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1 **Self-affirmation effects on doping related cognition among exercisers who use**

2 **nutritional supplements**

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17 **Abstract**

18 **Objectives**: The use of nutritional supplements has been associated with stronger

19 doping intentions and actual use of doping substances, but there is limited research

20 about doping risk communication among nutritional supplement users. The present

21 study examined if using a self-affirmation manipulation a) changes intentions to use

22 doping and b) influences related social cognitions (i.e., attitudes, social and moral

23 norms, self-efficacy and situational temptation, and anticipated regret) among

24 exercisers who use nutritional supplements, following a brief exposure to doping-

25 related health risk messages.

26 **Design**: Between subjects experimental design.

27 **Method**: Sixty exercisers were randomly assigned to self-affirmation and control

28 groups and completed a structured and anonymous questionnaire about doping

29 intentions and related social cognitive variables.

30 **Results**: Self-affirmed participants reported higher scores in descriptive and moral

31 norms and anticipated regret towards using doping substances, than control

32 participants. Doping intentions were predicted by situational temptation and

33 anticipated regret. Anticipated regret mediated the effect of the self-affirmation

34 manipulation on doping intentions.

35 **Conclusions**: In the context of doping risk communication, self-affirmation may

36 influence the decision-making process by acting on anticipated regret. Our findings

37 can inform risk communication campaigns targeting exercisers who use nutritional

38 supplements.

39

40 **Keywords:** recreational sports, nutritional supplements, self-affirmation, social

41 cognition

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44   **Self-affirmation effects on doping related cognition among exercisers who use**

45   **nutritional supplements**

46   Nutritional supplements (e.g., protein, vitamins and minerals, amino acids, and

47   creatine) are widely used to enhance athletic performance and physique in

48   competitive, elite, and non-competitive, amateur sports and fitness settings (Bailey et

49   al., 2011). At the same time, evidence suggests that using nutritional supplements

50   represents one of the most important risk factors for using other performance

51   enhancement substances that are banned in competitive sports, such as anabolic

52   steroids, stimulants, growth hormone, and other performance enhancers described in

53   the list of prohibited substances issued annually by the World Anti-doping Agency

54   (WADA). A meta-analysis of 45 studies found a strong average association between

55   nutritional supplement (NS) use and doping intentions (η^2 =0.36, 95% CI = 0.20 –

56   0.52) and self-reported doping use (η^2 = 8.24, 95% CI = 5.07 – 13.39; Ntoumanis et

57   al., 2014).

58   Some researchers have argued that the observed association between NS use

59   and doping behaviour constitutes evidence for a "gateway", such that athletes who

60   more frequently use NS become more familiarized with chemically-assisted

61   performance enhancement and, therefore, progressively move in to the "dark side" of

62   performance enhancement (Backhouse et al., 2013). Other studies in sport and

63   exercise settings have shown that NS users tend to develop more positive beliefs

64   about, and attitudes towards, doping use, and also hold stronger intentions to use

65   doping substances (Barkoukis, Lazuras, Lucidi, & Tsorbatzoudis, 2015). Taken

66   together, these findings suggest that NS users represent a potentially high-risk group

67   for doping use. Unlike professional and competitive sports, however, there has been a

68 lack of systematic, theory-driven and evidence-based interventions to communicate

69 the risks of doping that aim to change doping-related beliefs (e.g., attitudes),

70 intentions, and behaviour among non-competitive amateur athletes and exercisers

71 who use nutritional supplements (Barkoukis, 2015). Recently, doping researchers

72 have argued that doping among exercisers and non-competitive amateur athletes

73 represents an emerging public health challenge and have called for more concerted

74 preventive efforts (Christiansen & Bojsen-Møller, 2012; Henning & Dimeo, 2017;

75 van de Ven, 2016). Indeed, the non-medical and uncontrolled use of doping

76 substances has been associated with an early onset of preventable mental and physical

77 morbidity (e.g., depression, anxiety, mood and body image disturbances, suicidal

78 thoughts and attempts, kidney and liver damage, elevated blood pressure) and

79 mortality (Hartgens & Kuipers, 2004; Darke et al., 2014; Frati et al., 2015; Lindqvist

80 et al., 2013), especially among younger people (Quaglio et al., 2009).

