and shame). In session 3 (moral disengagement), we educated participants about the justifications athletes use for doping, and taught them to challenge these justifications. Session 4 (moral engagement) highlighted the consequences of doping for others, while in Session 5 (self-regulatory efficacy), we presented participants with real stories of highly successful athletes, who resisted the temptation to dope, as they could be role models to be emulated. Session 6 included a review of each of the five preceding sessions. A detailed description of each session can be seen in Table 2.

The intervention was pilot-tested with small groups of student-athletes in the UK and Greece, and participant feedback was used to improve and refine each session. In order to ensure that the content of the psychological intervention was in line with social cognitive theory, two

psychologists with expertise in this theory assessed the fidelity of the intervention using the global fit score (Intervention target the theoretical predictors/constructs) of the Michie and Prestwich (2010) Theory Coding schema. Each expert judged the content of each session and how accurately it reflected social cognitive theory variables or predictors using a 10-point Likert type scale (e.g., To what degree do you consider the session targets accurately the constructs of the theory? Please answer from 1 to 10 for each predictor/construct.) Experts agreed that the content between the intervention and the theoretical framework was very good (average score = 9; *SD* = 0.94) and their agreement was very high for all the sessions evaluated (r = .92).

Educational Intervention

The educational intervention included information from a variety of sources, such as the Australian, British, German and World Anti-Doping Agencies (ASADA, UKAD, NADA, and WADA), and its content was similar to the interventions typically used by these anti-doping organizations to promote clean sport. However, its duration was longer (i.e., six hours) to ensure that it matched the psychological intervention. The topics covered in the six sessions were: (a) introduction to WADA and its role in regulating doping in sport; (b) the doping control process; (c) prohibited substances and their side effects; (d) the risks of supplements; (e) the role of healthy nutrition in benefiting performance and recovery; and (f) whistle blowing and its role in protecting clean athletes. The educational intervention has been used in another study (Kavussanu et al., 2021), and a detailed description of each session can be seen in Table 1S in supplemental material.

Outcomes

Doping Likelihood

In line with past research (e.g., Kavussanu et al., 2016, 2020, 2021), doping likelihood was measured using two hypothetical scenarios. The first scenario described a situation, where athletes had the opportunity to use a prohibited substance to enhance their performance, while the second scenario described a situation where athletes could take a prohibited substance to speed up recovery from injury. The performance enhancement scenario is presented below.

"It's the week before the most important competitive game/event of your season. Lately, your performance has been below your best. You don't feel you have the necessary fitness for this competition, and you're concerned about how you'll perform. You mention this to a teammate, who tells you that he/she uses a new substance that has enhanced his/her fitness and performance. The substance is banned for use in sport, but there's no chance that you will be caught."

After each scenario, participants rated how likely they were to use the prohibited substance on a Likert-type scale with anchors of 1 (*not at all likely*) and 7 (*very likely*). Responses to the two items were highly correlated: for pre: $r(206) = .75$, $p < .001$; for post: $r(190) = .76$, $p < .001$; for follow-up: $r(172) = .76$, $p < .001$. The mean of each of these two items was computed and used as a measure of doping likelihood. Previous research has reported very good internal consistency for this measure (e.g., Kavussanu et al., 2021).

Anticipated Guilt

We measured anticipated guilt with the five-item guilt subscale from the State Shame and Guilt Scale (Marschall et al., 1994). Participants were asked to imagine that they had used a banned substance to significantly enhance their performance in a very important competition and indicate how they think they would feel. The stem for each item was "If I had used a banned substance…" and sample items were "I would feel remorse, regret" and "I would feel bad about what I had done". Participants indicated their responses on a Likert scale anchored by 1 (*not at all*) and 7 (*very strongly*). Marschall et al. (1994) reported very good internal consistency for this measure ($\alpha = .82$). The mean of the five items was calculated and used as a measure of anticipated guilt. The same procedure was used for all variables.

Moral Disengagement

We measured moral disengagement in doping with the Moral Disengagement in Doping Scale (Kavussanu et al., 2016). Participants were asked to read six statements and indicate their level of agreement using a Likert scale anchored by 1 (*strongly disagree)* and 7 (*strongly agree)*.

Example items are “Doping does not really hurt anyone” and “Players/athletes cannot be blamed for doping if their teammates pressure them to do it”. The scale scores have shown very good levels of internal consistency (α range = .82 - .86), and support for the factorial, convergent, concurrent, and discriminant validity of the scale has been provided (Kavussanu et al., 2016).

Self-regulatory Efficacy

Self-regulatory efficacy was measured with an adapted and abbreviated version (Ring et al., 2019) of the Doping Regulatory Self-Efficacy Scale (Lucidi et al., 2008). Participants were asked to indicate their confidence in their ability to avoid using banned substances to improve performance in sport in seven situations using a Likert scale anchored by 1 (*not at all confident*) and 7 (*completely confident*). Thus, the scale consists of seven items (each referring to one situation), and example items were “when most athletes in your sport use them” and “before an important competition, even when you can get away with it”. The scale has shown high levels of internal consistency (α range = .95 - .97) and test-retest reliability (*r* = .76; Lucidi et al., 2008). The adapted scale has also shown excellent internal consistency (α = .97) and factorial validity (Ring & Kavussanu, 2018).

Procedure

Unless otherwise stated, the same procedure was used in the UK and Greece. Upon approval of the research by the first author’s University Research Ethics committee, we administered a screening survey to a large sample of athletes in the UK (*n* = 445) and Greece (*n* = 489) in order to identify eligible clubs. Participants were recruited from sport clubs by contacting club coaches or secretaries via email or telephone, briefly explaining the research, and asking coaches to allow their athletes to take part in the screening survey. The survey included the two scenarios assessing doping likelihood, as well as other measures, not used in this study. During the athlete recruitment phase, the intervention was also developed, translated into Greek, and pilot tested in a small group of athletes in each country.

Clubs whose athletes agreed to participate in the study were randomly assigned to one of the

two interventions (allocation 1:1) by a member of the research team. We assigned clubs rather than individual athletes to avoid contamination of the intervention (see Campbell et al., 2012), which would have occurred if athletes from the same club, assigned to different intervention groups, spoke to each other about what is happening in their group. In the randomization process, we incorporated stratification by sport type and sex to balance these variables across the two groups. In allocating clubs, we used minimization, a process that minimizes the imbalance on important participant characteristics between groups (Moher et al., 2012). Minimization has the advantage of making small groups closely similar in terms of participant characteristics, and trials that use minimization are considered methodologically equivalent to randomized trials, even when a random element is not incorporated (Moher et al., 2012). The nature of the intervention precluded masking of group allocation.

Prior to the start of the intervention, participants were informed about the purpose of the study, that participation was voluntary, and that they would be compensated for attending all six sessions and completing the questionnaires at the three time points. They were given broad information about the content of the intervention, were told that all information obtained would be anonymous and will be used only for research purposes, and provided informed consent. Each intervention was delivered to small groups of 8 - 15 athletes ($M \pm SD = 11 \pm 3$) using PowerPoint presentation software in a classroom setting at the club's training facility. In each country, the two interventions were delivered by the same trained facilitator, once a week, over a period of 6-8 weeks. The two facilitators had experience with delivering educational anti-doping interventions in elite athletes (UK) or teaching small classes of sport science university students (Greece). Prior to the start of the delivery, to ensure the facilitators were competent in delivering the interventions, and that the interventions would be delivered as intended, the facilitators were observed delivering some sessions in small groups of student-athletes, and they were provided with feedback to enhance delivery.

Participants completed a questionnaire, which included the measures detailed above, at three

time points: (a) before the start of the first session; (b) at the end of the sixth session; and (c) two months after the intervention was completed. We used a two-month follow up in line with previous research (e.g., Ntoumanis et al., 2021). Although Kavussanu et al (2021) used a three and a six-month follow up, the longer follow up was not consider necessary in this study because intervention effects, which were maintained three months later, did not dissipate after six months. Therefore, it was considered more pragmatic to collect the follow up data two months later to minimise drop outs. To ensure honesty of responses and minimize social desirability, all responses to the questionnaires were anonymous: Participants were asked to come up with a bespoke password using information known only to them, which they noted for each completed questionnaire, and this password was used to link the data from the three time points. Upon completion of the 2-month follow-up, participants were compensated with £50 in the UK or an equivalent value gift voucher in Greece. All data were collected in a classroom setting at the club venue by a research assistant. Once the intervention was completed, focus groups were conducted with some participants, the results of which will be reported in a separate paper.

Data Analysis

Data analyses were conducted in Mplus, version 8.5 (Muthén & Muthén, 2012-2020). A multilevel piecewise growth model was used to examine changes in study outcomes, with two slopes and with athletes nested within clubs to account for non-independence of observations (i.e., three-level analysis, Muthén & Muthén, 1998-2017, p. 303). The models were estimated using maximum likelihood estimation with robust standard errors. We specified two slopes because we expected to see changes immediately after intervention (from pre to post, slope 1) and no change thereafter (from post to follow-up, slope 2). In line with conventional multilevel growth modeling, the residual variances of the outcome variables were constrained to be equal over time in the within part of the model and were fixed at zero on the between level. In the models, we entered

condition (0 = educational, 1 = psychological) and country (0 = UK, 1 = Greece)[1] as club-level predictors of intercepts (which reflected the differences in baseline scores) and of the two slopes (which reflected changes in outcomes). Additionally, following previous studies on testing interventions aimed at reducing doping likelihood (e.g., Kavussanu et al., 2021), we included sex (0 = male, 1 = female) as individual-level predictor of intercepts and of the two slopes to control for sex differences in doping likelihood.

