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Journal of Sports Sciences

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rjsp20

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To cite this article: Javier Horcajo , David Santos , Joshua J. Guyer & Rafael Mateos (2020): A meta-cognitive approach to doping in sports: The effects of thought validation on attitudes related to doping, Journal of Sports Sciences, DOI: 10.1080/02640414.2020.1776930

To link to this article: https://doi.org/10.1080/02640414.2020.1776930

JOURNAL OF SPORTS SCIENCES
https://doi.org/10.1080/02640414.2020.1776930

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SOCIAL AND BEHAVIORAL SCIENCES

A meta-cognitive approach to doping in sports: The effects of thought validation on attitudes related to doping

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ABSTRACT

To better understand doping-related attitude change, it is important to consider not only the amount of thinking (i.e., elaboration) done by message recipients, but also the favorability of their thoughts in response to the proposal, as well as the perceived validity in their thoughts. The main goal of the present study was to analyze the effects of a meta-cognitive process (i.e., thought validation) on attitudes related to doping. Thus, we randomly assigned participants to read a message either against or in favor of legalising several doping behaviors. Participants listed their thoughts regarding the proposal and indicated the perceived validity in their thoughts, then reported their attitudes. As hypothesised, the message against legalisation elicited more unfavorable thoughts and attitudes than the message in favor of legalisation. Most relevantly, the effects of the message direction on attitudes were greater for participants with higher (vs. lower) levels of thought validity. Furthermore, consistent with the thought validation process, results revealed that thought favorability was a better predictor of attitudes for participants with higher (vs. lower) perceived thought validity, indicating that perceiving one's thoughts as valid plays an important role in persuasion. These findings provide novel insights for research and interventions regarding doping in sports.

ARTICLE HISTORY
Accepted 27 May 2020

KEYWORDS
Doping; attitude; persuasion; meta-cognition; validation

Introduction

Doping is a multifaceted and complex phenomenon that can be studied in a wide variety of ways (see S. Backhouse et al., 2016; Murray et al., 2009). From the specific perspective of a "cognitive research program" (Hauw & McNamee, 2015), the psychological processes linked to doping are very relevant, particularly as they relate to attitudes and attitude change. In fact, research in this domain has shown that athletes' attitudes towards doping are one of the most significant psychological predictors of intentions, and both attitudes and especially intentions can predict actual doping behaviors (Ntoumanis et al., 2014). Consequently, many well-known intervention programmes have included some form of persuasive communication and techniques geared towards promoting attitudes and intentions against the use of banned performance-enhancing substances (e.g., Barkoukis et al., 2016; Goldberg et al., 1996; Mottram et al., 2008; see S. Backhouse et al., 2016, for a review).

Theoretical models of persuasion have focused on the psychological mechanisms responsible for attitude change. From a *cognitive response approach*, persuasion is predicted by the recipient's thoughts in response to a persuasive proposal (Greenwald, 1968; Petty et al., 1981). According to this approach, thoughts are conceptualized as "cognitive responses" from which an attitude is formed, maintained or modified to shape a global evaluation (i.e., attitude) of an object, topic, person, etc. That is, thoughts generated in response to a message can result in attitudes (i.e., global evaluations). Therefore, distinguishing between thoughts and attitudes has been particularly important within the persuasion literature given that attitudes are formed, maintained or changed as a consequence of thoughts generated in response to a persuasive proposal/message (e.g., see Eagly & Chaiken, 1992; Greenwald, 1968; Petty & Cacioppo, 1981; Petty et al., 1981; for a review).

A large body of research has examined how the *valence* of thoughts generated in response to a message can affect attitude change as a function of the extent to which individuals are both motivated and able to process the information contained in that message (e.g., see Briñol & Petty, 2012; for a review). Generally, more favorable thoughts (i.e., thoughts that agree with the proposal) lead to more persuasion, whereas more unfavorable thoughts (i.e., thoughts that disagree with the proposal) lead to less persuasion or can even modify recipients' attitudes in a direction opposite to the one advocated in the message. More recently, multi-process models of persuasion, such as the Elaboration Likelihood Model (ELM, Petty & Cacioppo, 1986) and the Heuristic-Systematic Model (HSM, Chaiken et al., 1989), have extended the cognitive response approach via theoretical frameworks that have advanced our understanding of the psychological processes underlying attitude change. As this relates to our study, one advantage of the ELM is that this model uniquely specifies that persuasion can occur via a meta-cognitive process (e.g., see Petty & Briñol, 2012; Petty et al., 2018, 2002). Thus, the ELM provides a theoretical framework which allows us to test the potential role of meta-cognition on doping-related attitude change.

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Specifically, the ELM identifies several core psychological processes by which variables can influence attitude change (e.g., Petty et al., 2018). The specific process by which persuasion occurs is first determined by where a person falls on the elaboration continuum (i.e., the extent to which a person carefully examines the available information about the persuasive proposal).[1] Furthermore, the ELM states that whether attitudes are changed by either high or low elaboration processes has important downstream implications for the strength of the resulting attitudes. For example, attitude change occurring via careful processing is typically more persistent, resistant, and predictive of intentions and behaviors than attitude change occurring via relatively less careful processing (e.g., Petty et al., 1995; Petty & Wegener, 1998; for a review). This pattern has also been found in the context of attitudes related to doping (e.g., Horcajo & De la Vega, 2014; Horcajo & Luttrell, 2016; Horcajo, Santos et al., 2019). Therefore, in line with prior research on persuasion, the present study proposes that the theoretical framework provided by a contemporary model of attitude change such as the ELM allows for greater understanding of *whether, when*, and *why* doping-related interventions will be successful, unsuccessful or even detrimental for promoting attitudes, intentions, and behaviors against doping.