81 **Self-affirmation & Risk Communication**

82   Risk communication represents an important public health tool to prevent

83 lifestyle-related diseases and change unhealthy behaviours (Glik, 2007; Witte, Allen,

84 & Witte, 2000). Nevertheless, risk communications can fail for various reasons,

85 leaving unhealthy behaviours, cognitions and intentions unchanged. Some of these

86 reasons reflect defensive processing among the target groups involved. To illustrate,

87 smokers presented with information about the health risks of smoking may take a

88 defensive stance to their behaviour, derogating the health message by downplaying

89 the health consequences of smoking or denigrating the message source (Harris,

90 Mayle, Mabbott, & Napper, 2007; Weinstein, 1984; Weinstein, Marcus, & Moser,

91 2005).

92   From the perspective of self-affirmation theory (Steele, 1988), people engage

93   in defensive processing when risk information reminds them of the inadequacy of

94   their choices, which may trigger negative self-evaluations. Defensive processing

95   enables them to modulate the cognitive and affective repercussions of risk messages

96   and thereby maintain a sense of being morally worthy, competent and able to control

97   important outcomes ('adaptively adequate', Steele, 1988; Sherman & Cohen, 2006).

98   Self-affirmation theory proposes that people are strongly motivated to maintain such a

99   global perception of themselves (as being morally and adaptively adequate).

100   However, the theory also proposes that individuals can maintain this perception by

101   engaging in self-affirmations, which are acts that bolster the sense of having moral or

102   adaptive adequacy. Consequently, when people are allowed to affirm themselves in

103   one behavioural domain (e.g., being a good parent; being a kind person), this frees

104   them to process a personally relevant risk message more open-mindedly and without

105   feeling so threatened (Cohen & Sherman, 2014; Sherman & Cohen, 2002).

106   Interventions based on self-affirmation theory have demonstrated the effectiveness of

107   this approach to improving message acceptance and changing intentions and behavior,

108   in a wide range of health-related (e.g., Epton et al., 2015; Sweeney & Moyer, 2015)

109   and non-health behaviors (Cohen & Sherman, 2014). Based on this literature, it is

110   expected that self-affirmation may assist in improving message acceptance with

111   respect to doping related information (i.e., health effects of doping, moral and social

112   consequences of doping, alternative approaches to enhance performance) by reducing

113   the defensive processes associated with threat of being involved in a stigmatized

114   behavior, such as doping (Barkoukis, Brooke, Ntoumanis, Smith, & Gucciardi, 2019).

115   One way in which self-affirmation may promote behaviour change is by

116   influencing social cognitive variables that are pertinent to intention formation and

117   action initiation, such as attitudes towards the behaviour in question, social norms,

118   and self-efficacy (Epton & Harris, 2008), and anticipated regret (van Koningsbruggen

119   et al., 2016). For instance, van Koningsbruggen et al. (2016) showed that, relative to

120   control participants, self-affirmed participants had higher feelings of anticipated

121   regret following a health message, suggesting that self-affirmation may encourage

122   people to more openly report the regret they would experience in performing an

123   inappropriate behavior, such as doping. Other research has shown that self-

124   affirmation interventions can improve goal attainment (Harris, Harris, & Miles, 2017;

125   Logel & Cohen, 2012), problem solving under pressure (Creswell, Dutcher, Klein,

126   Harris, & Levine, 2013), and activate neural reward pathways and brain regions

127   associated with positive autobiographical memories, such as the ventral striatum

128   (Dutcher et al., 2016). Thus, it is theoretically plausible that self-affirmation can

129   influence self-awareness and related processes with respect to doping use, such as

130   making personal values and norms around doping more salient.

131   To date, there is only one study examining self-affirmation with respect to

132   doping behaviour. Barkoukis, Lazuras and Harris (2015) investigated the effect of a

133   self-affirmation manipulation on the decision to dope among competitive athletes who

134   self-reported using doping substances. The results showed that self-affirmed athletes

135   reported significantly lower doping intentions and lower scores reflecting situational

136   temptation to use doping substances - both known to be significant factors in

137   predicting doping behaviour (Ntoumanis et al., 2014).