We followed the CONSORT guidelines (Schultz et al., 2010) to present the results for the tested models. We estimated the models using all data available, which reflected the intention to treat (ITT) analysis. For sensitivity analysis, we selected responses from only those athletes who attended all six sessions and provided responses to all assessments, which reflected the per protocol (PP) analysis. Changes in study outcomes were determined based on 95% confidence intervals (CI), so the effect was considered significant if the confidence interval did not include zero, and on effect sizes (ES), which are presented in baseline standard deviation units (Feingold, 2009), with values of .20-.49 representing a small effect, .50-.70 a medium effect, and .80 or greater a large effect. Because tests of baseline differences were not of interest, we do not present or discuss them in the main paper; however, full results are presented in the supplemental material.

Results

The flow of progress through the phases of the trial is shown in Figure 1. Retention rates of athletes were good (based on the assessments/missing data): 92.3% at the end of the 6-week intervention and 83.2% at the two-month follow-up. The missing data out of 208 cases were between 0 and 1.0% at preintervention, 7.7% at postintervention, and between 16.3% and 16.8% at the 2-month follow-up. Most athletes completed all six sessions (77.9%). Overall, more Greek than UK athletes (87.1% vs. 53.9%, adjusted residual = 5.1), more athletes in the educational than in the psychological intervention (79.8% vs. 58.7%, adjusted residual = 3.3), and more female than

[1] We also tested these models with intervention X country interaction as a predictor of the intercepts and the two slopes; however, because this interaction did not emerge significant for any study predictor, we removed it to simplify the models because parsimonious models are preferred.

male athletes (77.8% vs. 61.7%, adjusted residual = 2.5) completed the study per protocol (i.e., attended the six sessions and provided responses to all three waves of assessments).

The results are presented in Tables 3-5. Table 3 shows reliability estimates and descriptive statistics for the four outcomes by intervention at three time points; Table 4 shows the results of the multilevel piecewise growth models for the four outcomes; and Table 5 shows adjusted pre-post changes in the four outcomes by intervention[2] (i.e., simple slope analyses). Full results for the models are presented in Tables 3S-6S of the supplemental material, which include the results for baseline differences and changes from pre to post and from post to 2-month follow-up by intervention and country, as well as sex. The results for the ITT and PP analyses are presented below. Country differences were minor and generally inconsistent (see supplemental material).

Primary Outcome

As shown in Table 4, time by intervention interaction emerged for both pre-post and post-follow-up. Compared to athletes in the educational intervention, athletes in the psychological intervention reported greater decrease in doping likelihood from pre to postintervention, ΔM = -.68, 95% CI [-.94, -.43], *SE* = .13, ES = -.44 (Table 5). However, compared to athletes in the psychological intervention, athletes in the educational intervention reported greater decrease in doping likelihood from post to follow-up, ΔM = -.42, 95% CI [-.74, -.10], *SE* = .16, ES = -.27. These effects were confirmed in the PP analyses. Overall, from pre to follow-up, athletes in both interventions showed a decrease in doping likelihood (psychological: ΔM = -.84, 95% CI [-1.10, -.58], *SE* = .13, ES = -.54; educational: ΔM = -.65, 95% CI [-1.08, -.22], *SE* = .22, ES = -.41), and the difference in this change between the two interventions was not significant (ΔM = -.20, 95% CI [-.62, .23], *SE* = .22, ES = -.13). These results suggest that both the psychological and the educational interventions worked in decreasing athletes' doping likelihood, but the psychological

[2] Because Time x Country interaction did not emerge significant in the ITT analyses for any outcomes, we present the results

intervention "worked" immediately after completion of the intervention, whereas the educational intervention had a delayed effectiveness.

Secondary Outcomes

The results for our secondary outcomes are also presented in Tables 4 and 5. Athletes reported lower *moral disengagement* at postintervention compared to preintervention, ΔM = -.39, 95% CI [-.68, -.10], *SE* = .15, ES = -.38. No changes emerged from post to follow-up, indicating that both interventions were effective at maintaining the reduction in moral disengagement over 2 months. These effects were confirmed in the PP analyses. The total reductions in scores (i.e., from pre to follow-up) were ΔM = -.54, 95% CI [-.82, -.25], *SE* = .15, ES = -.52 in the psychological intervention, and ΔM = -.44, 95% CI [-.63, -.24], *SE* = .10, ES = -.42 in the educational intervention, and did not differ significantly across the two interventions, ΔM = -.10, 95% CI [-.30, .10], *SE* = .10, ES = -.10.

There were no intervention effects for *anticipated guilt* from pre to post based on the 95% confidence intervals (see Table 4). However, there were effects from post to follow-up: Athletes in the psychological intervention reported greater increase in anticipated guilt, than athletes in the educational intervention (Table 5). Overall (from pre to follow-up), anticipated guilt increased in the psychological intervention, ΔM = 1.83, 95% CI [.47, 3.18], *SE* = .69, ES = .95, and in the educational intervention, ΔM = .76, 95% CI [.10, 1.43], *SE* = .34, ES = .40, however, the increase was greater in the psychological intervention, ΔM = 1.06, 95% CI [.02, 2.11], *SE* = .53, ES = .55.

For *self-regulatory efficacy*, the time by intervention effect emerged significant for pre-post change (Table 4). However, examination of the adjusted means of self-regulatory efficacy showed that the changes from pre to postintervention were not significant in either intervention, as indicated by the 95% confidence intervals containing zeros (psychological: ΔM = -.35, 95% CI [-1.01, .31], *SE* = .34, ES = -.21; educational: ΔM = .40, 95% CI [-.17, .96], *SE* = .29, ES = .23). These effects were confirmed in the PP analyses. Overall, athletes in the educational intervention reported higher self-regulatory efficacy at follow-up than at preintervention, ΔM = .38, 95% CI

[.07, .70], *SE* = .16, ES = .23, whereas the scores of athletes in the psychological intervention did not change, Δ*M* = -.15, 95% CI [-.61, .31], *SE* = .23, ES = -.09. The total changes differed *across* the two interventions, Δ*M* = -.53, 95% CI [-1.01, -.06], *SE* = .24, ES = -.31, suggesting that only the educational intervention was effective in increasing self-regulatory efficacy of athletes.

Discussion

Doping can have significant adverse health consequences for the user (e.g., Quaglio et al., 2009) and compromises the image and integrity of sport. In the past ten years, several studies have examining attitudes, intentions, and individual difference factors in relation to doping behavior among competitive athletes (see Ntoumanis et al., 2014). Although several anti-doping interventions have been developed (see Bates et al., 2019; Ntoumanis et al., 2014), and some of them have targeted psychological factors empirically linked to doping, most studies have not measured proxies of doping behavior or examined long-term effects of interventions, which have been typically delivered in only one country. In this research, we addressed these issues. We developed and evaluated an intervention, which was guided by social cognitive theory (Bandura, 1985, 1991, 1997) and targeted psychological factors, which have been linked with doping (see Kavussanu, 2019); we measured doping likelihood, delivered the intervention in young athletes from two countries, and examined its long-term effects compared to a standard educational/knowledge-based intervention. Below we discuss our findings as they pertain to our primary outcome followed by our secondary outcomes.

Effects of Intervention on Outcomes

In line with our hypothesis, the psychological intervention was more effective than the educational intervention in reducing doping likelihood from pre to post in both countries and this reduction was maintained at follow up; however, the effects of the two interventions were similar at follow-up. The long-term reduction in doping likelihood as a result of our intervention is an important finding, as ultimately, the goal of doping prevention programmes is to produce sustained effects on doping. As research conducted in UK Athletics has shown (e.g., Hurst et al., 2020), this

is not always accomplished by current doping prevention programmes delivered in elite athletes. That is, although these programmes can temporarily reduce doping likelihood, their long-term effects have not been confirmed with the exception of two studies (Kavussanu et al., 2021; Nicholls et al., 2020). Our finding supports and extends the results of another study, which showed that an intervention which had targeted moral identity, moral disengagement, and moral atmosphere was as effective as an educational intervention in reducing doping likelihood in the long term (Kavussanu et al., 2021). Taken together with past research, our findings suggest that focusing on psychological factors empirically linked to doping is as important as educating athletes about the harms of doping, the risks of supplements, and the importance of whistle blowing.

