# A PROTOCOL STUDY FOR THE INVESTIGATION OF CHEMICALLY-ASSISTED PERFORMANCE ENHANCEMENT IN FOUR DOMAINS

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*Abstract. Chemically-assisted performance enhancement (CAPE), which involves the use of substances in order to prevent illness or improve performance and appearance, is a recent trend of our society. CAPE has been extensively investigated in competitive sports, however, there is only limited evidence with respect to other life domains such as work and study. The objective of the present paper is to describe the protocol of a study that will address the above-mentioned gaps in the literature. The study involves a longitudinal evaluation of predictive factors derived from the Theory of Triadic Influence and Goal Systems Theory. The study aims to: a) propose a sound and comprehensive theoretical model that will include the commonalities of the manifestation of CAPE behaviours across different settings and b) highlight the conceptual differences that are necessary to be taken into account for tailor-made intervention in these settings. The study is expected to assist in the development of a comprehensive understanding of performance enhancement behaviours across different life domains. The longitudinal design of the study and the breadth of the measured variables are considered as an asset that will contribute to understanding commonalities and conceptual differences in performance enhancement behaviours across different life domains and provide the evidence base for tailor-made intervention in these domains.*

*Keywords: doping, neuroenhancement, workplace, study, sport, exercise.*

## Introduction

A recent trend of our society is the use of drugs while not being ill. This trend results in the phenomenon of chemically-assisted performance enhancement (CAPE), which involves the use of substances in order to prevent illness or improve performance and appearance. People endorse CAPE, although they do not actually need it. There have been identified two main types of CAPE: use of substances to improve physical performance and appearance and use of substances to improve cognitive performance. The use of substances for physical enhancement involves using substances, such as androgenic anabolic steroids, to increase body mass or other physical performance indicators (e.g., use of erythropoietin to increase endurance). Similarly, cognitive enhancement is referred to the non-medical use of prescribed drugs by people who aim to improve their cognitive function and academic performance. CAPE has been reported in various contexts including work, education, sport and leisure and concerns an alarming issue in modern societies. Past evidence indicates that professional athletes use drugs to increase performance (Ulrich et al., 2017), recreational exercisers to improve physique and appearance (Lazuras et al., 2017), and people working in academies use cognitive enhancers to improve performance (Zohny, 2015). In sport, anabolic-androgenic steroid (AAS) users practice combinations of drugs for performance enhancement by incorporating various prescription drugs, over-the-counter products, herbal medicines, and dietary supplements (Baker et al.,

2006; Cohen et al., 2007; Copeland et al., 2000; Parkinson & Evans, 2006; Perry et al., 2005;). Regarding the use of CAPE to enhance cognitive function, Eickenhorst et al. (2012) stated that the main motives reported by students were the desire to enhance concentration and alertness and the need to increase cognitive functioning in general, to enable them to relax, cope with stress and performance pressure. Other commonly reported reasons for using cognitive enhancing drugs include staying awake and increasing efficiency.

CAPE is a rather common phenomenon. The use of anabolic steroids in the general population has become more and more common during this century (McVeigh & Begley, 2017). A large body of evidence demonstrates that the abuse of performance-enhancing drugs, such as anabolic steroids, is evident across all levels of sports and is likely to inflict people younger than 12 years old (Dunn & White, 2011). Studies estimating the prevalence of using prohibited substances in competitive sports have shown that almost 57% of competitive athletes reported a lifetime experience (Ulrich et al., 2017). In addition, approximately 20% of gym exercisers in five European countries reported experience with substance use to improve physique (Lazuras et al., 2017). Furthermore, Radimer et al. (2004) indicated that more than half of the adults in USA were using nutritional supplements on a daily basis in the past month. In a sample of college athletes, 89% reported regular use of nutritional supplements (Froiland et al., 2004). More recently, O'Brien et al. (2017) reported that a total of 43.2% of adults, 20.1% of adolescents, and 23.5% of children in Australia used at least one nutritional supplement in the past two weeks. Furthermore, research has shown that 33.9% of the adults who made a serious attempt to lose weight reported ever using a dietary supplement for weight loss (Pillitteri et al., 2008).