138   **The present study**

139   Although sport involvement is meant to promote healthier lifestyles and

140   disease prevention, an increasing volume of evidence suggests exercisers and amateur

141   athletes use or consider using doping substances for performance and appearance

142 enhancement reasons. Anti-doping scholars have emphasized the negative public

143 health implications of this trend (e.g., Christiansen & Bojsen-Møller, 2012; Henning

144 & Dimeo, 2017; van de Ven, 2016). Although previous research has demonstrated the

145 promising effects of self-affirmation in changing situational temptation and intentions

146 to dope in competitive athletes (Barkoukis, et al., 2015), no studies have established

147 whether similar effects of self-affirmation can be found in non-elite and non-

148 competitive athletes. Meta-analysis and review papers have shown that non-elite

149 athletes and exercisers who consume nutritional supplements are at higher risk for

150 doping (Nicholls et al., 2017; Ntoumanis et al., 2014). Other research has shown that

151 nutritional supplement users hold more favourable beliefs about doping use, and such

152 beliefs may facilitate the transition to doping (Barkoukis et al., 2015). Therefore, it is

153 important to investigate whether a self-affirmation manipulation can alter exercisers'

154 beliefs towards doping use. From a theoretical point of view, this will advance our

155 understanding of self-affirmation effects in groups that are not currently engaged in a

156 health-risk (and socially undesirable) behaviour, but are high at-risk for doing so.

157 From a practitioners' point of view, if self-affirmation is effective in altering

158 exercisers' beliefs about doping use, then this can inform subsequent initiatives to

159 reduce the risk for doping in this population. Therefore, the present study was

160 designed to investigate if self-affirmation influences doping intentions and related

161 social cognitive variables among exercisers who use nutritional supplements but not

162 doping substances, following exposure to messages about the health risks associated

163 with doping use.

164   Based on previous research about the effects of self-affirmation on doping

165 intentions (Barkoukis et al., 2015) and on physical activity (Cooke et al., 2014) the

166 current study focused on social cognitive variables derived from the Theory of

167 Planned Behavior and the Reasoned Action Perspective (Ajzen, 1991; Fishbein &

168 Ajzen, 2011) because these variables have been associated with doping use and

169 intentions in previous research (Barkoukis & Lazuras, in press; Lazuras et al., 2015;

170 Ntoumanis et al., 2014). The following hypotheses were tested: a) self-affirmed

171 exercisers will report lower doping intentions and scores on related social cognitive

172 variables that predict intentions and/or behaviour change (i.e., attitudes, social and

173 moral norms, self-efficacy, situational temptation, and anticipated regret) following

174 exposure to health messages against doping, and b) the effects of self-affirmation on

175 doping intentions would be mediated by doping-related social cognitive variables.

176   **Method**

177 **Participants**

178   A snowball sampling (chain referral) strategy was used to recruit participants.

179 Assistance in data collection was initially requested from three fitness instructors,

180 who served as co-researchers. They all agreed to promote the study in their fitness

181 centers. Eligibility criteria included systematic participation in training for the past

182 five years and use of nutritional supplements. Overall, we recruited sixty exercisers

183 (43 males) who were currently using nutritional supplements. With GPower 3.10 we

184 calculated a priori power analysis for our study. Based on previous research

185 (Barkoukis et al., 2015) which demonstrated medium to large effect sizes (η^2 ~ .09 -

186 .19) when comparing self-affirmed and non-self-affirmed groups in doping related

187 cognition, we set the effect size f = .40 using one-way ANOVA with fixed effects,

188 with a probability level a= 0.05, and power set at 0.85. The analysis showed that a

189 total sample size of 60 participants (30 in each group) was required. The study was

190 granted ethics approval by the respective committee (UREC) of the University of

191 Sheffield, and participants were informed about their participation rights, data

192 anonymity and confidentiality. Due to the sensitive nature of the behavior involved,

193 participants were asked to provide consent for participation in the study. Only their

194 gender was recorded as a demographic variable, as the recording of other

195 demographic characteristics (e.g., age) was perceived by participants as a potential

196 threat to their anonymity.

197 **Measures**

198   A brief structured survey was used to assess social cognitions related to

199 doping use. These measures were based on past research on doping (e.g., Barkoukis,

200 et al., 2013; Barkoukis et al., 2015; Lazuras et al., 2010) and assessed attitudes

201 towards doping use, social norms (descriptive and injunctive norms) and moral

202 norms, perceived behavioral control, situational temptation, and anticipated regret.

203 The studies by Barkoukis and colleagues have attested to the face, content,

204 concurrent, and predictive validity of the measures described below.