Both interventions reduced moral disengagement from pre to post in both countries, and this reduction was maintained at follow-up. Our findings replicate the results of another study, which also targeted moral disengagement as one of the intervention variables and found similar effects for the "moral" and educational interventions (Kavussanu et al., 2021). Although the educational intervention did not explicitly target moral disengagement, it is likely that some elements of this intervention, such as learning about the doping sanctions and risks to health, and whistle-blowing, may have sensitized participants to the "doping problem", and this could have led to a reduction in moral disengagement (Kavussanu et al., 2021). The long-term reduction of moral disengagement is an important finding, in light of the strong consistent positive links between moral disengagement and doping variables in a variety of samples from different countries (for reviews see Kavussanu, 2016, 2019; Ntoumanis et al., 2014).

Anticipated guilt increased in the psychological intervention more so than in the educational intervention, however, the increase was significant only from post to follow-up. The psychological intervention included one session dedicated to moral emotion, utilizing real athlete stories to draw attention to the feelings of guilt athletes who have doped experience, and enhancing athletes' understanding of the aversive emotional experience associated with doping.

This was based on research showing that anticipated guilt has been strongly and inversely associated with doping likelihood (Kavussanu et al., 2016, 2020; Lazuras et al., 2017b; Ntoumanis et al., 2014; Ring & Kavussanu, 2018). Although the importance of targeting this variable in doping prevention programmes has been repeatedly highlighted, this was the first intervention to devote an entire session to this variable, and to show long-term intervention effects, confirmed in both sets of analyses, thus attesting to the veracity of our findings. The focus on the emotions athletes who use banned substances experience and the contrast with the feelings of pride associated with effortful accomplishment is a unique feature of this intervention. It would be interesting for future research to attempt to replicate our findings and determine whether an increased awareness of the emotions experienced by athletes who have already used prohibited substances to enhance their performance, deters intervention participants from doping.

Contrary to our hypothesis, the psychological intervention did not increase self-regulatory efficacy, which was augmented in the educational intervention from pre to follow-up. Receiving useful information about doping, the doping control process, the risks of sport supplements, healthy nutrition, and the anti-doping rule violations, appears to have strengthened participants' confidence to resist the temptation to dope. Although self-regulatory efficacy to resist this temptation is a protective factor from doping (e.g., Ring & Kavussanu, 2018), to our knowledge, no other intervention studies have measured or targeted this variable, to our knowledge, thus we cannot make comparisons to previous research. It is possible that self-regulatory efficacy requires a stronger intervention to change. Finally, it is worth noting that the two intervention groups were not balanced in their preintervention scores on this variable, thus we cannot draw valid conclusions in relation to the potential relative effects of the interventions on this variable.

Practical Implications

Our findings have important implications for national anti-doping organizations, particularly in light of the recent publication of WADA's International Standard for Education (ISE), which provides guidelines for stakeholders in developing and delivering effective anti-doping education

interventions worldwide. The findings suggest that anti-doping programmes should target psychological variables such as moral disengagement and anticipated guilt, or provide comprehensive anti-doping education, covering a variety of topics over an extended period of time. In short, our psychological intervention can provide a blueprint to be used by both researchers and stakeholders interested in preventing doping. That both interventions were effective suggests that there may be value in combining them into a single programme.

Limitations and Directions for Future Research

Our research has some limitations, which need to be considered when interpreting the findings. First, we did not have a no-intervention control group, thus we do not know whether the observed changes would have naturally occurred over time. The psychological intervention was compared with a standard educational intervention. However, that our outcomes changed from pre to post and did not continue this trend similarly across the two interventions at follow-up, provides support that the observed changes were due to the interventions. Future research should attempt to replicate the present findings employing an additional group that is either passive or receives a neutral intervention.

A second limitation is that we had some missing data, particularly at the two-month follow-up. This happened because participants were not present at the time of our visit at the club, and due to the anonymity of responses it was not possible to contact them. Although this limitation is common in studies that employ a longitudinal design, in the future, researchers could make a greater effort to obtain data at follow-up by devising ways to collect data while ensuring anonymity of responses. Future research could also include the coach of the team in the intervention sessions in light of recent evidence that interventions which have been delivered in coaches as well as athletes (Nicholls et al., 2020) have led to long-term effects in doping susceptibility, and the important role coaches play in athletes' decision to dope (e.g., Barkoukis et al., 2019). In this study, we examined general/generalized doping likelihood using only 2 scenarios. Future studies could examine specific types of doping likelihood, considering different

types/scenarios when examining specific types of doping likelihood and whether the guilt varies as a function of different types of doping likelihood.

Future research could also integrate the present intervention with other approaches to determine if the effects on doping likelihood could be strengthened. For example, Horcajo et al (2019, 2020) found that reading a message against legalizing doping elicited more unfavourable thoughts and attitudes toward doping than reading a message that favoured legalization. It might be that integrating such a persuasive approach to our intervention may lead to stronger intervention effects, so this is an avenue that could be explored in future research.

Conclusion

In conclusion, our findings provide empirical support for the effectiveness of an intervention grounded on social cognitive theory in reducing doping likelihood and moral disengagement and increasing anticipated guilt. Although both interventions were effective in reducing the likelihood to dope in athletes, overall, the psychological intervention had stronger long-term effects on anticipated guilt. These findings suggest that alongside their typical content (e.g., providing information about the harms of banned substances) anti-doping education programmes need to target psychological variables, and in particular draw athletes' attention to the emotions associated with success in sport experienced when one competes clean or dopes, as well as the consequences doping has on others. An intervention that combines the most effective elements of our two interventions may show the largest long-term reduction in doping likelihood.

Author Notes

1. In one case, athletes were recruited from a sport college rather than a sport club. However, we refer to sport clubs throughout the paper for simplicity reasons. These athletes participated in a variety of sports during the intervention.
2. Responses to the two scenarios were not significantly different from each other at posttest or follow up, but differed at pretest (M_{diff} = -.31, SD = 1.19), with participants scoring higher at doping likelihood for injury recovery than performance enhancement. Analysis conducted separately for each scenario showed that the significant findings for doping likelihood were driven primarily by scenario 1. It is worth noting, however, that the estimates for scenario 2, although not significant, were similar to those for scenario 1. Full details of these analyses are available from the first author upon request.
3. The authors would like to thank the International Olympic Committee for providing financial support for this project.
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References

Backhouse, S.H., Whitaker, L., Patterson, L., Erickson, K., & McKenna, J. (2016). *Social psychology of doping in sport: A mixed-studies narrative synthesis*. Montreal, Canada: World Anti-Doping Agency.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Bandura, A. (1985). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.

Bandura, A. (1991). Social cognitive theory of moral thought and action. In W. M. Kurtines & J. L. Gewirtz (Eds.), *Handbook of moral behaviour and development: Theory, research, and applications* (Vol. 1, pp. 71-129). Hillsdale, NJ: Lawrence Erlbaum Associates.

Barkoukis, V., Lazuras, L., Tsorbatzoudis, H., & Rodafinos, A. (2013). Motivational and social cognitive predictors of doping intentions in elite sports: An integrated approach. *Scandinavian Journal of Medicine & Science in Sports, 23(5)*, e330-e340.

Barkoukis, V., Brooke, L., Ntoumanis, N., Smith, B., & Gucciardi, D. F. (2019). The role of the athletes' entourage on attitudes to doping. *Journal of Sports Sciences*, *37*(21), 2483-2491.

Barkoukis, V., Brooke, L., Ntoumanis, N., Smith, B., Gucciardi, D.F. (2019). The role of the athletes' entourage on attitudes to doping. *Journal of Sports Sciences, 37*, 2483-2491.

Barkoukis, V., Kartali, K., Lazuras, L., & Tsorbatzoudis, H. (2016). Evaluation of an anti-doping intervention for adolescents: Findings from a school-based study. *Sport Management Review, 19(1),* 23-34.

Bates, G., Begley, E., Tod, D., Jones, L., Leavey, C., & McVeigh, J. (2019). A systematic review investigating the behaviour change strategies in interventions to prevent misuse of anabolic steroids. *Journal of Health Psychology, 24(11),* 1595–1612.

Blank, C., Kopp, M., Niedermeier, M., Schnitzer, M., Schobersberger, W. (2016). Predictors of doping intentions, susceptibility, and behaviour in elite athletes: A meta-analytic review, *SpringerPlus, 5 (1)*, 1333.

Bloom, H. S. (1995). Minimum detectable effects: A simple way to report the statistical power of experimental designs. *Evaluation Review*, *19*(5), 547-556.

Boardley, I. D., Smith, A. L., Mills, J. P., Grix, J., & Wynne, C. (2017). Empathic and self-regulatory processes governing doping behaviour. *Frontiers in Psychology*, 22

De Hon, O., Kuipers, H., & van Bottenburg, M. (2015). Prevalence of doping use in elite sports: a review of numbers and methods. *Sports Medicine, 45(1)*, 57-69.

Elbe, A.-M., & Brand, R. (2016). The effect of an ethical decision-making training on young athletes' attitudes toward doping. *Ethics & Behaviour, 26(1),* 32-44.

Elbe, A.-M., & Pitsch, W. (2018). Doping prevalence among Danish elite athletes. *Performance Enhancement & Health, 6(1),* 28-32.

Elliot, D. L., Goldberg, L., Moe, E. L., DeFrancesco, C. A., Durham, M. B., & Hix-Small, H. (2004). Preventing substance use and disordered eating: initial outcomes of the ATHENA (Athletes Targeting Healthy Exercise and Nutrition Alternatives) program. *Archives of Pediatrics & Adolescent Medicine, 158(11)*, 1043-1049.