Meta-cognition and attitude change

Most relevant to the present study, we note that the psychological processes by which the ELM states a variable influences attitude change can be distinguished based on whether they reflect *primary* versus *secondary* cognition (e.g., Petty & Briñol, 2012; Wagner et al., 2012). Primary (or first-order) cognition refers to the *content* of the thoughts generated (e.g., the *valence*, that is, how favorable/unfavorable those thoughts are) in response to a message (e.g., "*Banned performance-enhancing substances such as anabolic androgenic steroids are unhealthy*"). However, following a primary thought, individuals can generate additional thoughts (or appraisals) by reflecting on their primary thought (or their thought processes) in a meta-cognitive manner (e.g., "*I am certain that banned performance-enhancing substances such as anabolic androgenic steroids are unhealthy*"). This second-order thinking, or "thinking about thinking", reflects secondary cognition, otherwise known as meta-cognition (e.g., see Briñol & DeMarree, 2012; Dunlosky & Metcalfe, 2009; Jost et al., 1998; Petty et al., 2007; for a review).

The core idea here is that individuals can reflect on their own thoughts generated in response to a persuasive proposal by considering the *validity* of their thoughts, for instance, in terms of their *subjective perceptions of confidence* in their thoughts (Petty et al., 2002). In turn, this meta-cognitive process of *thought validation* can affect subsequent attitudes, judgments, and behaviors to the extent that people believe their thoughts are correct or feel pleasant with their thoughts. Conversely, thoughts perceived as incorrect or appraised as unpleasant can be mentally discarded, and thus have comparatively little influence on subsequent attitudes, judgments, and behaviors (e.g., see Briñol & Petty, 2009, 2015; Petty & Briñol, 2020; for a review). Therefore, under conditions in which careful scrutiny of a message is likely (i.e., high elaboration), the ELM proposes that attitude change can occur as a result of secondary cognition (i.e., meta-cognition); specifically, via a thought validation process. Of greater importance, this meta-cognitive process shows that thoughts alone are not sufficient for predicting subsequent attitudes. Rather, people must also rely on their own thoughts (because they think that their thoughts are valid) for them to have an important influence on the resulting attitudes.

Previous research has found that perceiving one's thoughts as valid increases the extent to which one's thoughts predict subsequent attitudes compared to doubting the validity of one's thoughts (e.g., Petty et al., 2002; Requero et al., 2020). Importantly, the direction of a person's thoughts (i.e., whether favorable or unfavorable regarding the persuasive proposal) can interact with their thoughts' perceived validity, thus yielding different persuasive outcomes. That is, favorable thoughts perceived as relatively high (vs. low) in validity tend to enhance persuasion, whereas unfavorable thoughts perceived as relatively high (vs. low) in validity tend to decrease persuasion. In sum, the extent of persuasion not only depends on the *amount* and *valence* of recipients' thoughts, but also on whether (or not) recipients *rely on their thoughts* when forming or changing their attitudes.

Doping-related attitude change

Most theory-driven social psychological research on doping has been based on social cognitive theories, such as the theory of reasoned action (Fishbein & Ajzen, 1975), or the theory of planned behavior (Ajzen, 1991), as well as constructs (e.g., self-efficacy, moral disengagement, etc.) taken from Bandura's theories on thought and action (Bandura, 1986, 1991, 1997). Additionally, several models have specifically been proposed to understand doping behavior (see S. Backhouse et al., 2016; for a review), such as the Sport Drug Control Model (SDCM; Donovan et al., 2002; see also Donovan, 2009), the Drugs in Sport Deterrence Model (DSDM; Strelan & Boeckmann, 2003; see also, 2006), the Life-Cycle Model of Performance Enhancement (LCMPE; Petróczi & Aidman, 2008), or the Incremental Model of Doping Behavior (IMDB; Petróczi, 2013), among others. Some researchers have also developed models integrating motivation and social cognition that extend existing theories in order to increase the explained variance in doping behavior (e.g., Barkoukis et al., 2013; Chan et al., 2014; Lazuras et al., 2015).

[1] According to the ELM, at the high end of the elaboration continuum (i.e., when both ability and motivation are high), a variable (e.g., the *credibility* of a source advocating against the use of banned performance-enhancing substances) can either (1) *serve as an argument* for or against the proposal, or (2) *bias the direction of cognitive responses* (i.e., thoughts) to be more or less favorable toward the proposal, or (3) *determine whether an individual validates or invalidates their own thoughts* generated in response to a message. At the low end of the elaboration continuum (i.e., when ability and/or motivation are low), (4) a variable can *serve as a simple peripheral cue*, whereby evaluative judgments may arise by way of heuristics (i.e., forming judgments and making decisions based on relatively low-effort thinking, for instance, the "illegal-is-effective" heuristic, see Dodge et al., 2013). In the middle of the elaboration continuum, when thinking is not constrained to be either high or low, (5) a variable can *affect the actual amount of processing that occurs* (see Petty & Briñol, 2012; Petty & Cacioppo, 1986; Petty et al., 2018; Petty & Wegener, 1998, 1999; for a review on the ELM).

As far as we are aware, none of these models and theoretical perspectives has explicitly referred to *meta-cognition* when describing and/or explaining doping behavior. Furthermore, research specifically analyzing attitude change related to doping has exclusively focused on primary cognition processes. For example, studies conducted by Horcajo and colleagues either manipulated (e.g., varying the personal relevance and responsibility) or measured (e.g., assessing the individuals' need for cognition) the extent of elaboration (i.e., the amount of thinking), and found that when doping-related attitudes changed through relatively thoughtful processes (i.e., high elaboration), this led to greater attitude certainty, persistence, and resistance to change, as well as higher attitude-intention correspondence than when attitudes changed through relatively non-thoughtful processes (i.e., low elaboration; see Horcajo & De la Vega, 2014, 2016; Horcajo & Luttrell, 2016; Horcajo, Santos et al., 2019). Interestingly, none of these studies analyzed the potential role played by the valence of thoughts generated in response to the persuasive proposal, rather only assumed their importance (e.g., Horcajo & Luttrell, 2016). In addition, other studies on attitude change related to doping (e.g., Barkoukis et al., 2015; James et al., 2010), as well as intervention studies (see S. Backhouse et al., 2016; for a review), have not assessed neither the amount of thinking nor the valence of thoughts. Therefore, one important feature of primary cognition that remains unexplored within the research on doping-related attitude change is the extent to which thought favorability in response to a persuasive proposal may affect attitudes.