205 **Attitudes**. Attitudes to doping were measured with the stem 'the use of prohibited

206 substances to enhance my performance this season is…' followed by four semantic

207 differential evaluative adjectives (*bad/good; useless/useful; right/wrong;*

208 *detrimental/beneficial*) scored on a seven-point scale (Barkoukis, et al., 2013; Lazuras

209 et al., 2010; Lazuras et al., 2015).

210 **Injunctive norms**. Injunctive norms were assessed with the mean of three items (e.g.,

211 'most people who are important to me would want me to use prohibited substances to

212 enhance my performance during this season'), scored on a seven-point scale (1 =

213 *strongly disagree*, 7 = *strongly agree*). A composite score was computed with higher

214 scores showing stronger norms about doping use (Barkoukis, et al., 2013; Lazuras et

215 al., 2010; Lazuras et al., 2015).

216 **Descriptive norms.** Descriptive norms were assessed with five items. Two open-

217 ended questions addressed the perceived prevalence of doping use among elite

218 athletes in Greece (i.e., 'Out of 100%, how many elite athletes in Greece do you think

219 engage in doping to enhance their performance?) and exercisers at the same to the

220 participant's level (i.e., 'Out of 100%, how many exercisers at the same to you level

221 in Greece do you think engage in doping to enhance their performance?'). Participants

222 were further asked to indicate how many other exercisers they knew who used doping

223 substances (scored on a 5-point scale, 1 = nobody, 5 = a lot of them); if they believed

224 that most professional athletes use doping substances (scored on a 7-point scale, 1 =

225 definitely not, 5 = definitely yes); and how many of their fellow exercisers would use

226 doping substances if they wanted to improve their athletic performance (scored on a

227 7-point scale, 1 = none of them, 7 = most of them). This method for assessing

228 descriptive norms has been used effectively in previous studies on doping (e.g.,

229 Barkoukis et al., 2013; Lazuras et al., 2010; Lazuras et al., 2015; Wiefferink et al.,

230 2008).

231 **Moral norms**. Moral norms were assessed with three items (e.g. 'Doping use is

232 against my moral principles'). Exercisers responded on a 7-point Likert scale ranging

233 from 1 (*strongly disagree*) to 7 (*strongly agree*). One item was reverse scored so that

234 a composite mean score was computed with higher scores reflecting stronger moral

235 norms against doping use (Barkoukis et al., 2015).

236 **Self-efficacy**. Self-efficacy about using doping substances was assessed using three

237 items (e.g., 'I feel in complete control over whether I will use prohibited substances to

238 enhance my performance during this season'), measured on a seven-point scale (1 =

239 *strongly disagree*, 7 = *strongly agree*) with higher scores indicating higher self-

240 efficacy (Barkoukis, et al., 2013; Lazuras et al., 2010; Lazuras et al., 2015).

241   **Situational temptation.** A measure of situational temptation developed by Lazuras et

242   al. (2010) was used to assess perceived efficacy to resist situational pressures to dope

243   (i.e., situational temptation). The measure includes a stem proposition ('How much

244   would you be tempted to use prohibited doping substances to enhance your

245   performance this season'), followed by five items ('when your coach suggests so,'

246   'when you believe that most colleagues of yours use prohibited substances,' 'when

247   you were told to enhance your performance,' 'when you were feeling disadvantaged',

248   and 'when you prepare for an important game/competition'). Responses were given

249   on a five-point Likert scale (1 = *not at all tempted*, 5 = *very much tempted*) with

250   higher scores showing greater situational temptation (i.e., less self-efficacy about

251   resisting temptation) (Barkoukis, et al., 2013; Lazuras et al., 2015).

252   **Doping intentions**. Intentions to dope during the season were assessed with the mean

253   of three items (e.g., 'I intend to use prohibited substances to enhance my performance

254   during this season'), scored on a seven-point scale (1 = *definitely not*, 7 = *definitely*

255   *yes*). Higher scores reflected higher doping use intentions (Barkoukis, et al., 2013;

256   Lazuras et al., 2010; Lazuras et al., 2015).

257   **Anticipated regret.** Anticipated regret was assessed with the stem "If I use prohibited

258   substances to enhance my performance during this season, I will…", followed by four

259   items (regret it; be disappointed with myself; feel bad with myself; feel shame),

260   scored on a 7-point Likert scale (1 = *definitely not*, 7 = *definitely yes*) with higher

261   scores indicating greater regret (Lazuras et al., 2015).