Elliot, D. L., Goldberg, L., Moe, E. L., DeFrancesco, C. A., Durham, M. B., McGinnis, W., & Lockwood, C. (2008). Long-term outcomes of the ATHENA (Athletes Targeting Healthy Exercise & Nutrition Alternatives) program for female high school athletes. *Journal of Alcohol and Drug Education, 52*, 73-92.

Erickson, K., McKenna, J., & Backhouse, S. H. (2015). A qualitative analysis of the factors that protect athletes against doping in sport. *Psychology of Sport and Exercise, 16,* 149-155.

Feingold, A. (2009). Effect sizes for growth-modeling analysis for controlled clinical trials in the same metric as for classical analysis. *Psychological Methods, 14*(1), 43–53.

Goldberg, L. & Elliot, D. L. (2005). Preventing substance use among high school athletes: The ATLAS and ATHENA Programs. *Journal of Applied School Psychology, 21*, 63-87.

Goldberg, L., Elliot, D.L., Clarke, G. N., Mackinnon, D. P., Moe, E., Zoref, L., et al. (1996). Effects of a multidimensional anabolic steroid prevention intervention: The Adolescents

Training and Learning to Avoid Steroids (ATLAS) program. *The Journal of the American Medical Association, 276*, 1555-1562.

Goldberg, L., MacKinnon, D. P., Elliot, D., Moe, E., Clarke, G., & Cheong, J. (2000). The adolescents training and learning to avoid steroids program: Preventing drug use and promoting health behaviours. *Archives of Pediatric and Adolescent Medicine, 154*, 332-338.

Horcajo, J., Santos, D., Guyer, J.J., & Moreno, L. (2019). Changing attitudes and intentions related to doping: An analysis of individual differences in need for cognition. *Journal of Sports Sciences, 37,* 2835–2843.

Horcajo, J., Santos, D., Guyer, J.J., & Mateos, R. (2020). A meta-cognitive approach to doping in sports: The effects of thought validation on attitudes related to doping. *Journal of Sports Sciences,* 38, 2242–2252.

Hurst, P., Ring, C., & Kavussanu, M. (2020). An evaluation of UK Athletics' Clean Sport intervention in preventing doping in junior elite athletes. *Performance Enhancement and Health.* Advance online publication. https://doi.org/10.1016/j.peh.2019.100155

Kavussanu, M. (2019). Toward an understanding of transgressive behaviour in sport: Progress and prospects. *Psychology of Sport & Exercise*, *42*, 33-39.

Kavussanu, M., Hurst, P., Yukhymenko-Lescroart, M., Galanis, E., King, A., Hatzigeorgiadis, A., & Ring, C. (2021). A moral intervention reduces doping likelihood in British and Greek athletes: Evidence from a cluster randomized control trial. *Journal of Sport & Exercise Psychology, 43,* 125–139.

Kavussanu, M., Hatzigeorgiadis, A., Elbe, A.-M., & Ring, C. (2016). The moral disengagement in doping scale. *Psychology of Sport and Exercise, 24*, 188-198.

Kavussanu, M., Yukhymenko-Lescroart, M., Elbe, A.M., & Hatzigeorgiadis, A. (2020). Integrating moral and achievement variables to predict doping likelihood in football: A cross-cultural investigation. *Psychology of Sport & Exercise, 47,* 505-518

Lazuras, L., Barkoukis, V., Loukovitis, A., Brand, R., Hudson, A., Mallia, L., & Zelli, A. (2017a). "I want it all, and I want it now": lifetime prevalence and reasons for using and abstaining from controlled Performance and Appearance Enhancing Substances (PAES) among young exercisers and amateur athletes in five European countries. *Frontiers in Psychology, 8*, 717

Lazuras, L., Barkoukis, V., Mallia, L., Lucidi, F., & Brand, R. (2017b). More than a feeling: The role of anticipated regret in predicting doping intentions in adolescent athletes. *Psychology of Sport and Exercise*, *30*, 196-204.

Lucidi, F., Mallia, L., Alivernini, F., Chirico, A., Manganelli, S., Galli, F., ... & Zelli, A. (2017). The effectiveness of a new school-based media literacy intervention on adolescents' doping attitudes and supplements use. *Frontiers in Psychology, 8*, 749.

Lucidi, F., Zelli, A., Mallia, L., Grano, C., Russo, P. M., & Violani, C. (2008). The social-cognitive mechanisms regulating adolescents' use of doping substances. *Journal of Sports Sciences, 26*(5), 447-456. doi:10.1080/02640410701579370

Mallia, L., Chirico, A., Zelli, A., Galli, F., Palombi, T., Bortoli, L., et al. (2020). The implementation and evaluation of a media literacy intervention about PAES use in sport science students: The use of substances. *Frontiers in Psychology,* 11, 1–10. doi:10.3389/fpsyg.2020.00368.

Marschall, D., Sanftner, J., Tangney, J.P. (1994). *The state shame and guilt scale*. Fairfax, VA: George Mason University.

Michie, S. & Prestwich, A. (2010). Are interventions theory-based? Development of a theory-coding scheme. *Health Psychology, 29,* 1 – 8.

Moher, D., Hopewell, S., Schulz, K. F., Montori, V., Gøtzsche, P. C., Devereaux, P., Elbourne, D., Egger, M., & Altman, D. G. (2012). CONSORT 2010 explanation and elaboration: updated guidelines for reporting parallel group randomised trials. *International Journal of Surgery*, *10*(1), 28-55. https://doi.org/ https://doi.org/10.1136/bmj.c869

Muthén, L. K., & Muthen, B. (1998–2017). *Mplus user's guide: Statistical analysis with latent variables: User's guide*. Muthén & Muthén.

Muthén, L. K., & Muthén, B. (2012–2020). Mplus (version 8.5). Muthén & Muthén.

Nicholls, A.R., Cope, E., Bailey, R., Koenen, K., Dumon, D., Theodorou, N.C., Chanal, B., Saint Laurent, D., Müller, D., Andrés, M.P., Kristensen, A.K., Thompson, M.A., Baumann, W., & Laurent, J.F. (2017). Children's first experience of taking anabolic-androgenic steroids can occur before their 10th birthday: A systematic review identifying 9 factors that predicted doping among young people. *Frontiers in Psychology, 20* https://doi.org/10.3389/fpsyg.2017.01015

Nicholls, A.R., Morley, D., Thompson, M.A., Huang, C., Abt, G., Rothwell, M., Cope, E., & Ntoumanis, N. (2020). The effects of the iPlayClean education programme on doping attitudes and susceptibility to use banned substances among high-level adolescent athletes from the UK: A cluster-randomised controlled trial. *International Journal of Drug Policy, 82,* 10820.

Ntoumanis, N., Barkoukis, V., Gucciardi, D. F., & Chan, D. K. C. (2017). Linking coach interpersonal style with athlete doping intentions and doping use: A prospective study. *Journal of Sport & Exercise Psychology, 39*, 188–198.

Ntoumanis, N., Ng, J. Y., Barkoukis, V., & Backhouse, S. (2014). Personal and psychosocial predictors of doping use in physical activity settings: A meta-analysis. Sp*orts Medicine, 44*(11), 1603–1624. https://doi.org/10.1007/s40279-014-0240-4

Ntoumanis, N., Quested, E., Patterson, L., Kaffe, S., Backhouse, S.H., Pavlidis, G., Whitaker, L., Barkoukis, V., Smith, B.J., Staff, H.R., Gucciardi, D.F. (2021). An intervention to optimise coach-created motivational climates and reduce athlete willingness to dope (CoachMADE): a three-country cluster randomised controlled trial. *British Journal of Sports Medicine, 55,* 213–219.

Ranby, K. W., Aiken, L. S., Mackinnon, D. P., Elliot, D. L., Moe, E. L., McGinnis, W., et al. (2009). A mediation analysis of the ATHENA intervention for female athletes: prevention of athletic-enhancing substance use and unhealthy weight loss behaviours. *Journal of Pediatric Psychology, 34*, 1069-1083.

Ring, C., & Hurst, P. (2019). The effects of moral disengagement mechanisms on doping likelihood are mediated by guilt and moderated by moral traits. *Psychology of Sport & Exercise, 40,* 33-41.

Ring, C., & Kavussanu, M. (2018). The role of self-regulatory efficacy, moral disengagement and guilt on doping likelihood: A social cognitive theory perspective. *Journal of Sports Sciences, 36*, 578–584.

Ring, C., Kavussanu, M., Lucidi, S., & Hurst, P. (2019). Effects of personal and situational factors on self-referenced doping likelihood. *Psychology of Sport & Exercise, 41*, 29-35.

Sagoe, D., Holden, G., Rise, E. N. K., Torgersen, T., Paulsen, G., Krosshaug, T., & Pallesen, S. (2016). Doping prevention through anti-doping education and practical strength training: The Hercules program. *Performance Enhancement & Health, 5(1),* 24-30.