To address this gap in the doping literature, our study first analyzed the role played in attitude change by primary thoughts in response to a message related to doping in sports. Second and more importantly, the main goal of our study was to analyze the impact of a meta-cognitive process (i.e., thought validation) on doping-related attitude change. In line with the ELM, to better understand attitude change, it is important to consider not only the amount of thinking (i.e., elaboration) done by message recipients and the content (e.g., favorability) of their thoughts in response to a proposal, but also the perceived validity in their thoughts. Thus, our study tested the effects of thought validation on attitudes towards a proposal regarding the legalisation of several banned behaviors in sports (e.g., the use of Anabolic Androgenic Steroids, AAS, and Erythropoietin, EPO, to enhance performance). Specifically, we randomly assigned participants to read a persuasive message whose content was either against (i.e., the anti-legalisation message) or in favor of (i.e., the pro-legalisation message) that legalisation proposal. This experimental manipulation of the direction of the message was included to influence the favorability of participants' thoughts (i.e., unfavorable vs. favorable) in response to the proposal. After reading the persuasive message, participants reported their thoughts, then completed a measure of thought validity aimed at capturing the extent to which they considered their thoughts towards the proposal as valid or not. Finally, they reported their attitudes towards the legalisation proposal.

In accord with the ELM and prior research, we made four main predictions:

Hypothesis 1: We predicted a main effect of the message direction (against vs. in favor of legalisation) on thought favorability, such that the anti-legalisation message would elicit more unfavorable thoughts than the pro-legalisation message, regardless of participant's thought validity.

Hypothesis 2: We also predicted a main effect of the message direction on attitudes towards the legalisation proposal. Thus, attitudes were expected to be more unfavorable in response to the anti-legalisation message compared to the pro-legalisation message.

Hypothesis 3: Most importantly, we predicted an interaction between the message direction and thought validity on attitudes towards the legalisation proposal. Thus, the effects of the message direction on attitudes would be greater for participants with higher (vs. lower) levels of validity in their thoughts.

Another way to examine the influence of thought validation on attitude change is to analyze the relationship between thought favorability and attitudes as a function of thought validity. In accord with the thought validation hypothesis (see Petty et al., 2002), we expected that the more individuals perceive their thoughts as valid, the larger the relationship would be between thought favorability and attitudes. Therefore:

Hypothesis 4: We predicted an interaction between thought favorability (when included as a predictor) and thought validity on attitudes towards the legalisation proposal. Thus, thought favorability would better predict attitudes for those participants with higher (vs. lower) levels of validity in their thoughts.

Method

Participants and design

An a priori power analysis was performed using G*Power (Faul et al., 2009) which assumed a small to medium value for the predicted key interaction (i.e., hypothesis 3) effect size (Cohen's f =.22; see Requero et al., 2020). Results of this analysis suggested that the desired sample size for a two-tailed test (α = .05) with .80 power was N = 165. Our final sample (N = 168) slightly exceeded that estimation because we kept signups open until the end of the academic semester.

Therefore, one hundred sixty-eight undergraduate university students (36 males, 130 females, and two gender-unidentified participants, M_{age} = 20.96; SD = 4.66; ranging from 18 to 55 years old) voluntarily participated in the study. More specifically, all participants were native Spanish speakers enrolled in different courses within a psychology programme at a large public university located in Spain (Universidad Autónoma de Madrid). Moreover, participants were recreational sportspeople selected on the basis that they would weekly practice one sport (M_{days} = 3.12; SD = 1.38; ranging from 1 to 7 days a week). We aimed to examine attitudes related to doping in this population because the use of unhealthy performance-enhancing substances and methods beyond elite and competitive athletes is "a potentially growing

and problematic phenomenon that may be developing into a serious societal and public health concern" (S. Backhouse et al., 2014; p. 7; see also, e.g., Lazuras et al., 2017).

Participants were randomly assigned to conditions in a 2 (Message Direction: Against vs. In Favor of Legalisation) between-subjects design in which Thought Validity was measured as a continuous predictor variable, and Thought Favorability and Attitudes towards the legalisation proposal were the dependent measures.[2] In order to test hypothesis 4, Thought Favorability was used as a continuous predictor variable.

Procedure

Permission to conduct the study was provided by the university institutional ethics committee before the study began. In addition, all participants were required to read and sign an informed consent form before the beginning of the study. After signing this form, participants completed the study individually using a questionnaire. While participants were completing this questionnaire, a researcher was available and answered questions that arose regarding the study materials, measures, etc.

Using a procedure adapted from prior research (e.g., Horcajo, Santos et al., 2019), participants were told that they would be taking part in a study conducted by the World Anti-Doping Agency (WADA) regarding the legalisation of several banned behaviors (e.g., the use of AAS and EPO to enhance performance). Relevant to this legalisation proposal, beliefs regarding whether doping should be legalised are one of the most significant psychological predictors of intentions to dope and actual doping behaviors, as found in Ntoumanis et al.'s meta-analysis (2014). Furthermore, because doping-related attitudes can be biased by socially desirable responding (e.g., Gucciardi et al., 2010; Petróczi & Nepusz, 2011), we chose a fictitious legalisation proposal taken from prior research (e.g., Horcajo & De la Vega, 2014; Horcajo, Santos et al., 2019) as our target attitude object (instead of towards doping itself). Thus, participants' attitudes towards that proposal (vs. towards doping itself) should be less affected by social desirability concerns, and specifically formed as a function of the message they received (against vs. in favor of that legalisation proposal).