262   **Design**

263   A between-group experimental design was used. Participants were randomly allocated

264   to either the self-affirmation or the control group.

265   **Affirmation manipulation.** Participants in the intervention group were exposed to

266   the self-affirmation manipulation developed by Reed and Aspinwall (1998). This

267   consists of 10 questions designed to encourage participants to elaborate on their past

268   acts of other-directed kindness, namely to recall and give examples of past acts of

269   kindness, such as "Have you ever forgiven another person when they have hurt you?"

270   and "Have you ever been considerate of another person's feelings?" Participants

271   responded using a Yes–No format. Those who responded positively were asked to

272   elaborate further on their experiences by providing more details about their acts of

273   kindness. Writing about such acts has been shown to be more effective in increasing

274   message acceptance when compared to control tasks, such as writing about irrelevant

275   issues or not writing at all (Crocker, Niiya, & Mischkowski, 2008).

276   An active control group (e.g., Reed & Aspinwall, 1998) was used. Participants

277   randomized to the control condition were given a similar self-reported task but,

278   instead of reporting acts of kindness, they were asked to state their opinions on a

279   range of unrelated issues, such as "I think that chocolate is the best flavor ice cream,"

280   and "I think the beach is the best place to go on holidays", and to elaborate on those

281   beliefs by providing further details.

282   **Intervention message.** A health-related message was developed based on the

283   WADA's anti-doping campaigns and information leaflets about the health

284   consequences of doping use. This included a general statement on the side effects of

285   doping use on the body and the relationship between doping use and mortality.

286   Subsequently the specific side effects on cardiovascular function, on hepatic function

287   and on the reproductive and endocrine systems, the psychological, dermatological and

288   musculo-skeletal side effects, and other health symptoms and long term health effects

289   of doping were described. The display of the side effects of doping on health was

290   accompanied by related research citations in order to more explicitly demonstrate that

291   the stated effects were supported by scientific evidence and that they did not represent

292   lay beliefs or assumptions about the effects of doping use (Parssinen & Seppala,

293   2002). Both groups received the same intervention message.

294   **Procedure**

295   The three fitness instructors who served as co-researchers were contacted, and the

296   aim and procedure of the study were explained. In order to facilitate the data

297   collection process and ensure that ethical guidelines were not violated, these co-

298   researchers received brief training about who to approach and how to approach them.

299   Following the training, they were given a weblink (URL) with the study's survey and

300   were asked to provide it to exercisers within their fitness centers who were training

301   and they knew were using nutritional supplements systematically. The co-researchers

302   were continuously recruiting exercisers until reaching the critical number of 30

303   participants with complete data in each group. They asked participants to log into the

304   system to complete the survey. After logging into the system, participants were

305   randomly assigned to the experimental and control group by random numbers

306   generated by the system and completed a consent form. Following that the typical

307   self-affirmation paradigm was used (Epton & Harris, 2008; Reed & Aspinwall, 1998)

308   in which participants completed the manipulation (self-affirmation or control

309   condition) before reading the health message. After the message they completed the

310   survey measuring doping intentions and social cognition variables. Survey completion

311   lasted 15-20 min and was performed in the gym (e.g., reception or locker rooms).

312   Data collection lasted approximately six months. Overall, 111 exercisers were

313   approached and agreed to enter the weblink. Of those, 60 provided complete data.

314

315 **Results**

316 **Descriptive statistics and randomization check**

317   The means and standard deviations of the study variables in the experimental and

318 control groups are presented in Table 1. Correlation analyses revealed moderate to

319 strong relationships among the study's variables (Table 2). As a test for participant

320 randomization to each condition we compared gender distribution between the

321 intervention and the control groups, using Pearson's chi-square test (χ^2). The results

322 indicated no significant differences in the distribution of males and females (21 males

323 in the control group; 23 males in the intervention group) between conditions,

324 $\chi^2(1, N = 60) = 0.34$, $p > .05$.