Cognitive enhancement seems to be rather common in students as well (Lazuras et al., 2017). Smith and Farah (2011) conducted a review of 28 epidemiological studies for the prevalence of non-medical prescription stimulants in normal healthy students. Their results showed that the lifetime prevalence ranged from 2.3 to 55%. For example, a study in a sample of high-school students showed that 15.8% of them had used a non-medical cognitive enhancer at least once during the past year (Janssen et al., 2018). In addition, 35.5% of undergraduate students from a competitive college in the US had used amphetamines without a prescription (Reisinger et al., 2016). de la Torre et al. (1997) identified the need to test for drugs in the workplace. Hoberman (2015) suggested that police officers and people working in the army forces were at risk for using performance-enhancement drugs, while Knapik et al. (2016) reported that seventy-three percent of the US Navy and Marine Corps personnel were using dietary supplements at least one time per week. Furthermore, the use of CAPE is also present in the medical environment; a study in surgeons showed that 8.9% of the sample had used a drug for cognitive enhancement potentially putting the patients at risk (Franke et al., 2013).

This evidence suggests that a large proportion of the general population uses substances to prevent illness or improve performance and appearance. However, the use of such substances has been linked to many serious physical and psychological side effects. A large body of evidence, especially in the sport domain, reveals that CAPE has been associated with severe health effects such as kidney and liver damage, elevated blood pressure, cardiovascular function and even sudden and early death (Bryden et al., 1995; Darke et al., 2014; Hartgens & Kuipers, 2004; Kuipers et al., 1991). Concerning mental health, the side effects include mood swings, dependence, anxiety, aggression, mania, depression and even psychotic episodes

(Birzniece, 2015; Freinhar & Alvarez, 1985; Pope & Katz, 1994). In addition, the evidence regarding the efficacy of various substances for improving academic performance is inconclusive. A review of 28 studies on the non-medical use of prescription stimulants tentatively supports their positive effects on the consolidation of fact-based learning, but the results were mixed concerning working memory, cognitive control, and executive function. Hence, it seems that people use substances to increase performance and appearance, although the positive effects of these substances are not well-documented and health side effects exist.

Among the various settings were CAPE has been used, there is extensive evidence on the psychological mechanisms underpinning behaviour only in competitive sports. However, there is a dearth of research in the other settings, such as recreational sport, education, workplace. A recent meta-analysis revealed more than 60 articles investigating the psychological predictors in sport (Ntoumanis et al., 2014). The number of studies in sport has increased significantly since then. Studies applying the Theory of Planned Behaviour (TPB) have reported that attitudes, perceived behavioural control and subjective norms are significant predictors of doping intention and behaviour (e.g., Goulet et al., 2010; Lazuras et al., 2010, 2015; Lucidi et al., 2008). These studies were conducted with elite competitive athletes (Lazuras et al., 2010), adolescent competitive athletes (Zelli et al., 2010; Lucidi et al., 2008), and gym users (Wiefferink et al., 2008). Beside the basic TPB variables, researchers have also used some additional variables that are not included in the TPB framework for the prediction of doping intention and behaviour. The extension of the TPB approach was undertaken because of: (a) the need to investigate morality aspects, bearing in mind that doping is considered an immoral behaviour; (b) recent developments in TPB research in other areas of enquiry (e.g., smoking), showing that the inclusion of new constructs (i.e., descriptive norms, situational temptation) improves the predictive ability of the TPB model; and (c) recent arguments suggesting the use of integrative approaches (Fishbein & Cappella, 2006) to incorporate distal predictors of behaviour (e.g., sportspersonship, moral disengagement, achievement goals) and demographics. In this respect, Lucidi et al. (2008) measured participants' moral disengagement and showed that this variable predicted doping intentions and behaviours. Barkoukis et al. (2011) found that athletes with high sportspersonship, autonomous motivation and mastery-oriented achievement goals reported lower doping intentions compared to those with low sportspersonship, controlled motivation, and performance-oriented achievement. With respect to demographic predictors of doping use, past evidence showed that males, compared to females, have been found to be at a greater risk for doping across samples of adolescents (Dodge & Jaccard, 2006) and competitive athletes (Whitaker et al., 2015; Backhouse et al., 2013). Recently, Barkoukis et al. (2013) and Lazuras et al. (2015) proposed an integrative model of doping behaviour incorporating the most influential risk and protective predictor of doping use. This evidence shows that research in this area has considered doping use as the main outcome behaviour and tried to identify the decision-making processes associated with engagement in this behaviour. Still doping use is an unhealthy, immoral and rather unpleasant behaviour that helps the athlete/exerciser achieve other important goals (Tsorbatzoudis et al., 2015).