In this study, participants were explicitly encouraged to think carefully about the information included in the message by informing them that they belonged to a selected sample of sportspeople taken from a university students population whose responses would directly influence WADA's evaluation of this issue. As a function of their opinions, WADA could decide to legalise those substances in the immediate future, thus increasing participants' perceived responsibility. Research has shown that personal responsibility can enhance motivation to process the message (Petty & Cacioppo, 1986; see also Horcajo & De la Vega, 2014; Horcajo & Luttrell, 2016). Next, participants received a persuasive message that presented either unfavorable (i.e., anti-legalisation) or favorable (i.e., pro-legalisation) information about the legalisation of the banned behaviors. After reading the message, participants reported their thoughts in response to the proposal using a thought-listing task, then indicated the extent to which they perceived their thoughts as valid. Finally, participants reported their attitudes towards the legalisation proposal, then filled out several socio-demographic and ancillary questions. After all measures were completed, each participant was debriefed and received information clarifying the purpose of the study. Importantly, the debriefing form clearly stated that this research was not being conducted by or on behalf of WADA, thus it did not represent the position of WADA. Furthermore, participants were explicitly told that all information in the study (i.e., materials, experimental inductions, etc.) was fictitious and had been created by the researchers solely for the purpose of this study. We specifically highlighted this information when participants received the arguments in favor of legalising the use of AAS or EPO.

Independent/predictor variables

Message direction

Messages were taken from prior research (Horcajo & De la Vega, 2014, 2016; Horcajo & Luttrell, 2016; Horcajo, Santos et al., 2019). On the one hand, in the *anti-legalisation* condition, the message included several negative effects of legalisation. For instance, some arguments were "it is not appropriate to permit the use of substances such as EPO and AAS because these substances can produce severe harm to athletes' health," and "the level of physical and psychological dependence could increase the consumption of those harmful substances," and "one of the most obvious consequences of legalising these doping substances is that their consumption would skyrocket and occur at increasingly early ages by athletes."

On the other hand, in the *pro-legalisation* condition, the message included a variety of positive effects of legalisation under medical guidance. For instance, some arguments were "substances such as EPO and AAS could help athletes cope with stress," and "legalisation would be beneficial because some athletes acquire these substances on the 'black market' without any medical control or a prescription from a physician regarding a safe dosage," and "the legalisation of some practices and substances that are currently prohibited would lead to more investment in research and development in order to improve sports performance, which would create new job opportunities and with it new jobs."

Thought validity

Participants reported the extent to which they perceived the thoughts that they generated to be valid using a 9-point scale. Specifically, participants responded to the following item: "To what extent do you think your thoughts are valid?" (1 = *Not very valid*, 9 = *Very valid*).[3] Although this measure is composed of a single-item, this specific item has been successfully used in

[2]To check for randomization, we compared the gender distribution between the anti-legalisation message (22.35% male) and the pro-legalisation message (20.99% male; see Barkoukis et al., 2015; Horcajo, Paredes et al., 2019; for a similar analysis). The results of a chi-square test indicated no significant difference in proportions of males and females randomized to the experimental groups, $\chi^2(1) = .046$, $p = .831$.

[3]This measure was not affected by the Message Direction manipulation, although it was close to being significant, $F(1, 166) = 3.229$, $p = .074$, $\eta_\rho^2 = .019$. When Thought Favorability was included as a covariable, the Message Direction did not significantly influence Thought Validity, $F(1, 165) = 0.001$, $p = .982$, $\eta_\rho^2 < .001$.

previous research as a reliable indicator of thought validity (e.g., Briñol et al., 2004; Clark et al., 2013; Petty et al., 2002; Requero et al., 2020).

Dependent variables

Thought favorability

Two independent judges coded the valence of participants' thoughts as favorable, unfavorable, or neutral regarding the proposal, while blind to experimental conditions (e.g., see Cacioppo et al., 1981; Petty & Cacioppo, 1986; for a description and discussion of the "thought listing" technique).[4] Judges agreed on 92.33% of the thoughts coded, and disagreements (7.66%) were resolved by a senior researcher also blind to experimental conditions. Based on this final coding, an index of the valence of thoughts was created for each participant using the following formula: Thought Favorability = (Number of favorable thoughts – Number of unfavorable thoughts)/(Number of favorable thoughts + Number of unfavorable thoughts). Scores on this index ranged from −1 (i.e., all thoughts were unfavorable) to 1 (i.e., all thoughts were favorable).

Attitudes

Attitudes towards the legalisation proposal were assessed using eight 9-point semantic differential scales based on previous research (Horcajo & Luttrell, 2016; Horcajo, Santos et al., 2019): against vs. in favor, more vs. less stress after legalisation, unhealthy vs. healthy, inappropriate vs. appropriate, negative vs. positive, undesirable vs. desirable, non-recommendable vs. recommendable, and bad vs. good. Item-ratings were highly correlated (α = .922), thus averaged to create a composite attitude index. Responses to these items were scored so that higher values represented more favorable attitudes towards the legalisation proposal.

Results

Thought favorability

The thought favorability index was submitted to a hierarchical multiple regression analysis, conducted via PROCESS (model 1; Hayes, 2013). Message Direction (dummy coded; anti-legalisation = 0; pro-legalisation = 1), Thought Validity (continuous variable), and the interaction term (Message Direction × Thought Validity) were entered as predictors. The continuous variable (i.e., Thought Validity) was mean centered to address multi-collinearity concerns when computing interaction terms. Following the suggestion of Cohen and Cohen (1983), main effects and interaction were interpreted in the first block in which they appeared in the regression analyses.