325 **Effect of self-affirmation on doping intentions and related social cognitive**

326 **variables**

327   A multivariate analysis of variance (MANOVA) was performed to assess

328 differences between self-affirmed and control groups in doping intentions and related

329 social cognitive variables towards doping, namely, attitudes towards doping use,

330 descriptive and injunctive norms, moral norms, self-efficacy, situational temptation,

331 and, anticipated regret; Hypothesis 1). The results showed that self-affirmed

332 participants reported higher scores (*Wilks' Lamda* = .572, $F = 2.64$, $p = .008$) on two

333 items reflecting descriptive social norms, namely, knowing more exercisers who have

334 used prohibited substances ($F = 8.08$, $p = .006$, $\eta_p^2 = .12$) and perceiving greater

335 prevalence of doping use among elite athletes ($F = 5.53$, $p = .022$, $\eta_p^2 = .08$); stronger

336 moral norms ($F = 5.81$, $p = .019$, $\eta_p^2 = .09$), and more anticipated regret ($F = 9.04$, p

337 $= .004$, $\eta_p^2 = .13$). The observed effect sizes ranged from moderate to strong

338 according to Cohen (1988). No other significant differences were observed.

339   Multiple linear regression analysis was used to test if the effects of self-

340   affirmation on doping intentions are mediated by doping-related social cognitive

341   variables (Hypothesis 2). The analysis was completed in two steps (see Table 3).

342   First, to enable the assessment of the unique effects of the self-affirmation

343   manipulation (coded as a dummy variable, 0 = control group, 1 = self-affirmation), it

344   was entered at Step 1 to predict doping intentions. The social cognition variables (i.e.,

345   attitudes towards doping, descriptive and injunctive social norms, moral norms, self-

346   efficacy beliefs, situational temptation and anticipated regret) were added at Step 2 to

347   examine potential mediation effects, that is, whether doping-related social cognitive

348   variables may account for the effect of the self-affirmation manipulation.). The

349   overall model was statistically significant and predicted 24.5% (Adjusted R^2) of the

350   variance in doping intentions. The analysis showed that the effect of the intervention

351   was not statistically significant in the first step of the analysis, but the addition of

352   social cognitive variables in Step 2 significantly increased predicted variance

353   explained in intentions (F_{change} = 2.83; p = .006). Significant predictors of doping

354   intentions in the second step of the analysis included situational temptation and

355   anticipated regret (see Table 3). Because self-affirmation did not have a significant

356   effect on doping intentions we did not proceed with assessing the mediation effects of

357   social cognitive variables.

358   **Discussion**

359   The present study examined the effects of a self-affirmation manipulation on

360   doping intentions and related social cognitive variables among exercisers who used

361   nutritional supplements - a population that is at high risk for doping use according to

362   previous research (e.g., Hoffman et al., 2008; Nicholls et al., 2017; Ntoumanis et al.,

363   2014). Self-affirmed participants reported higher scores on descriptive and moral

364 norms, as compared to participants in the control condition. Specifically, self-affirmed

365 participants reported that doping use would be more against their own moral

366 principles, that they knew more exercisers who used doping substances, and believed

367 that more professional athletes engage in doping to improve their performance. This

368 possibly indicates that self-affirmed participants more readily accessed normative

369 information about doping use as well as their own moral principles and standards

370 towards the behaviour. Previous research has indicated that self-affirmation activates

371 brain areas associated with the processing of self-referential information (Dutcher et

372 al., 2016). Other studies have further shown that self-affirmation influences thought

373 accessibility, specifically by attenuating the accessibility of thoughts that are

374 threatening to the self (e.g., mortality; Schmeichel & Martens, 2005; Vail, Morgan, &

375 Kahle, 2018). One possibility is that self-affirmation might increase private self-

376 awareness (e.g., Reid, Field, Jones, DiLemma, & Robinson, 2019), as well as the

377 accessibility of self-referential cognitions that may serve to protect self-integrity (e.g.,

378 personal moral standards/moral norms; see Dutcher et al., 2016). Hence, normative

379 information (e.g., perceived prevalence) about doping use may have become more

380 salient in the self-affirmed participants serving as a mechanism helping them be more

381 alert about "exposure" to or involvement with doping in the future. Another

382 explanation for the higher descriptive norm scores in the self-affirmed group may

383 relate to the tendency to more openly disclose information that would otherwise be

384 unreported. In support of this argument, a recent study showed that self-affirmed

385 participants were more likely to disclose undesirable behaviours and related

386 information, compared to non-affirmed participants (Davis, Soref, Villalobos, &

387 Mikulincer, 2016). Although these explanations are theoretically plausible, they

388 require empirical investigation.