Schulz, K. F., Altman, D. G., Moher, D., & CONSORT Group. (2010). CONSORT 2010 statement: Updated guidelines for reporting parallel group randomised trials. *Trials, 11*(32), 1-8. https://doi.org/10.1186/1745-6215-11-32

Singler, A. (2015). Why education of athletes is not enough. In V. Moller, I. Waddington, & J. Hoberman (Eds.), *Routledge Handbook of Drugs and Sport* (pp. 239): Routledge.

Stanger, N., Backhouse, S.H. (2020). A multistudy cross-sectional and experimental examination into the interactive effects of moral identity and moral disengagement on doping. *Journal of Sport & Exercise Psychology, 42 (3),* 185-200.

Tangney, J. P., Stuewig, J., & Mashek, D. J. (2007). Moral emotions and moral behaviour. *Annual Review of Psychology, 58*, 345–372.

Ulrich, R., Pope, H. G., Cléret, L., Petróczi, A., Nepusz, T., Schaffer, J., & Simon, P. (2018). Doping in two elite athletics competitions assessed by randomized-response surveys. *Sports Medicine, 48(1),* 211-219.

Table 1

Participant Characteristics as a Function of Intervention (k = 19, N = 208)

Variable		Intervention group	
		Psychological (n = 109)	Educational (n = 99)
Sex	Male	64	51
	Female	42	48
Sport	Basketball	7	9
	Rugby	-	14
	Netball	-	9
	Lacrosse	-	13
	Football	33	14
	Field hockey	8	-
	Handball	14	-
	Volleyball	-	11
	Rowing	19	21
	Multiple	11	-
	Track & field	7	-
	Judo	8	-
	Badminton	-	9
Country	UK	62	53
	Greece	47	46
Club		10	9
		M (*SD*)	*M* (*SD*)
Age		17.68 (1.76) Range: 15-24	18.54 (2.51) Range: 16-24
Years competed		7.21 (4.08)	7.15 (4.13)
Hours/week training		9.19 (4.73)	9.84 (6.02)

1

Table 2

Title, Aims, and Content of the Six Sessions of the Psychological Intervention

Title (Construct)	Aim	Content
The ideal athlete and the choices we make (Moral agency)	To introduce the concept of the ideal athlete and lead participants to think that doping is a choice that some athletes make	The ideal athlete profile emerges from group discussion. This is an athlete who does not cheat. Participants watch videos of "ideal athletes" displaying honesty and resisting the temptation to dope. It is emphasized that doping is a choice, and that by choosing to compete clean, one can be like the ideal athlete.
Success, emotions and doping (Anticipated guilt)	To make participants understand that succeeding as a clean athlete leads to pride and happiness, whereas succeeding (i.e., winning) by doping entails feelings of guilt and shame and is not worth doing	Participants reflect on a great accomplishment they had and the emotions they experienced. Successful athletes who competed clean are contrasted with athletes who achieved success by doping. The emotional experience of the two sets of athletes is discussed, and participants examine their potential emotions if they had succeeded by doping.
Justifications for doping (Moral disengagement)	To make participants aware of the justifications athletes use for doping, and to identify and challenge these justifications	Participants learn about the types of justifications typically used by athletes who dope. They are asked to identify and challenge these justifications in real and hypothetical stories, as well as reflect on their own experiences of bad behaviour.
Consequences of doping for others (Moral disengagement)	To draw attention to the consequences of doping for others, thereby challenging the distortion of consequences mechanism of moral disengagement	Stories of athletes who have been awarded medals retrospectively are presented, drawing attention to the emotions they experience. The consequences of one's doping for teammates and family are discussed, and participants are encouraged to reflect on their own experiences.
Competing as a clean athlete (Self-regulatory efficacy)	To strengthen participants' confidence to resist doping	Stories of athletes who achieved success without doping and can act as role models are presented. Participants also consider why clean athletes made the decision to compete clean and role play resisting the temptation to dope.
Course conclusion	To bring together all the material that was discussed in the preceding five sessions.	Participants are asked to present to their peers the main points of the previous sessions, while the facilitator also presents a summary of each session.

Note. The psychological intervention was guided by social cognitive theory and targeted three variables, which have been empirically associated with doping likelihood: anticipated guilt (-), moral disengagement (+), and self-regulatory efficacy (+). Each session focused on one of these variables.

Table 3

Reliability Estimates and Descriptive Statistics by Intervention

Outcome	Reliability Estimate McDonald's ω (Cronbach's α)	Psychological intervention			Educational Intervention		
		N	*M*	*SD*	*N*	*M*	*SD*
Doping likelihood (pre)	.86 (.86)	109	2.53	1.62	99	2.51	1.51
Doping likelihood (post)	.87 (.87)	96	1.76	1.05	96	2.15	1.36
Doping likelihood (2-month follow-up)	.86 (.86)	82	1.76	0.96	92	1.88	1.24
Moral disengagement (pre)	.78 (.75)	109	2.17	0.99	99	2.34	1.07
Moral disengagement (post)	.79 (.76)	96	1.83	0.74	96	1.95	0.98
Moral disengagement (2-month follow-up)	.76 (.73)	82	1.66	0.72	92	1.96	0.92
Self-regulatory efficacy (pre)	.95 (.95)	109	5.39	1.55	99	4.76	1.84
Self-regulatory efficacy (post)	.97 (.97)	96	5.06	1.95	96	5.17	1.80
Self-regulatory efficacy (2-month follow-up)	.97 (.97)	81	5.43	1.87	92	5.29	1.65
Anticipated guilt (pre)	.95 (.95)	108	4.85	2.11	98	4.95	1.74
Anticipated guilt (post)	.94 (.94)	96	5.82	1.54	96	5.36	1.56
Anticipated guilt (2-month follow-up)	.93 (.93)	81	6.41	0.83	92	5.45	1.62

Table 4

Results for Pre-Post and Post-Follow-Up Changes in Multilevel Piecewise Growth Models for Study Outcomes

	Intention-to-treat Analysis (N = 208)			Per-Protocol Analysis (N = 141)		
Term	Estimate (SE)	95% CI	ES	Estimate (SE)	95% CI	ES
Doping likelihood						
Time (pre-post)	-0.22 (0.21)	[-0.64, 0.19]	-0.14	-0.19 (0.22)	[-0.63, 0.25]	-0.12
Time (pre-post) x Intervention	**-0.46 (0.20)**	**[-0.84, -0.08]**	**-0.29**	**-0.49 (0.24)**	**[-0.97, -0.02]**	**-0.32**
Time (post–follow-up)	**-0.42 (0.16)**	**[-0.74, -0.10]**	**-0.27**	**-0.32 (0.11)**	**[-0.54, -0.10]**	**-0.21**
Time (post–follow-up) x Intervention	**0.26 (0.09)**	**[0.09, 0.43]**	**0.17**	0.22 (0.13)	[-0.04, 0.47]	0.14
Moral disengagement						
Time (pre-post)	**-0.39 (0.15)**	**[-0.68, -0.10]**	**-0.38**	**-0.46 (0.10)**	**[-0.66, -0.26]**	**-0.46**
Time (pre-post) x Intervention	0.04 (0.12)	[-0.20, 0.27]	0.03	0.02 (0.13)	[-0.23, 0.27]	0.02
Time (post–follow-up)	-0.05 (0.09)	[-0.23, 0.13]	-0.04	0.10 (0.09)	[-0.08, 0.29]	0.10
Time (post–follow-up) x Intervention	-0.14 (0.10)	[-0.34, 0.07]	-0.13	-0.13 (0.11)	[-0.34, 0.08]	-0.13
Anticipated guilt						
Time (pre-post)	0.33 (0.28)	[-0.22, 0.88]	0.17	0.67 (0.49)	[-0.30, 1.63]	0.34
Time (pre-post) x Intervention	0.63 (0.44)	[-0.24, 1.50]	0.33	0.90 (0.53)	[-0.14, 1.94]	0.46
Time (post–follow-up)	**0.43 (0.14)**	**[0.16, 0.70]**	**0.22**	**0.46 (0.14)**	**[0.19, 0.72]**	**0.24**
Time (post–follow-up) x Intervention	**0.44 (0.16)**	**[0.12, 0.75]**	**0.23**	**0.50 (0.15)**	**[0.21, 0.79]**	**0.26**
Self-regulatory efficacy						
Time (pre-post)	0.40 (0.29)	[-0.17, 0.96]	0.23	0.10 (0.25)	[-0.38, 0.59]	0.06
Time (pre-post) x Intervention	**-0.74 (0.31)**	**[-1.35, -0.13]**	**-0.44**	**-1.23 (0.35)**	**[-1.92, -0.54]**	**-0.70**
Time (post–follow-up)	-0.01 (0.17)	[-0.35, 0.33]	-0.01	0 (0.17)	[-0.33, 0.33]	0.00
Time (post–follow-up) x Intervention	0.21 (0.19)	[-0.17, 0.59]	0.12	0.34 (0.21)	[-0.07, 0.74]	0.19

Note. Intervention: 0 = educational, 1 = psychological. Intention-to-treat analyses included all cases available. Per-protocol analysis included cases who completed all intervention sessions (six) and provided responses to all waves of measurement (i.e., listwise deletion). Standard errors are in parenthesis. CI = confidence interval. ES = effect size, expressed in the baseline standard deviation units, with values between .20 and .49 constitute a small effect, .50 to .79 a medium effect, and .80 or greater a large effect. All effects (including for the control variables) are reported in the supplemental file. The full model was adjusted for sex. Confidence intervals that do not include 0 are in boldface.