Confirming the success of the Message Direction manipulation, results revealed the predicted significant main effect of Message Direction, $B = 0.931$, $t(165) = 10.355$, $p < .001$, 95% CI: 0.754, 1.109, such that participants' thoughts were more unfavorable in the anti-legalisation ($M = -0.68$, $SD = 0.51$) than in the pro-legalisation ($M = 0.11$, $SD = 0.72$) message condition. The results also revealed a non-predicted significant relationship between Thought Validity and thought favorability, $B = -0.069$, $t(165) = -2.164$, $p = .032$, 95% CI: −0.132, −0.006, indicating that more unfavourable thoughts towards the legalisation proposal were associated with increases in Thought Validity. As expected, these main effects were not qualified by a two-way interaction between Message Direction and Thought Validity, $B = -0.012$, $t(165) = -0.188$, $p = .851$, 95% CI: −0.141, 0.117.

Attitudes

A hierarchical multiple regression analysis using attitudes as the dependent variable (also conducted via PROCESS, model 1) revealed the predicted significant main effect of Message Direction, such that the anti-legalisation message yielded more unfavorable attitudes ($M = 2.65$, $SD = 1.27$) than the pro-legalisation message ($M = 3.98$, $SD = 1.69$), $B = 1.264$, $t(165) = 5.489$, $p < .001$, 95% CI: 0.809, 1.719. Moreover, we found a marginally significant main effect of Thought Validity on attitudes, $B = -.155$, $t(165) = -1.906$, $p = .058$, 95% CI: −0.317, 0.006, indicating that participants who perceived their thoughts as more valid also had more unfavorable attitudes.

Most importantly, the predicted two-way interaction was found between Message Direction and Thought Validity, $B = 0.359$, $t(164) = 2.174$, $p = .031$, 95% CI: 0.033, 0.685 (see Figure 1).[5] As hypothesised, among participants who reported relatively high levels of Thought Validity (+1SD), those receiving a message against legalisation showed significantly more

[4]Both judges were PhD students who received training in the proper procedures required when coding thoughts. Specifically, before coding thoughts in this study, both judges practiced coding thoughts from a similar study, then compared their thought-ratings to ensure that they were correct and properly calibrated with one another. Given that each judge coded the same thoughts separately, this process helped to ensure that both judges understood how to correctly code the valence of participant's thoughts, and that the application of the coding scheme was properly calibrated across judges. The same procedure was used in the current study. This process of coding was conducted under the close supervision of an experienced, senior researcher.

[5]Even though the call to participate in our study explicitly stated that all prospective participants must practice at least one sport once a week, to ensure that this minimum threshold to be considered a recreational sports person was met, at the very end of the study all participants were required to report the number of days per week that they practiced their sport using a 1–7 scale. When this measure was included in the analysis, the three-way interaction was not significant, $B = -0.190$, $t(163) = -1.539$, $p = .126$, 95% CI: −0.433, 0.054. Likewise, neither the two-way interaction between the Message Direction and the Number of Days, $B = 0.242$, $t(164) = 1.429$, $p = .155$, 95% CI: −0.092, 0.576, nor the two-way interaction between Thought Validity and the Number of Days, $B = 0.047$, $t(164) = 0.779$, $p = .437$, 95% CI: −0.072, 0.166, were significant. Most importantly, the expected two-way interaction between the Message Direction and Thought Validity remained significant when controlling for the Number of Days, $B = 0.350$, $t(163) = 2.085$, $p = .039$, 95% CI: 0.019, 0.681. Finally, no main effect of the Number of Days on attitudes emerged, $B = 0.011$, $t(163) = 0.126$, $p = .900$, 95% CI: −0.155, 0.176.

In addition, we also analysed the role of gender as a potential moderator variable. When gender was included in the analysis, the three-way interaction was not significant, $B = -0.135$, $t(162) = -0.322$, $p = .748$, 95% CI: −0.960, 0.691. Likewise, neither the two-way interaction between the Message Direction and Gender, $B = -0.368$, $t(163) = -0.655$, $p = .513$, 95% CI: −1.477, 0.741, nor the two-way interaction between Thought Validity and Gender, $B = 0.180$, $t(163) = 0.803$, $p = .423$, 95% CI: −0.263, 0.623, were significant. Furthermore, the predicted two-way interaction between the Message Direction and Thought Validity remained significant when controlling for Gender, $B = 0.349$, $t(162) = 2.102$, $p = .037$, 95% CI: 0.021, 0.677. Finally, consistent with some previous studies (specifically, regarding attitudes towards the use of AAS; see S. Backhouse et al., 2016, for a review), the main effect of Gender on attitudes related to doping was close to being significant, $B = -0.501$, $t(162) = -1.817$, $p = .071$, 95% CI: −1.045, 0.044, indicating that women had more unfavorable attitudes towards the legalisation proposal than men.

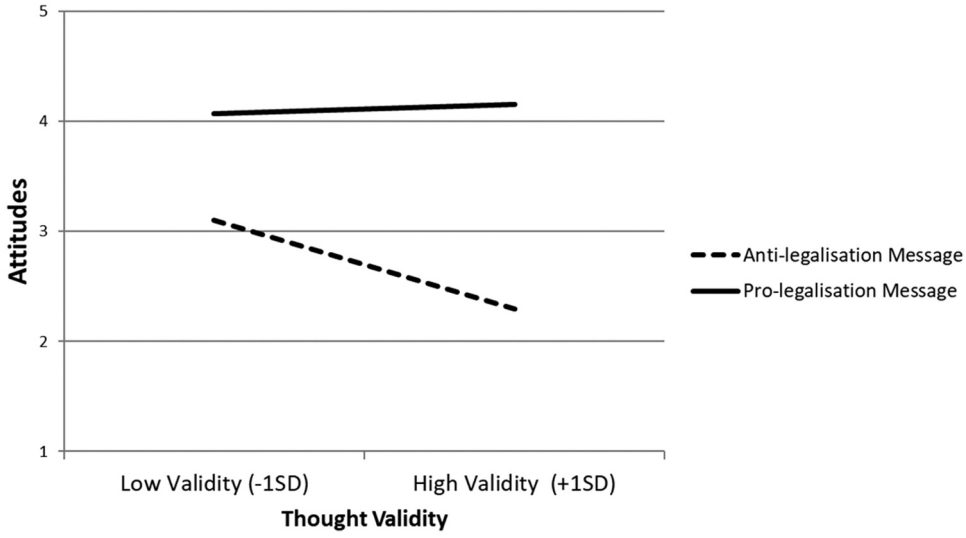

Figure 1. Attitudes as a function of message direction and thought validity.