389   Importantly, self-affirmed exercisers in the present study reported significantly

390   higher anticipated regret scores than control participants. Recent studies have shown

391   that self-affirmation may influence behaviour change processes by acting on

392   anticipated regret which, in turn, may predict intentions and actual behaviour change

393   (van Koningsbruggen et al., 2016). Therefore, the non-significant effect we observed

394   on doping intentions does not mean that self-affirmation is unimportant in doping-

395   related cognitions in exercisers who use nutritional supplements, but rather suggests

396   that this effect may occur through changes in proximal predictors of health-related

397   intentions and behaviour, such as anticipated regret. Previous research has

398   demonstrated the importance of anticipated regret in health-related behaviours

399   (Brewer, DeFrank, & Gikey, 2016), and anticipated regret has also been found to be

400   one of the most important predictors of doping intentions in sport populations

401   (Lazuras, Barkoukis, Mallia, Lucidi, & Brand, 2017; Lazuras et al., 2015; Ntoumanis

402   et al., 2014), and predicted doping intentions in the present study.

403   There were no significant differences between the self-affirmed and control

404   participants in intentions to use doping substances in the present study. This may be

405   attributed to the overall lower scores in doping intentions (i.e., a floor effect) in both

406   groups: typically participants were not intending to use doping substances and,

407   therefore, self-affirmation could not produce changes in this variable. This may also

408   explain why the present findings with exercisers who used NS differ from the results

409   reported by Barkoukis et al. (2015), who showed that self-affirmation significantly

410   reduced doping intentions among competitive athletes who had used doping

411   substances in the past. Possibly, exercisers using nutritional supplements may not

412   perceive doping use as something relevant to them, although self-affirmation helps

413   them to readily recognize it as a problem in given referent groups. Self-affirmation in

414   the doping prevention context may be more relevant to exercisers already engaging in

415   the target behaviour (i.e., who use/have used or intent to use doping substances), than

416   to exercisers without such experiences and intentions.

417   Finally, regarding the predictors of doping intentions in the present study,

418   situational temptation and anticipated regret were the only significant predictors of

419   doping intentions in the full model. Situational temptation has been found to be the

420   most influential social cognitive construct on doping use intentions (Barkoukis et al.,

421   2013a; Lazuras et al., 2010). Thus, the current findings corroborate past evidence and

422   support situational temptation as an important construct influencing intentions.

423   Anticipated regret significantly predicted doping intentions, thus showing that it is

424   relevant to the intention-formation process in the context of doping use, both among

425   athletes and leisure time exercisers. These findings suggest that situational temptation

426   and anticipated regret can serve as protective factors and should be addressed in

427   educational campaigns targeting clean exercisers.

428   A limitation of the present study is the lack of measures assessing whether

429   participants understood the content of the message and whether they were self-

430   affirmed. In future studies, the use of manipulation checks would confirm the efficacy

431   of the manipulation in self-affirming participants and increase confidence that the

432   observed results are due to changes in participants' sense of self-integrity. In addition,

433   the use of measures of message acceptance in the future would allow estimating the

434   effect of the self-affirmation on the acceptance of the content of the message.

435   Furthermore, the study sample was rather small, resulting from the difficulty reaching

436   this population. Therefore, some of the non-significant effects reported here might

437   have been significant with a larger sample of participants with more statistical power.

438   In addition, the sustainability of the effects was not tested in the present study. Future

439   research should more thoroughly investigate the longer term effects of self-

440   affirmation, which may provide valuable information for anti-doping prevention

441   campaigns and education. Finally, the measure of intentions used provided low scores

442   on exercisers' beliefs about doping in the future. Using alternative proxy measures of

443   doping behaviour, such as doping susceptibility, doping likelihood or implementation

444   intentions (Barkoukis, Lazuras & Tsorbatzoudis, 2014; Blank, Kopp, Niedermeier,

445   Schnitzer, & Schobersberger, 2016), might result in increased response variability

446   and, hence, more proportion of variance explained. Nevertheless, the present study is

447   among the first studies to investigate how self-affirmation works on people being at

448   risk for manifesting an inappropriate behavior and provides valuable information that

449   could inform anti-doping awareness raising and educational campaigns in leisure-time

450   exercisers who use nutritional supplements and constitute the large majority of

451   recreational sport exercisers.