Regarding the psychological factors explaining CAPE in students, Middendorff et al. (2012) reported that the main motive of students to use CAPE was for the maintenance rather than the enhancement of their performance during an exam period. There is also evidence that some

students do not believe that prescription stimulants result in improvements in academic performance, and identify possible adverse effects including addiction/dependency, mental health issues, and sleep disturbance (Deline et al., 2014). Sattler and Wiegel (2013) showed that increased test anxiety was related to a higher six-month prevalence of medication use. Furthermore, a study by Sattler et al. (2013) investigated the mechanisms underlying the decision of university teachers and students to use CAPE by using hypothetical vignettes. The results of the study demonstrated a negative association between the probability and strength of side-effects, and the internalisation of social norms and willingness to use cognitive enhancers. The findings of the study also revealed that, on the one hand, pressure from peers led to an increase in participant's willingness to use such substances, while, on the other hand, substance use prevention and information about the costs and benefits of such substances led to a decrease in willingness. Moreover, willingness to use these drugs was positively associated with past use, prevalence in peers and low intrinsic motivation. In line with previous evidence, this study perceived CAPE as the main outcome behaviour, whereas evidence on the reasons engaging in this behaviour implies the accomplishment of higher-order goals, such as better performance and achievement.

As shown above, CAPE has been extensively investigated in competitive sports, and this evidence heavily relied on a short range of social cognitive theories. This, however, limits the understanding of the psychological processes underpinning the behaviour, and reduces the potential to design effective prevention campaigns and interventions. Furthermore, a comprehensive and ecological model that would enable scientific community to address CAPE does not exist. To address these gaps, new and ecological theoretical approaches should be endorsed in the study of CAPE. Two theoretical frameworks (i.e., the Integrative Model [IM] and the Theory of Triadic Influence [TTI]) have been proposed as appropriate in comprehending the decision-making processes associated with CAPE.

According to the IM, whether a person will engage in a behaviour to perform that behaviour is best predicted by the person's intention (Fishbein, 2009). As such, intentions are conceptualised as the readiness to perform a given behaviour. Nevertheless, it is possible that some factors might function as stumbling blocks to the performance of a behaviour, like the lack of the necessary abilities or environmental barriers. Hence, according to the theory, there are three determinants of intention: a) attitudes towards the behaviour (i.e., positive or negative evaluation of the behaviour) b) norms (i.e., normative beliefs or social pressure) and c) self-efficacy (i.e., a person's belief in their ability to perform the behaviour). The theory also proposes that these three variables come from underlying beliefs regarding a) the outcomes of the performance of the behaviour, b) the normative prescriptions, and c) the barriers to and facilitators of the performance of the behaviour. Furthermore, additional variables might also influence the behaviour in an indirect way. Such variables include demographic characteristics, past behaviour, media influence, personality characteristics, emotions and other individual differences that are reflected in the beliefs underlying a person's behaviour (Fishbein, 2009).

The TTI proposes that theories and variables can be ordered into different levels of causation. Proximal variables, namely attitudes, subjective norm and self-efficacy, which are also included in the IM, influence intentions and have direct effects on behaviour. The effects of distal variables, which are related to the social-personal nexus, are mediated through the proximal variables. Lastly, there are three ultimate causes of behaviour, which include

personality, social situations and cultural environment. The theory also proposes that the effect of ultimate variables on behaviour is arranged through three different streams of influence, which are relatively distinct: the personal, social and environmental streams (Flay et al., 2009). Lazuras et al. (2015) studied the application of this model to doping, and the results have shown that there is a stream linking personality with self-efficacy beliefs and a second one linking cultural environment with attitudes towards the behaviour and anticipated regret.

However, CAPE differs from other unhealthy, unethical, and illegal behaviours that are performed for the sake of the behaviour (i.e., smoking, alcohol drinking, risky driving). Instead, it is used as a means to achieve a higher-order goal: winning medals, improving appearance, earning more money, being famous etc. So far, scientific evidence has neglected this important feature of CAPE and has solely focused on identifying its determinants. Still, for effective prevention efforts to be made, a more holistic and complete understanding of CAPE is required. In this sense, Goal Systems Theory (Kruglanski et al., 2002) provides some insightful thoughts that could be integrated into the study of CAPE and provide a more realistic, comprehensive and deep understanding of the phenomenon. According to this theory, goals are cognitive constructs that are represented mentally and whose content is motivational (Kruglanski et al., 2002). They are associated with a range of behaviours that facilitate their attainment, i.e., means. There are some primary goals that are served by sub-goals and means. In turn, these means are served by other means, and those associations continue reaching levels that are out of conscious control. According to the theory, one larger goal may be formed by the combination of other goals. In addition, the goals might differ from each other concerning the number of the different ways they can be achieved as well as the strength of their associations with the means depending on the specific goal or individual involved. The strength is described as the likelihood that the individual will use the given means when a given goal is activated. The theory suggests that the more likely the means will result in the fulfilment of the goal the stronger is the relation between the goal and the means. Similarly, this strength decreases when other means are also available. In addition, the same means may serve more than one goal, and the theory proposes that the relation of a mean and a goal is weakened when it is also related with other goals. Lastly, there is also a differentiation regarding the associations of one goal with other goals as well as the association of different means with other means (Kruglanski et al., 2002).