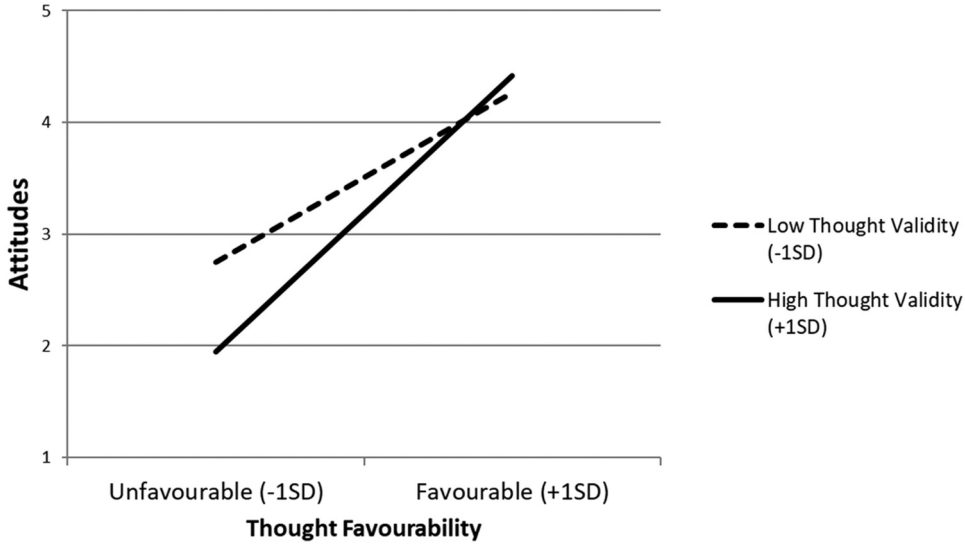

Figure 2. Attitudes as a function of thought validity and thought Favorability.

unfavorable attitudes than those receiving a message in favor of the legalisation proposal, $B = 1.760$, $t(165) = 5.461$, $p < .001$, 95% CI: 1.123, 2.396. In line with our hypothesis, however, this difference was significantly smaller for participants who reported relatively low levels of Thought Validity (−1SD), $B = 0.744$, $t(165) = 2.251$, $p = .026$, 95% CI: 0.091, 1.396.[6]

Thought-attitude linkage

Our hypothesis 4 was that Thought Favorability would be a better predictor of attitudes for those participants with higher (vs. lower) levels of Thought Validity. As predicted, regressing attitudes (via PROCESS, model 1) onto Thought Validity (centered), Thought Favorability (centered, and now included as a predictor), and their interaction term, revealed a significant main effect of Thought Favorability on attitudes, $B = 1.315$, $t(165) = 9.798$, $p < .001$, 95% CI: 1.050, 1.580, indicating that Thought Favorability was associated with attitude favorability. Also as expected, there was no main effect of Thought Validty on atttitudes, $B = -0.067$, $t(165) = -0.933$, $p = .352$, 95% CI: −0.208, 0.074. Most importantly, we found the predicted significant interaction between Thought Validity and Thought Favorability on attitudes, $B = 0.223$, $t(165) = 2.385$, $p = .018$, 95% CI: 0.038, 0.408 (see Figure 2). Consistent with the thought validation

[6]Viewed differently, this interaction also indicated that among participants receiving the message against legalisation, those who reported relatively high levels of Thought Validity (+1SD) had significantly more unfavorable attitudes than those who reported relatively low levels of Thought Validity (−1SD), $B = -0.373$, $t(165) = -2.902$, $p = .004$, 95% CI: −0.627, −0.119. However, among participants who received the message in favor of legalisation, no difference between levels of Thought Validity emerged, $B = -0.014$, $t(165) = -0.139$, $p = .890$, 95% CI: −0.219, 0.190.

hypothesis, this interaction pattern revealed that Thought Favorability was a better predictor of attitudes when participants reported higher levels of Thought Validity (+1SD), $B = 1.635$, $t(165) = 8.670$, $p < .001$, 95% CI: 1.263, 2.008, than when they reported lower levels of Thought Validity (−1SD), $B = 1.004$, $t(165) = 5.411$, $p < .001$, 95% CI: 0.638, 1.371.

Discussion

In this study, we predicted and found that the message against the legalisation proposal elicited more unfavorable thoughts (hypothesis 1) and attitudes (hypothesis 2) towards legalisation than the message in favor of that proposal. Of greater importance to our study, regarding the effects on attitudes, we predicted and found that the direction of the message interacted with participants' perceived validity in their thoughts (hypothesis 3). That is, the message direction had a greater effect on attitudes for participants with higher (vs. lower) levels of thought validity. Furthermore, when participants' thought validity was relatively high (vs. low), they exhibited greater reliance on their thoughts in forming their attitudes towards the legalisation proposal. In other words, thought favorability was a better predictor of attitudes for participants with higher (vs. lower) levels of validity in their thoughts (hypothesis 4). Therefore, these findings show that the extent to which people perceive their thoughts as valid plays an important role in persuasion regarding attitudes related to doping in sports.

To our knowledge, this is the first empirical evidence that recipients' thoughts generated in response to a persuasive proposal related to doping predicted their subsequent attitudes. Of greater importance, our findings also show for the very first time that attitude change in the context of doping occurred through a process of secondary cognition or meta-cognition (i.e., thought validation). In line with prior research on thought validation (e.g., Petty et al., 2002), the results of our study provided convergent empirical evidence that attitude change related to doping is a consequence of the interactive effects of recipients' thought favorability in response to a persuasive proposal and thought validity. Therefore, the current study has shown that both thought dimensions (i.e., primary and secondary) are relevant factors deserving of consideration when attempting to describe, explain, and predict doping-related attitude change.