Table 5

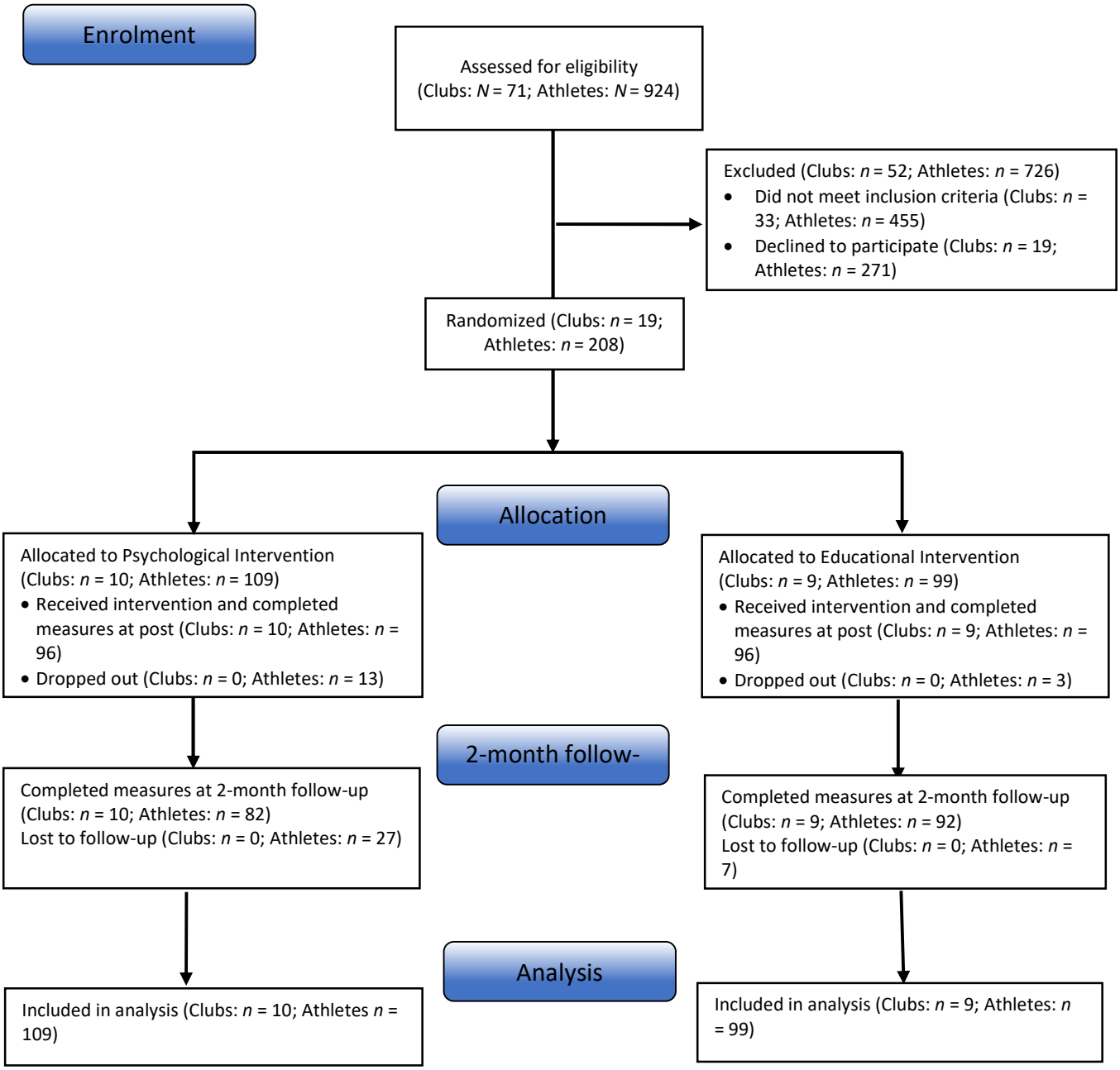
Adjusted Pre-Post and Post–Follow-Up Changes in Study Outcomes by Intervention

	Intention-to-Treat Analysis $N = 208$, $k = 19$			Per-Protocol Analysis $N = 141$, $k = 18$		
	Δ*M* (*SD*)	95% CI	ES	Δ*M* (*SD*)	95% CI	ES
Doping likelihood						
Psychological (pre-post)	**-0.68 (0.13)**	**[-0.94, -0.43]**	**-.44**	**-0.68 (0.25)**	**[-1.17, -0.2]**	**-.44**
Educational (pre-post)	-0.22 (0.21)	[-0.64, 0.19]	-.14	-0.19 (0.22)	[-0.63, 0.25]	-.12
Psychological (post – follow-up)	-0.16 (0.13)	[-0.42, 0.10]	-.10	-0.11 (0.11)	[-0.32, 0.11]	-.07
Educational (post – follow-up)	**-0.42 (0.16)**	**[-0.74, -0.10]**	**-.27**	**-0.32 (0.11)**	**[-0.54, -0.10]**	**-.21**
Moral disengagement						
Psychological (pre-post)	**-0.36 (0.16)**	**[-0.67, -0.04]**	**-.34**	**-0.44 (0.13)**	**[-0.70, -0.19]**	**-.44**
Educational (pre-post)	**-0.39 (0.15)**	**[-0.68, -0.10]**	**-.38**	**-0.46 (0.10)**	**[-0.66, -0.26]**	**-.46**
Psychological (post – follow-up)	-0.18 (0.08)	[-0.34, -0.02]	-.18	-0.03 (0.09)	[-0.21, 0.16]	-.03
Educational (post – follow-up)	-0.05 (0.09)	[-0.23, 0.13]	-.04	0.10 (0.09)	[-0.08, 0.29]	.10
Anticipated guilt						
Psychological (pre-post)	0.96 (0.52)	[-0.06, 1.98]	.50	**1.57 (0.74)**	**[0.12, 3.01]**	**.81**
Educational (pre-post)	0.33 (0.28)	[-0.22, 0.88]	.17	0.67 (0.49)	[-0.30, 1.63]	.34
Psychological (post – follow-up)	**0.87 (0.23)**	**[0.41, 1.32]**	**.45**	**0.96 (0.20)**	**[0.58, 1.35]**	**.49**
Educational (post – follow-up)	**0.43 (0.14)**	**[0.16, 0.70]**	**.22**	**0.46 (0.14)**	**[0.19, 0.72]**	**.24**
Self-regulatory efficacy						
Psychological (pre-post)	-0.35 (0.34)	[-1.01, 0.31]	-.21	**-1.13 (0.39)**	**[-1.89, -0.37]**	**-.65**
Educational (pre-post)	0.40 (0.29)	[-0.17, 0.96]	.23	0.10 (0.25)	[-0.38, 0.59]	.06
Psychological (post – follow-up)	0.20 (0.21)	[-0.20, 0.60]	.12	0.34 (0.25)	[-0.15, 0.83]	.19
Educational (post – follow-up)	-0.01 (0.17)	[-0.35, 0.33]	-.01	0 (0.17)	[-0.33, 0.33]	.00

Note. Per-protocol analysis included cases who completed all intervention sessions (six) and provided responses to all waves of measurement (i.e., listwise deletion). Standard errors are in parenthesis. CI = confidence interval. ES = effect size, expressed in the baseline standard deviation units, with values between .20 and .49 constitute a small effect, .50 to .79 a medium effect, and .80 or greater a large effect. All effects (including for the control variables) are reported in the supplementary file. The full model was adjusted for sex. Confidence intervals that do not include 0 are in boldface.