The evidence so far is rather limited and inconclusive, and largely neglects the actual nature and purpose of CAPE behaviours, which is to achieve a higher-order goal. It is expected that the study will provide useful information for the development of tailor-made interventions that will assist in the combat against substance use. The objective of the present paper is to describe the protocol of a study that will address the above-mentioned gaps in the literature by employing a longitudinal design that will investigate the risk and protective factors of CAPE behaviours and the ultimate reasons for engaging in such behaviours in different settings using self-reports as well as implicit measures. The aims of the study are: a) to propose a sound and comprehensive theoretical model that will include the commonalities of the manifestation of CAPE behaviours across different settings and b) highlight the conceptual differences that are necessary to be taken into account for tailor-made intervention in these settings.

**Methodology**

*Participants*

Approximately 150 competitive athletes engaging in local, regional and national competitions will be recruited to participate in the study. Also, approximately 150 recreational exercisers (e.g., fitness exercisers, gym users, bodybuilding enthusiasts) will be recruited to participate in the study. Furthermore, approximately 150 professionals from different fields at risk for engaging in CAPE behaviours (e.g., doctors, policy officers, army officers, academics) will be recruited to participate in the study. Lastly, approximately 150 students from different faculties at risk for engaging in CAPE behaviours (e.g., medicine, engineering) will be recruited to participate in the study.

*Procedure*

Ethical approval will be obtained from Aristotle University of Thessaloniki Ethics Board. All participants will be informed on the aims and objectives of the study and will be reassured about the anonymity of their responses and that their responses will be used for research purposes solely. All participants should provide informed consent to take part in the study. Participants will be recruited in the beginning of the season and will complete online the baseline battery of questionnaires. During the season, they will provide online monthly reports on their CAPE-related behaviours. At the end of the season, they will complete online the baseline survey again. In case of high dropout rates due to the online completion of the surveys and diaries, a paper and pencil approach will be implemented.

*Measures*

- Demographics: Participants will be asked to report only basic demographic information (i.e., age and gender) in order to identify their profiles and match them across measurement points.
- Battery of questionnaires: Participants will complete a battery of questionnaires measuring risk and protective factors for CAPE use based on previous research on CAPE and the premises of the Theory of Triadic Influence and Goal Systems Theory. More specifically:
- Personal goal and means to achieve it: Participants will be asked to list a personal goal and activities serving as means to that goal. Participants will select their goal from a list of goals reflecting personal aspirations people typically have, such as health, fame, money. Participants will also be provided with an open-ended question to report their personal goal if it is not included in the list. Next, participants will choose from a list the means that they intent to use in order to achieve their personal goals by the end of the year (e.g., proper training, proper diet and nutrition, good sleep, nutritional supplements, CAPE substances). Participants will also be provided with an open-ended question to report other means they intend to use if they are not included in the list.

- Goal commitment: Participants' goal commitment will be measured by asking them to rate the extent to which "Doing good at 'work/study/sport/exercise'" is important to them on a scale ranging from 0 (Not important at all) to 100 (Extremely important).

- Perceived goal difficulty: Participants' perceived difficulty of succeeding at 'work/study/sport/exercise' will be measured with a single item (i.e., Succeeding at 'work/study/sport/exercise' is difficult) on a 7-point scale ranging from 1 (Do not agree at all) to 7 (Extremely agree).

- CAPE likelihood: Three short vignettes will measure the likelihood to use CAPE substances (e.g., 'I am likely to use CAPE substances when I am overwhelmed with 'work/study/sport/exercise'') on a 7-point Likert-type scale anchored by "strongly agree" (7) to "strongly disagree" (1).

- CAPE behaviour: The question "Have you ever used CAPE substances to enhance your performance?" will be used to assess self-reported past and current CAPE use and four different response options will be offered (1 = no, I have never used CAPE substances; 2 = yes, I once used CAPE substances to enhance my performance, but not ever since; 3 = yes, I occasionally use CAPE substances to enhance my performance; and 4 = yes, I systematically use CAPE substances to enhance my performance).