The present study has extended the effects found in prior research on thought validation to the context of attitudes related to doping; that is, a topic involving an illegal (i.e., banned by the WADA), unhealthy (i.e., including health risks among sportspeople), and unethical (i.e., against the spirit of sport and fair play) behavior. In addition, our research included a methodological novelty. That is, most of the studies analyzing the effects of thought validation on persuasion have used either argument quality manipulations (i.e., strong vs. weak arguments) or manipulations that required participants to self-generate arguments/thoughts (e.g., favorable vs. unfavorable) regarding a topic (e.g., see Briñol & Petty, 2009, 2015; for a review). However, in our study, we used a different manipulation to affect thought favorability by varying the message direction (i.e., against vs. in favor of the legalisation proposal). Thus, our results also contribute to the persuasion literature by showing that the thought validation effects occur under some circumstances (e.g., high elaboration), irrespective of the specific manipulation used to influence the valence of thoughts.

Our findings also have some important implications for future research on doping. As far as we are aware, the main theoretical models and perspectives proposed to understand doping behaviors, as well as the main intervention programmes developed (see S. Backhouse et al., 2016; for a review) have not considered the role of meta-cognitive processes in attitude formation and change. However, most of those models, perspectives, and programmes are based on the assumption that doping is a deliberate and planned decision-making process in which individuals' cognition (e.g., attitudes, intentions, etc.) plays a relevant role in predicting their behavior (see Dodge et al., 2013; Johnson, 2011, 2012; Mazanov & Huybers, 2010; Smith et al., 2010; Stewart & Smith, 2008; for a discussion). Whether doping behavior is deliberative and intentional (i.e., planned), or more spontaneous and automatic, is an issue that is beyond the scope of our study. Indeed, a wealth of social psychological research has shown that both cognition andbehavior can be both deliberative and automatic depending on specific circumstances (e.g., see Chaiken & Trope, 1999; Petty et al., 2009; Sherman et al., 2014; for reviews). More importantly, we propose that a meta-cognitive process such as thought validation is a relevant mechanism that can help to understand doping-related attitude change. In fact, our findings provide initial evidence suggesting that doping research could benefit from considering the meta-cognitive processes in their explanations of doping.

Specifically, current social cognitive models could improve their ability to predict attitudes, intentions, and under some conditions, behaviors related to doping by including the extent to which the perceived validity in one's thoughts is linked to each of those constructs. Thus, we think that one important advantage of our theoretical framework (i.e., ELM) is that it allows researchers and practitioners to make more specific predictions regarding *when* (and not only *whether*) doping-related attitude change will be consequential for intentions and behavior. In fact, prior research has found that although attitudes can be changed either by relatively high or low elaboration processes (i.e., thoughtful vs. non-thoughtful thinking about the merits of an issue), attitudes formed or changed as a result of careful thinking were more likely to yield changes in behavioral intentions than attitudes formed or changed as a result of less careful thinking (Horcajo & Luttrell, 2016; Horcajo, Santos et al., 2019). Because intentions are generally a significant predictor (with a medium effect size) of doping behavior (Ntoumanis et al., 2014) in the context of primary cognition (where careful thinking may or may not occur), it stands to reason that attitude change occurring via a meta-cognitive process (which *requires* careful thinking) should also be consequential for behavioral intentions, and at least indirectly, for doping behavior. In line with this prediction, some studies have found a meaningful impact of thought validation (i.e., meta-cognition) on actual behaviors in different domains,

including sport performance.[7] In sum, the theoretical framework provided by the ELM is complementary to current models in doping research, and extends our understanding of attitude change, as well as its effects on intentions and behaviors. As such, we think that this model could also be useful to better understand not only attitude change, but also doping behavior, although much more research is needed to specifically assess the effects on actual doping behaviors in sports settings.

Although the results of the present study supported our four hypotheses, it should be noted that our study has some limitations. First, we acknowledge that not all results were consistent with our expectations. In line with our hypothesis, the legalisation proposal was rejected more when participants received the anti-legalisation message and perceived higher validity in their thoughts, compared to participants who perceived lower validity in their thoughts. However, when participants received the pro-legalisation message, there were no significant differences in attitudes between participants with higher versus lower levels of validity in their thoughts. One possibility is that the pro-legalisation message did not yield a sufficient number of favorable thoughts to validate. In fact, because the use of AAS and EPO, or doping in general, was likely a very counter-attitudinal topic in our sample, this may be why participants in the pro-legalisation message condition generated only a slightly higher number of favorable than unfavorable thoughts in response to that message.

An additional limitation is that thought validity was measured using a single item rather than manipulated in order to draw causal conclusions regarding its effects on attitudes (e.g., see Gascó et al., 2018; Horcajo et al., 2010; Petty et al., 2002; for different manipulations of thought validity). On the one hand, although the reliability of single-item measures can raise concerns, we attempted to address this issue by selecting a measure of thought validity that has been successfully used in prior research (e.g., Briñol et al., 2004; Clark et al., 2013; Petty et al., 2002; Requero et al., 2020; see also Paredes et al., in press; Santos et al., 2019; for other meta-cognitive single-item measures). Nevertheless, we acknowledge that a multi-item approach would improve reliability, thus permitting a more robust measurement of thought validity. On the other hand, future studies can benefit from manipulating thought validity in order to more accurately infer the causal role of thought validation, even though prior research has found that measures of thought validity are an effective way to explore the role of thought validation in persuasion. In fact, research including studies that measured as well as manipulated thought validity found a similar pattern of results (e.g., Petty et al., 2002; Requero et al., 2020), thus suggesting that both methodologies yield similar findings. Therefore, as a practical suggestion, we recommend the inclusion of thought validity measures because of their ease of use and efficiency. That is, thought validity measures are easy for sports researchers to include, they require only a few additional items, and participants should find them easy to answer. Furthermore, as shown in the current study, measures of thought validity are capable of predicting *when*, as well as helping us to understand *why* a proposal related to doping might be effective in changing attitudes.