452

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619   Table 1

620   *Descriptive Statistics of the Study's Variables for Both Groups*

	Experimental group		Control group	
	M	SD	M	SD
Attitudes	2.06	1.25	2.17	1.12
Self-efficacy	5.75	1.40	6.18	.92
Injunctive norms	1.41	.75	1.68	.73
Moral norms*	5.40	1.80	4.23	1.93
Descriptive norms[a]	35.17	21.95	45.93	25.43
Descriptive norms[b]	75.40	22.83	76.97	21.92
Descriptive norms [c]*	3.00	0.94	3.73	1.04
Descriptive norms[d]	5.37	1.32	6.13	1.19
Descriptive norms[e]	3.90	1.78	4.40	1.40
Situational temptation	1.96	.97	2.26	.84
Anticipated regret**	5.10	2.02	3.62	1.78
Intentions	1.63	1.44	1.62	1.02

621   *Note*. Higher scores in attitudes, situational temptation, norms and intentions reflect

622   more positive beliefs towards doping, whereas higher scores in anticipated regret

623   show more negative affect towards doping use; Descriptive norms[a] = perceived

624   prevalence of doping use in elite athletes; Descriptive norms[b] = perceived prevalence

625   of doping use in exercisers; Descriptive norms[c] = knowing doped exercisers;

626   Descriptive norms[d] = believing that most professional athletes use doping*;

627   Descriptive norms[e] = Believing that most exercise would use doping to enhance

628   performance ; * $p < .05$, ** $p < .005$, *** $p < .001$.

629

630   Table 2

631   *Correlation Coefficients among the Study Variables*

	1	2	3	4	5	6	7	8	9	10	11	12
1. Intentions	-	.26*	.01	.09	.13	.23	.12	.25*	-.20	.10	.54***	-.36**
2. Attitudes		-	.05	.06	.14	.08	.06	.06	-.38**	.11	.31*	-.41***
3. Injunctive norms			-	.06	-.07	.18	.15	.05	-.44***	-.06	.05	-.44***
4. Descriptive norms[a]				-	.28*	.37**	.34*	.38**	-.03	.14	.24	.00
5. Descriptive norms[b]					-	.37**	.64***	.33*	-.04	-.05	.20	.00
6. Descriptive norms[c]						-	.53***	.61***	-.15	.13	.23	-.16
7. Descriptive norms[d]							-	.45***	-.18	-.01	.24	-.18
8. Descriptive norms[e]								-	-.15	.03	.42***	-.12
9. Moral norms									-	-.14	-.28*	.67***
10. Self-efficacy										-	.19	-.12
11. Situational temptation											-	-.33**

12. Anticipated regret   -

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633 *Note*. Descriptive norms[a] = perceived prevalence of doping use in elite athletes; Descriptive norms[b] = perceived prevalence of doping use in

634 exercisers; Descriptive norms[c] = knowing doped exercisers; Descriptive norms[d] = believing that most professional athletes use doping*;

635 Descriptive norms[e] = Believing that most exercise would use doping to enhance performance ; * $p < .05$, ** $p < .005$, *** $p < .001$.

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637

638   Table 3

639   *Effect of self affirmation on the decision-making process*

Step 1	*Predictors*	B	*β*	95% CI for B	*Adjusted R²*
	Self-affirmation	.011	.005	-.637- .659	-.01%
Step 2	Self-affirmation	.549	.223	-.126 - 1.225	24.5%
	Attitudes to doping	.001	.001	-.283 - .285	
	Injunctive norms	-.215	-.130	-.676 - .247	
	Descriptive norms[a]	-.001	-.011	-.014 - .013	
	Descriptive norms[b]	.001	.010	-.018 - .019	
	Descriptive norms[c]	.283	.241	-.109, .674	
	Descriptive norms[d]	-.058	-.062	-.393 - .276	
	Descriptive norms[e]	-.038	-.049	-.289 - .214	
	Moral norms	.038	.059	-.172 - .247	
	Self-efficacy	-.016	-.015	-.269 - .237	
	Situational temptation	.623	.459**	.241 - 1.005	
	Anticipated regret	-.218	-.357*	-.434 - -.002	

640   *Note*. Descriptive norms[a] = perceived prevalence of doping use in elite athletes;

641   Descriptive norms[b] = perceived prevalence of doping use in exercisers; Descriptive

642   norms[c] = knowing doped exercisers; Descriptive norms[d] = believing that most

643   professional athletes use doping*; Descriptive norms[e] = Believing that most exercise

644   would use doping to enhance performance ; * $p < .05$, ** $p < .005$, *** $p < .001$.

645

646   *Note.* *$p < .05$; **$p \leq .001$.

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