- Perfectionism: The High Standards subscale of the Greek version of the Almost Perfect Scale-Revised (APS-R) (Diamantopoulou & Platsidou, 2014) will be used in the present study. The subscale consists of 7 items (e.g., I expect the best from myself) assessing the high standards one sets for oneself and is scored on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

- Group-identification and orientation will be assessed with items taken from past research (Norman et al., 2005) on the interaction of self-identity and group norms (e.g., 'I have a strong identity with my co-workers/teammates/co-exercisers'; scored on a 7-point Likert scale, with 1 (strongly disagree) and 7 (strongly agree); 'How much do you feel you identify with your co-workers/teammates/classmates/co-exercisers?' is scored on a 7-point Likert scale, with 1 (not at all) and 7 (very much); and 'The values and beliefs of my co-workers/classmates/teammates/co-exercisers largely reflect my own values and beliefs'). A mean score will be generated and higher scores will reflect greater group identification. Following research on the Theory of Normative Social Behaviour (e.g., Lapinski et al., 2007), two items will assess group orientation (e.g., 'It is important to me to be in harmony with people in my work/school/team/gym' and 'It is important to me to be in line with people in my work/school/team/gym'). Responses will be coded on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree), and higher scores will reflect stronger group orientation.

- Values: A six-item scale developed by Gelfand et al. (2011) will be used to assess cultural values. The scale measures three factors, i.e., the clarity and number of social norms, the degree of tolerance for norm violations, and the overall compliance with social norms in a country. Example items are: 'There are many social norms that people are supposed to abide by in my country'; 'In my country, if someone acts in an inappropriate way, others will strongly disapprove'; and 'People in my country almost always comply with social norms'. Responses are anchored in a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree).

- Self-determination: The Self-Regulation Questionnaires adjusted for each life domain will be used to measure self-determination (e.g., the Exercise Self-regulation Questionnaire).

The scale includes 12 items measuring intrinsic motivation (e.g., For the pleasure of discovering and mastering new training techniques), identified regulation (e.g., Because I have a strong value for being active and healthy), introjected regulation (e.g., Because I feel pressured to work out) and external regulation (e.g., Because I want others to see me as physically fit). Responses are provided in a 7-point Likert scale ranging from not at all true (1) to very true (7).

- Motivation to comply: This scale will ask participants: "When it comes to matters of performance enhancement, I want to do what people important to me approve". The response choices will range from completely disagree (1) to completely agree (7).

- Knowledge and information: Three items will be used to measure participants' knowledge about CAPE (e.g., 'How knowledgeable do you think you are with respect to CAPE?'). Responses will be anchored in a 7-point Likert scale ranging from 1 (not at all) to 7 (extremely).

- Perceived behavioural control: Perceived behavioural control (PBC) will be assessed through three items (e.g., "I feel in complete control over whether I will use CAPE substances to enhance my performance during this season") measured on a 7-point Likert-type scale ranging from 1 (no control) to 7 (complete control).

- Subjective norms: They will reflect the social acceptability and permissiveness of CAPE at the distal societal level and in the participant's proximal social environment, such as the team and family. The generation of items will be based on the Theory of Normative Social Behaviour (Lapinski & Rimal, 2005; Rimal & Real, 2005) and on recent studies of CAPE substance use in elite athletes (e.g., Lazuras et al., 2010). More specifically, distal-level subjective norms will reflect perceived acceptance of CAPE substance use by the society (e.g., 'Do you think that the society approves of CAPE practices in work/sports/school/gym?') and exposure to words performance and huntsmen campaigns ('In the last 5 years, how often have you received information against CAPE substance use?'). Proximal-level subjective norms will reflect perceived acceptance of CAPE use by fellow people (e.g., 'Do your co-workers/classmates/ teammates/co-exercisers approve of substance use for performance-enhancement reasons?'; 'I believe that my co-workers/classmates/teammates/co-exercisers find it OK to use substances to enhance performance'; 'My co-workers/classmates/teammates/co-exercisers hold a permissive attitude towards CAPE substance use'; 'My co-workers/classmates/teammates/co-exercisers would want me to use CAPE for performance enhancement reasons'; and by significant others ('My family will feel alright if I use CAPE substances to enhance my performance'; 'My friends would approve my substance use for performance enhancement reasons'). Responses to these items will be assessed on 7-point Likert scales (e.g., 1 = strongly disagree, 7 = strongly agree; 1 = definitely not, 7 = definitely yes; and 1 = never, 7 = very frequently).