There are, of course, a variety of future directions that warrant consideration, one of which involves examining *moderators* of thought validation. On the one hand, the meta-cognitive process of thinking about one's thoughts is more likely to occur *when elaboration is high*. Consequently, to the extent that an individual carefully processes a persuasive message, thought validity will also have a stronger impact on attitudes. This is the case because the same factors that have been found to motivate high amounts of message elaboration (e.g., high personal relevance of the issue, personal responsibility, need for cognition; see Horcajo & De la Vega, 2014; Horcajo & Luttrell, 2016; Horcajo, Santos et al., 2019) are also likely to motivate people to scrutinize and evaluate the validity of their own thoughts. In the present study, we assumed participants were under high elaboration because we explicitly encouraged participants to think carefully about the information included in the message by increasing their personal responsibility. Although this methodological strategy has been very succesful at increasing elaboration in prior research, future studies should include specific manipulations of the extent of elaboration (i.e., high vs. low; Petty & Cacioppo, 1986; e.g., see Horcajo & De la Vega, 2014; Horcajo & Luttrell, 2016; for examples in doping research). As another approach to examine this moderation, consider that research on individual differences has shown that people tend to exhibit stable, chronic differences in the extent to which they prefer to engage in careful thinking. This differential preference for effortful thinking is reflected by the construct known as Need for Cognition (NC; Cacioppo & Petty, 1982; see Horcajo, Santos et al., 2019, for an example of the effects of NC on attitudes and intentions related to doping). Given that thinking about one's thoughts is inherently a process that requires high levels of thinking, it suggests that the meta-cognitive pattern of effects in our study is more likely to emerge for individuals high (vs. low) on this trait (i.e., NC). Indeed, past research has shown that differences in NC do in fact moderate the effects of meta-cognition on attitudes (e.g., Briñol et al., 2007, 2004; Petty et al., 2002). Therefore, future studies should analyze the role of individual differences in, for instance, need for cognition (NC) as a more spontaneous measure of individual differences that could moderate the effects uncovered in this study.

On the other hand, thought validation is assumed to occur when people are prompted to consider the validity they have in their own thoughts *following* (or at least, during) thought generation instead of prior to thought generation. Thus, prior

[7]Of greatest relevance to this point is the study by Horcajo, Paredes et al. (2019). In this research, the authors found that thought validation had an impact on physical performance. It is important to note that participants in this study were actual athletes in gymnasiums and not the usual convenience sample used in psychological research. A second important point to mention is that the behavior studied is directly related to sports: physical performance on three different measures (i.e., a vertical-jump task, a squat test, and a deadlift task). In this study, participants were randomly assigned to first generate and then listen to either positive or negative self-statements (i.e., self-talk). They were then randomly assigned to nod (up and down) or to shake (side to side) their heads while being exposed to the self-talk they had previously generated. This induction was used to influence meta-cognition. As previous research has shown, nodding (vs. shaking) increases thought validity (Briñol & Petty, 2003). Results indicated that athletes' self-statements were significantly more impactful on physical performance in the head-nodding condition (high thought validity) than in the head-shaking condition (low thought validity).

Other studies have also shown an impact of meta-cognition on behavioral outcomes, such as punishment (Study 1, Santos & Rivera, 2015), cooperative behavior (i.e., money given to a partner; Study 1, DeMarree et al., 2012), and academic performance (Clark et al., 2017).

studies have shown that this meta-cognitive mechanism is particularly likely to operate when thoughts are generated before the validating variable is introduced. Future research should include manipulations of *timing*, varying the placement (i.e., prior to vs. after thought generation) of the validating variable. This is a very relevant point because different placements can trigger different psychological processes (i.e., primary or secondary) leading to different outcomes in persuasion (e.g., Horcajo et al., 2010; see Briñol & Petty, 2015; for a review).

Finally, although the bulk of doping research in sports has focused on attitudes, intentions, and behaviors linked to doping among elite and competitive athletes, in our study we focused on a relatively less studied population (i.e., recreational sportspeople) because the use of unhealthy performance-enhancing substances also occurs among recreational athletes across a wide range of physical activities and sports (see S. Backhouse et al., 2014; S. Backhouse et al., 2016; for reviews). We suggest that under some specific circumstances (e.g., high elaboration conditions), the effects found in our study would potentially be expected to occur in the general population, as well as in any athlete irrespectively of the type of sport, the level of athletes, and so forth. Nevertheless, further research should analyze the generalizability of our findings by examining other populations relevant to sports sciences (e.g., elite and competitive athletes in different sports, coaches, etc.). Hypothetically, instead of (or in addition to) affecting thought validation (i.e., secondary cognition or meta-cognition), variables such as the type of sport, level, gender, and so on, could have an influence on primary cognition processes. For instance, these variables could affect either thought favorability or the extent of elaboration when participants (e.g., competitive bodybuilders vs. recreational soccer players; male vs. female, etc.) are exposed to a message related to doping.

In conclusion, this study proposed and examined a meta-cognitive process by which attitude change related to doping can occur as a consequence of thought validation. Our findings contribute to doping research by identifying an important process that current theories, models, perspectives, and intervention programmes can include as a relevant psychological mechanism to describe, explain, predict, and promote attitudes against the use of unhealthy and banned performance-enhancing substances in sports. Thus, when attempting to change attitudes (e.g., through an intervention program or a social marketing campaign based on some persuasive information or arguments), not only is it important that the message influence the valence of recipient's thoughts (against doping), but also that individuals perceive their unfavorable thoughts towards doping as highly valid. This theoretical advance should in turn stimulate new evidence-based interventions into the problem of doping in sports.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the Ministerio de Economía, Industria y Competitividad, Gobierno de España (Spain) [PSI2017-83303-C2-1-P] Grant to Javier Horcajo.

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