Figure 1

CONSORT Flowchart of Participants



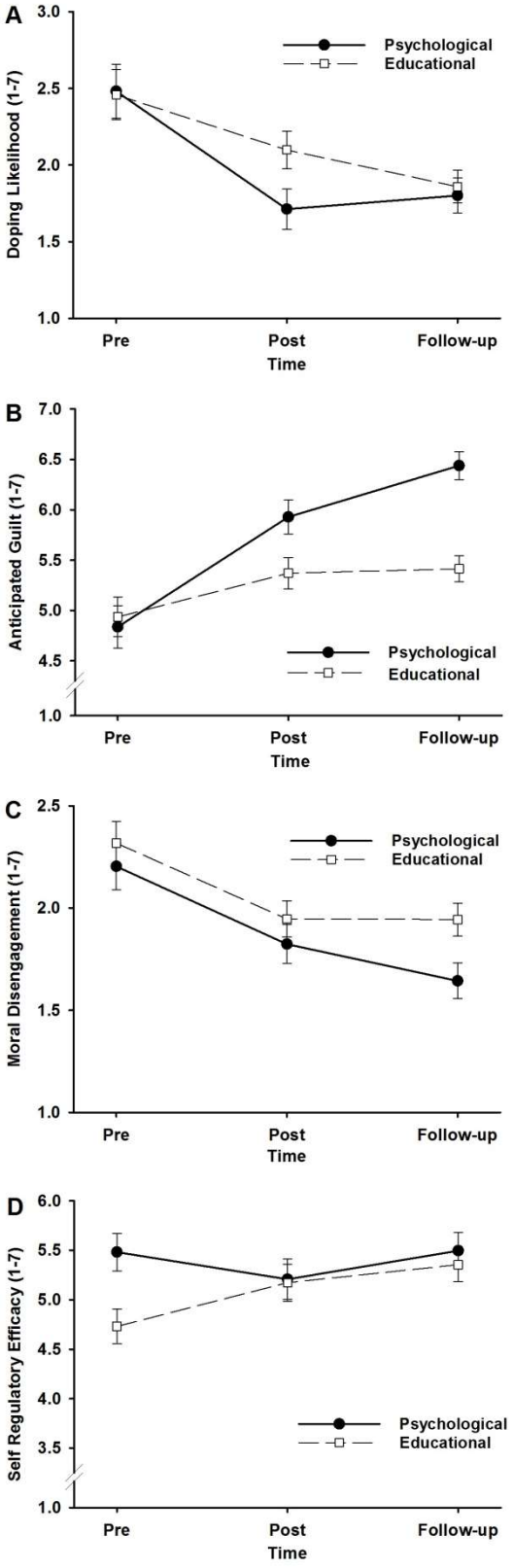


Figure 2. Mean (*Standard Error*) doping likelihood (A), anticipated guilt (B), moral disengagement (C) and self-regulatory efficacy (D) of the psychological and educational intervention groups at the preintervention, postintervention and 2-month follow-up times

Supplemental Material

A Psychological Intervention Reduces Doping Likelihood in British and Greek Athletes: A Cluster-Randomized Controlled Trial

Table 1S

Title, Aims, and Content of the Six Sessions of the Educational (Knowledge-Based) Intervention

Title	Aim	Content
Introduction to doping	To introduce participants to the WADA and its role in regulating doping in sport	The role of WADA as an international organization that regulates doping is discussed. The WADA Code is presented and the 10 anti-doping rule violations are explained giving examples of athletes who have violated these rules.
Doping control	To introduce participants to the doping control process	Participants are informed that they can be drug tested at any time and place. The anti-doping drug-testing procedure is explained and participants role play each step of the procedure using official anti-doping bottles and documentation. They are also informed about ADAMS and the athlete biological passport.
Banned substances	To introduce banned substances and the consequences they can have on athletes' health	The risks associated with the most common types of banned performance-enhancing substances (e.g., anabolic steroids, stimulants, erythropoietin) are explained, and participants watch a video of the East German shot putter, Heidi Krieger. They are also introduced to the process of obtaining a Therapeutic Use Exemption (TUE).
Sport supplements	To inform participants of the risks associated with sport supplements (e.g., protein, energy drinks, creatine)	Participants are informed about the potential contamination of sport supplements with banned substances and are instructed to check sport supplements using the Informed-Sport website. Cases of athletes failing a drug test due to contamination of sport supplements are presented. Participants are also asked to assess the need of sport supplements and consider if the benefits are the result of a placebo effect.
Nutrition	To discuss the role of nutrition and its benefits for performance and recovery	Information about carbohydrates, proteins, fats, vitamins, and minerals is presented and how to use these pre, during, and post competition is discussed. Participants are asked to examine their own nutrition using the MyFitnessPal app and identify the areas of their diet that could be improved.
Whistleblowing	To discuss the importance of whistleblowing in protecting clean athletes	Whistleblowing is explained, and examples of athletes who blew the whistle (e.g., Yuliya Stepanova) are presented. Participants are informed how to use the WADA Speak-Up website, and they are asked to test their knowledge about anti-doping rules and regulations using the WADA Play-True quiz.

Note. The aim of the educational intervention was to introduce doping and the doping control process, and to provide information about the health consequences of banned substances, the risks of sport supplements, and healthy nutrition. Whistleblowing was also covered in this intervention.

Table 2S

Results of Confirmatory Factor Analysis for Measured Variables

	χ^2	Df	CFI	RMSEA	90% CI	SRMR
Moral disengagement (pre)	14.4	9	.971	.054	[0, .103]	.034
Moral disengagement (post)	16.6	9	.951	.066	[0, .116]	.043
Moral disengagement (follow-up)	18.7	9	.911	.079	[.025, .129]	.054
Anticipated guilt (pre)	31.1	5	.958	.159	[.109, .215]	.028
Anticipated guilt (post)	37.7	5	.932	.185	[.132, .242]	.035
Anticipated guilt (follow-up)	17.8	5	.953	.122	[.064, .185]	.040
Self-regulatory efficacy (pre)	35.0	14	.968	.085	[.050, .121]	.025
Self-regulatory efficacy (post)	23.0	14	.989	.058	[0, .099]	.013
Self-regulatory efficacy (follow-up)	33.4	14	.972	.090	[.051, .129]	.018

Note. CFI = comparative fit index; RMSEA = root mean square error of approximation; CI = confidence interval; SRMR = standardized root mean square residual.

Table 3S

Results for Multilevel Piecewise Linear Growth Models for Doping Likelihood

Term	Intention-to-Treat Analysis			Per-Protocol Analysis		
	Estimate	95% CI	ES	Estimate	95% CI	ES
Baseline	**2.60 (0.24)**	**[2.12, 3.07]**		**2.42 (0.30)**	**[1.84, 3.00]**	
Baseline x Intervention	0.02 (0.27)	[-0.51, 0.55]	0.01	0.10 (0.34)	[-0.57, 0.77]	0.06
Baseline x Country	-0.27 (0.28)	[-0.82, 0.27]	-0.17	-0.11 (0.29)	[-0.67, 0.46]	-0.07
Baseline x Sex	-0.03 (0.27)	[-0.56, 0.50]	-0.02	-0.02 (0.34)	[-0.68, 0.65]	-0.01
Pre-post						
Time	-0.22 (0.21)	[-0.64, 0.19]	-0.14	-0.19 (0.22)	[-0.63, 0.25]	-0.12
Time x Intervention	**-0.46 (0.20)**	**[-0.84, -0.08]**	**-0.29**	**-0.49 (0.24)**	**[-0.97, -0.02]**	**-0.32**
Time x Country	0.31 (0.21)	[-0.11, 0.72]	0.19	0.23 (0.22)	[-0.20, 0.66]	0.15
Time x Sex	-0.44 (0.24)	[-0.91, 0.03]	-0.28	**-0.48 (0.24)**	**[-0.95, -0.01]**	**-0.31**
Post – follow up						
Time	**-0.42 (0.16)**	**[-0.74, -0.10]**	**-0.27**	**-0.32 (0.11)**	**[-0.54, -0.10]**	**-0.21**
Time x Intervention	**0.26 (0.09)**	**[0.09, 0.43]**	**0.17**	0.22 (0.13)	[-0.04, 0.47]	0.14
Time x Country	**0.30 (0.13)**	**[0.04, 0.55]**	**0.19**	0.26 (0.14)	[-0.01, 0.53]	0.17
Time x Sex	0.09 (0.23)	[-0.36, 0.54]	0.06	0.06 (0.12)	[-0.18, 0.29]	0.04

Note. Intervention: 0 = educational, 1 = psychological; country: 0 = UK, 1 = Greece; Intention-to-treat analyses included all cases available. Per-protocol analysis included cases who completed all intervention sessions (six) and provided responses to all waves of measurement (i.e., listwise deletion). Standard errors are in parenthesis. CI = confidence interval. ES = effect size, expressed in the baseline standard deviation units, with values between .20 and .49 constitute a small effect, .50 to .79 a medium effect, and .80 or greater a large effect. Confidence intervals that do not include 0 are in boldface.

Table 4S

Results for Multilevel Piecewise Linear Growth Models for Moral Disengagement

Term	Intention-to-Treat Analysis			Per-Protocol Analysis		
	Estimate	95% CI	ES	Estimate	95% CI	ES
Baseline	**2.55 (0.14)**	**[2.28, 2.82]**		**2.56 (0.18)**	**[2.21, 2.91]**	
Baseline x Intervention	-0.17 (0.11)	[-0.38, 0.04]	-0.17	-0.17 (0.13)	[-0.44, 0.09]	-0.17
Baseline x Country	**-0.40 (0.11)**	**[-0.61, -0.19]**	**-0.39**	**-0.42 (0.13)**	**[-0.68, -0.17]**	**-0.42**
Baseline x Sex	-0.08 (0.12)	[-0.31, 0.16]	-0.07	-0.09 (0.14)	[-0.37, 0.2]	-0.09
Pre-post						
Time	**-0.39 (0.15)**	**[-0.68, -0.10]**	**-0.38**	**-0.46 (0.10)**	**[-0.66, -0.26]**	**-0.46**
Time x Intervention	0.04 (0.12)	[-0.20, 0.27]	0.03	0.02 (0.13)	[-0.23, 0.27]	0.02
Time x Country	0.26 (0.13)	[-0.01, 0.52]	0.25	**0.40 (0.12)**	**[0.16, 0.64]**	**0.40**
Time x Sex	-0.23 (0.18)	[-0.59, 0.12]	-0.23	-0.26 (0.14)	[-0.53, 0.02]	-0.26
Post – 2-month follow up						
Time	-0.05 (0.09)	[-0.23, 0.13]	-0.04	0.10 (0.09)	[-0.08, 0.29]	0.10
Time x Intervention	-0.14 (0.1)	[-0.34, 0.07]	-0.13	-0.13 (0.11)	[-0.34, 0.08]	-0.13
Time x Country	0.10 (0.11)	[-0.11, 0.31]	0.10	-0.04 (0.09)	[-0.22, 0.14]	-0.04
Time x Sex	0.01 (0.04)	[-0.08, 0.10]	0.01	-0.05 (0.09)	[-0.22, 0.13]	-0.04

Note. Intervention: 0 = educational, 1 = psychological; country: 0 = UK, 1 = Greece; Intention-to-treat analyses included a cases available. Per-protocol analysis included cases who completed all intervention sessions (six) and provided responses to all waves of measurement (i.e., listwise deletion). Standard errors are in parenthesis. CI = confidence interval. ES = effect size, expressed in the baseline standard deviation units, with values between .20 and .49 constitute a small effect, .5 to .79 a medium effect, and .80 or greater a large effect. Confidence intervals that do not include 0 are in boldface.