- Descriptive norms: They will also be assessed at distal and proximal levels and reflect the perceived use and prevalence of CAPE substances. Distal-level descriptive norms will reflect perceived CAPE use by other people in the country (e.g., 'Out of 100%, how many people in your country do you think engage in substance use to enhance their performance?'). Responses will be open-ended and range from 0 to 100%. Proximal-level descriptive norms will assess perceived CAPE substance use in a close social environment ('How many of your co-workers/classmates/teammates/co-exercisers do you think engage in CAPE to enhance their

performance?'), and in fellow co-workers/classmates/teammates/co-exercisers ('How many fellow co-workers/classmates/teammates/co-exercisers in your field do you think engage in CAPE to enhance their performance?'). Responses to these two items will be coded on a 7-point continuous scale (1 = none of them, 7 = all of them). The measures of proximal-level descriptive norms will also include two items describing the social and moral atmosphere (Ommundsen et al., 2003) and reflecting hypothetical estimates of team norms on CAPE use (e.g., 'How many of your co-workers/classmates/teammates/co-exercisers would engage in CAPE if it was necessary for them to enhance their performance?' and 'Do you think that people at work/school/team/gym would encourage CAPE substance use if it was necessary for them to enhance their performance'). Responses will be coded on a 7-point Likert scale (1 = none of them to 7 = all of them; and 1 = strongly discourage to 7 = strongly encourage). Finally, a question will be also used to assess the frequency of exposure to CAPE incidents in co-workers/classmates/teammates/co-exercisers in other companies/schools/teams/gyms (e.g., 'In the last year, how often have you heard about workers/students/athletes/exercisers engaging in CAPE practices' and 'In the last year, how often have you heard about workers/students/ athletes/exercisers in other companies/schools/teams/gyms engaging in CAPE practices?'). Responses will be coded on a 7-point continuous scale (1 = never, 7 = very frequently).

- Attitudes: Attitudes will be assessed in response to the following question: "The use of CAPE substances to enhance my performance during this season is…". Responses are measured on four 4-point semantic differential scales with the following bipolar adjectives: bad-good, harmful-beneficial, ethical-unethical, and useful-useless.

- Situational self-efficacy: This measure will be derived from Lazuras et al. (2009, 2010) and include several items on situational pressures to engage in CAPE (e.g., 'I would be tempted to use CAPE substances if I believed that most of my co-workers/teammates/co-exercisers follow this practice'). Responses will be coded on a 5-point Likert scale (1 = not at all tempted, 5 = very much), and higher scores will represent less efficacy to resist CAPE substance use when faced with specific situational pressures.

- Diary: Participants will report the means that they use at this specific time point in order to achieve their personal goals (similar to the list in the baseline survey). Participants will also be provided with an open-ended question to report the means they use if it is not included in the list. Furthermore, the affective significance of the means will be measured by asking participants to rate the extent to which they enjoy pursuing the means listed, and their commitment will be measured by asking participants to rate the importance of pursuing these means first. Responses will be recorded on 7-point scales with the end points anchored as not at all and extremely).

*Data management and ethics approval*

All hardcopy data will be stored in a safe place at the Department of Physical Education and Sport Science. Only the coordinators and research staff of the project will have access to the data. No identifying information linking participants' responses with their names will be kept. All data will be kept securely for five years following the publication, and after that they will be destroyed. Data will be entered into an SPSS spreadsheet by trained research assistants. The data management procedures will adhere to GDPR guidelines. Ethics approval for this project

has been granted by the Research Ethics Committee of the Aristotle University of Thessaloniki. The study design adheres to the ethical guidelines of the American Psychological Association (2017) for research with human participants (section 8).

*Analyses*

Data will be checked for normal distribution. Descriptive analyses will be performed to identify the central tendency scores of the data. Analysis of correlation will be used to test for the associations between the tested variables. The hypotheses of the study will be tested with the use of Structural Equation Modelling.

**Conclusion**

The study is expected to assist in the development of a comprehensive understanding of performance enhancement behaviours across different life domains. The longitudinal design of the study and the breadth of the measured variables is considered as an asset that will contribute to understanding commonalities and conceptual differences in performance enhancement behaviours across different life domains and provide the evidence base for tailor-made intervention in these domains.

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**References**

American Psychological Association. (2017). Ethical principles of psychologists and Code of conduct. https://www.apa.org/ethics/code

Backhouse, S. E., Whitaker, L., & Petroczi, A. (2013). Gateway to doping: Supplement use in the context of preferred competitive situations, doping attitude, beliefs and norm. *Scandinavian Journal of Medicine and Science in Sports, 23*(2), 244-252. https://doi.org/10.1111/j.1600-0838.2011.01374.x

Baker, J. S., Graham, M. R., & Davies, B. (2006). Steroid and prescription medicine abuse in the health and fitness community: A regional study. *European Journal of Internal Medicine, 17*(7), 479-484. https://doi.org/10.1016/j.ejim.2006.04.010

Barkoukis, V., Lazuras, L., Tsorbatzoudis, H., & Rodafinos, A. (2011). Motivational and sportspersonship profiles of elite athletes in relation to doping behaviour. *Psychology of Sport and Exercise, 12*(3), 205-212. https://doi.org/10.1016/j.psychsport.2010.10.003

Barkoukis, V., Lazuras, L., Tsorbatzoudis, H., & Rodafinos, A. (2013). Motivational and social cognitive predictors of doping intentions in elite sports: An integrated approach. *Scandinavian Journal of Medicine & Science in Sports, 23*(5), e230-240.

https://doi.org/10.1111/sms.12068

Birzniece, V. (2015). Doping in sport: Effects, harm and misconceptions. *Internal Medicine Journal, 45*(3), 239-248. https://doi.org/10.1111/imj.12629

Bryden, A. A. G., Rothwell, P. J. N., & O'reilly, P. H. (1995). Anabolic steroid abuse and renal-cell carcinoma. *The Lancet*, *346*(8985), 1306-1307. https://doi.org/10.1016/s0140-6736(95)91915-5

Cohen, G. L., Sherman, D. K., Bastardi, A., Hsu, L., McGoey, M., & Ross, L. (2007). Bridging the partisan divide: Self-affirmation reduces ideological closed-mindedness and inflexibility in negotiation. *Journal of Personality and Social Psychology, 93*(3), 415-430. https://doi.org/10.1037/0022-3514.93.3.415

Copeland, J., Peters, R., & Dillon, P. (2000). Anabolic-androgenic steroid use disorders among a sample of Australian competitive and recreational users. *Drug and Alcohol Dependence, 60*(1), 91-96. https://doi.org/10.1016/S0376-8716(00)80011-3

Darke, S., Torok, M., & Duflou, J. (2014). Sudden or unnatural deaths involving anabolic-androgenic steroids. *Journal of Forensic Sciences, 59*(4), 1025-1028. https://doi.org/10.1111/1556-4029.12424

de la Torre, L., Segura, J., de Zeeuw, R., & Williams, J. (1997). Recommendations for the reliable detection of illicit drugs in urine in the European Union, with special attention to the workplace. *Annals of Clinical Biomechanics, 34*(4), 339-344. https://doi.org/10.1177%2F000456329703400402

Deline, S., Baggio, S., Studer, J., N'goran, A. A., Dupuis, M., Henchoz, Y., Mohler-Kuo, M., Faeppen, J.-B., & Gmel, G. (2014). Use of neuroenhancement drugs: Prevalence, frequency and use expectations in Switzerland. *International Journal of Environmental Research and Public Health, 11*(3), 3032-3045. https://doi.org/10.3390/ijerph110303032

Diamantopoulou, G., & Platsidou, M. (2014). Factorial validity and psychometric properties of the Greek version of the Almost Perfect Scale Revised (APS-R). *Hellenic Journal of Psychology, 11*(2), 123-137. https://pseve.org/wp-content/uploads/2018/03/Volume11_Issue2_Diamantopoulou

Dodge, T. L., & Jaccard, J. J. (2006). The effect of high school sports participation on the use of performance-enhancing substances in young adulthood. *Journal of Adolescent Health, 39*(3), 367-373. https://doi.org/10.1016/j.jadohealth.2005.12.025

Dunn, M., & White, V. (2011). The epidemiology of anabolic-androgenic steroid use among Australian secondary school students. *Journal of Science and Medicine in Sport, 14*(1), 10-14. https://doi.org/10.1016/j.jsams.2010.05.004

Eickenhorst, P., Vitzthum, K., Klapp, B. F., Groneberg, D., & Mache, S. (2012). Neuroenhancement among German university students: Motives, expectations, and relationship with psychoactive lifestyle drugs. *Journal of Psychoactive Drugs, 44*(5), 418-427. https://doi.org/10.1080/02791072.2012.736845

Fishbein, M. (2009). An integrative model for behavioural prediction and its application to health promotion. In R. J. DiClemente et al. (Eds.), *Emerging theories in health promotion practice and research* (2nd ed., pp. 215-234). San Francisco: Jossey-Bass.

Fishbein, M., & Cappella, J. N. (2006). The role of theory in developing health communications. *Journal of Communication, 56*(1), S1-S17. https://doi.org/10.1111/j.1460-2466.2006.00280.x

Flay, B. R., Snyder, F., & Petraitis, J. (2009). The Theory of Triadic Influence. In R. J. DiClemente et al. (Eds.), *Emerging theories in health promotion practice and research* (2nd ed., pp. 215-234). San Francisco: Jossey-Bass.