Table 5S

Results for Multilevel Piecewise Linear Growth Models for Anticipated Guilt

Term	Intention-to-Treat Analysis			Per-Protocol Analysis		
	Estimate	95% CI	ES	Estimate	95% CI	ES
Baseline	**4.75 (0.35)**	**[4.06, 5.43]**		**4.28 (0.54)**	**[3.21, 5.34]**	
Baseline x Intervention	-0.07 (0.53)	[-1.11, 0.97]	-0.04	-0.48 (0.63)	[-1.70, 0.75]	-0.25
Baseline x Country	0.30 (0.47)	[-0.61, 1.22]	0.16	1.01 (0.62)	[-0.21, 2.23]	0.52
Baseline x Sex	0.18 (0.35)	[-0.50, 0.85]	0.09	0.38 (0.47)	[-0.54, 1.29]	0.19
Pre-post						
Time	0.33 (0.28)	[-0.22, 0.88]	0.17	0.67 (0.49)	[-0.30, 1.63]	0.34
Time x Intervention	0.63 (0.44)	[-0.24, 1.50]	0.33	0.90 (0.53)	[-0.14, 1.94]	0.46
Time x Country	-0.26 (0.41)	[-1.06, 0.55]	-0.13	-0.72 (0.53)	[-1.76, 0.33]	-0.37
Time x Sex	0.52 (0.33)	[-0.13, 1.16]	0.27	0.46 (0.42)	[-0.38, 1.29]	0.23
Post – follow up						
Time	**0.43 (0.14)**	**[0.16, 0.70]**	**0.22**	**0.46 (0.14)**	**[0.19, 0.72]**	**0.24**
Time x Intervention	**0.44 (0.16)**	**[0.12, 0.75]**	**0.23**	**0.50 (0.15)**	**[0.21, 0.79]**	**0.26**
Time x Country	**-0.46 (0.15)**	**[-0.75, -0.17]**	**-0.24**	**-0.62 (0.15)**	**[-0.92, -0.32]**	**-0.32**
Time x Sex	**-0.36 (0.14)**	**[-0.64, -0.08]**	**-0.19**	**-0.28 (0.12)**	**[-0.51, -0.04]**	**-0.14**

Note. Intervention: 0 = educational, 1 = psychological; country: 0 = UK, 1 = Greece; Intention-to-treat analyses included all cases available. Per-protocol analysis included cases who completed all intervention sessions (six) and provided responses to all waves of measurement (i.e., listwise deletion). Standard errors are in parenthesis. CI = confidence intervals. ES = effect size, expressed in the baseline standard deviation units, with values between .20 and .49 constitute a small effect, .50 to .79 a medium effect, and .80 or greater a large effect. Confidence intervals that do not include 0 are in boldface.

Table 6S

Results for Multilevel Piecewise Linear Growth Models for Self-Regulatory Efficacy

Term	Intention-to-Treat Analysis			Per-Protocol Analysis		
	Estimate	95% CI	ES	Estimate	95% CI	ES
Baseline	**4.77 (0.18)**	**[4.42, 5.11]**		**4.96 (0.24)**	**[4.49, 5.42]**	
Baseline x Intervention	**0.69 (0.25)**	**[0.20, 1.18]**	**0.41**	**0.98 (0.38)**	**[0.24, 1.72]**	**0.56**
Baseline x Country	-0.24 (0.27)	[-0.77, 0.3]	-0.14	-0.52 (0.37)	[-1.24, 0.20]	-0.30
Baseline x Sex	0.19 (0.22)	[-0.24, 0.62]	0.11	0.07 (0.32)	[-0.55, 0.69]	0.04
Pre-post						
Time	0.40 (0.29)	[-0.17, 0.96]	0.23	0.10 (0.25)	[-0.38, 0.59]	0.06
Time x Intervention	**-0.74 (0.31)**	**[-1.35, -0.13]**	**-0.44**	**-1.23 (0.35)**	**[-1.92, -0.54]**	**-0.70**
Time x Country	-0.23 (0.32)	[-0.85, 0.39]	-0.14	0.26 (0.37)	[-0.46, 0.97]	0.15
Time x Sex	0.29 (0.32)	[-0.34, 0.92]	0.17	0.59 (0.38)	[-0.15, 1.33]	0.34
Post – follow up						
Time	-0.01 (0.17)	[-0.35, 0.33]	-0.01	0 (0.17)	[-0.33, 0.33]	0.00
Time x Intervention	0.21 (0.19)	[-0.17, 0.59]	0.12	0.34 (0.21)	[-0.07, 0.74]	0.19
Time x Country	0.28 (0.19)	[-0.09, 0.65]	0.16	0.17 (0.20)	[-0.23, 0.57]	0.10
Time x Sex	0.03 (0.22)	[-0.40, 0.46]	0.02	-0.04 (0.21)	[-0.45, 0.38]	-0.02

Note. Intervention: 0 = educational, 1 = psychological; country: 0 = UK, 1 = Greece; Intention-to-treat analyses included all cases available. Per-protocol analysis included cases who completed all intervention sessions (six) and provided responses to all waves of measurement (i.e., listwise deletion). Standard errors are in parenthesis. CI = confidence interval. ES = effect size, expressed in the baseline standard deviation units, with values between .20 and .49 constitute a small effect, .50 to .79 a medium effect, and .80 or greater a large effect. Confidence intervals that do not include 0 are in boldface.

CONSORT 2010 checklist of information to include when reporting a randomised trial*

Section/Topic	Item No	Checklist item	Reported on page No
Title and abstract			
	1a	Identification as a randomised trial in the title	1
	1b	Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts)	2
Introduction			
Background and objectives	2a	Scientific background and explanation of rationale	5-7
	2b	Specific objectives or hypotheses	8
Methods			
Trial design	3a	Description of trial design (such as parallel, factorial) including allocation ratio	9
	3b	Important changes to methods after trial commencement (such as eligibility criteria), with reasons	N/A
Participants	4a	Eligibility criteria for participants	9
	4b	Settings and locations where the data were collected	14
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	9, 10, 31, Table 1S
Outcomes	6a	Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed	8, 11-13
	6b	Any changes to trial outcomes after the trial commenced, with reasons	N/A
Sample size	7a	How sample size was determined	9
	7b	When applicable, explanation of any interim analyses and stopping guidelines	N/A
Randomisation:			
Sequence generation	8a	Method used to generate the random allocation sequence	N/A
	8b	Type of randomisation; details of any restriction (such as blocking and block size)	13
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	N/A
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	13
Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how	13, 14

	11b	If relevant, description of the similarity of interventions	N/A
Statistical methods	12a	Statistical methods used to compare groups for primary and secondary outcomes	15
	12b	Methods for additional analyses, such as subgroup analyses and adjusted analyses	15
Results			
Participant flow (a diagram is strongly recommended)	13a	For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome	35
	13b	For each group, losses and exclusions after randomisation, together with reasons	35
Recruitment	14a	Dates defining the periods of recruitment and follow-up	9
	14b	Why the trial ended or was stopped	N/A
Baseline data	15	A table showing baseline demographic and clinical characteristics for each group	30
Numbers analysed	16	For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups	35
Outcomes and estimation	17a	For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)	34
	17b	For binary outcomes, presentation of both absolute and relative effect sizes is recommended	N/A
Ancillary analyses	18	Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory	N/A
Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	9
Discussion			
Limitations	20	Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	21, 22
Generalisability	21	Generalisability (external validity, applicability) of the trial findings	21
Interpretation	22	Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	19-21
Other information			
Registration	23	Registration number and name of trial registry	N/A
Protocol	24	Where the full trial protocol can be accessed, if available	N/A
Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	23

*We strongly recommend reading this statement in conjunction with the CONSORT 2010 Explanation and Elaboration for important clarifications on all the items. If relevant, we also recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials. Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see www.consort-statement.org