Franke, A. G., Bagusat, C., Dietz, P., Hoffmann, I., Simon, P., Ulrich, R., & Lieb, K. (2013). Use of illicit and prescription drugs for cognitive or mood enhancement among surgeons. *BMC Medicine, 11*(1): 102. https://doi.org/10.1186/1741-7015-11-102

Freinhar, J. P., & Alvarez, W. H. (1985). Use of clonazepam in two cases of acute mania. *The Journal of Clinical Psychiatry, 46*(1), 29-30. https://pubmed.ncbi.nlm.nih.gov/3965440/

Froiland, K., Koswewski, W., Hingst, J., & Kopecky, L. (2004). Nutritional supplement use among college athletes and their sources of information. *International Journal of Sport Nutrition and Exercise Metabolism, 14*(1), 104-120. https://doi.org/10.1123/ijsnem.14.1.104

Gelfand, M. J., Raver, J. L., Nishii, L., Leslie, L. M., Lun, J., Lim, B. C., Duan, L., Almaliach, A., Ang. S., Arnadottir, J., Aycan, Z., Boehnke, K., Boski, P., Cabecinhas, R., Chan, D., Chhokar. J., D'Amato, A., Ferrer, M., Fischlmayr, I. C. et al. (2011). Differences between tight and loose cultures: A 33-nation study. *Science, 332*, 1100-1104. DOI: 10.1126/science.1197754

Goulet, C., Valois, P., Buist, A., & Côté, M. (2010). Predictors of the use of performance-enhancing substances by young athletes. *Clinical Journal of Sport Medicine, 20*(4), 243-248. https://doi.org/10.1097/jsm.0b013e3181e0b935

Hartgens, F., & Kuipers, H. (2004). Effects of androgenic-anabolic steroids in athletes. *Sports medicine, 34*(8), 513-554. https://doi.org/10.2165/00007256-200434080-00003

Hoberman, J. (2015). *Police officers' use of anabolic steroids in the United States.* Routledge Handbook of Drugs and Sport. Taylor and Francis Incorporation.

Janssen, E., Spilka, S., Le Nézet, O., & Shah, J. (2018). On the question of non-medical cognitive enhancers among in-school adolescents: Prevalence, predictors and potential health-related harms. *International Journal of Adolescent Medicine and Health*. https://doi.org/10.1515/ijamh-2018-0018

Knapik, J. J., Trone, D. W., Austin, K. G., Steelman, R. A., Farina, E. K., & Lieberman, H. R. (2016). Prevalence, adverse events, and factors associated with dietary supplement and nutritional supplement use by US Navy and Marine Corps personnel. *Journal of the Academy of Nutrition and Dietetics, 116*(9), 1423-1442. https://doi.org/10.1016/j.jand.2016.02.015

Kruglanski, A. W., Shah, J. Y., Fishbach, A., Friedman, R., Chun, W. Y., & Sleeth-Keppler, D. (2002). A Theory of Goal Systems. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (pp. 331-378). San Diego: Academic Press.

Kuipers, H., Wijnen, J. A. G., Hartgens, F., & Willems, S. M. M. (1991). Influence of anabolic steroids on body composition, blood pressure, lipid profile and liver functions in body builders. *International Journal of Sports Medicine, 12*(4), 413-418. https://doi.org/10.1055/s-2007-1024704

Lapinski, M. K., & Rimal, R. N. (2005). An explication of social norms. *Communication theory, 15*(2), 127-147. https://doi.org/10.1111/j.1468-2885.2005.tb00329.x

Lapinski, M. K., Rimal, R. N., DeVries, R., & Lee, E. L. (2007). The role of group orientation and descriptive norms on water conservation attitudes and behaviours. *Health Communication, 22*(2), 133-142. https://doi.org/10.1080/10410230701454049

Lazuras, L., Barkoukis, V., & Tsorbatzoudis, H. (2015). Toward an integrative model of doping use: An empirical study with adolescent athletes. *Journal of Sport and Exercise Psychology, 37*(1), 37-50. https://doi.org/10.1123/jsep.2013-0232

Lazuras, L., Barkoukis, V., Rodafinos, A., & Tzorbatzoudis, H. (2010). Predictors of doping intentions in elite-level athletes: A social cognition approach. *Journal of Sport and Exercise Psychology, 32*(5), 694-710. https://doi.org/10.1123/jsep.32.5.694

Lazuras, L., Eiser, J. R., & Rodafinos, A. (2009). Predicting Greek adolescents' intentions to smoke: A focus on normative processes. *Health Psychology*, *28*(6), 770-778. https://doi.org/10.1037/a0016126

Lazuras, L., Ypsilanti, A., Lambrou, E., & Kontogiorgis, C. (2017). Pharmaceutical cognitive enhancement in Greek university students: Differences between users and non-users in

social cognitive variables, burnout, and engagement. *Substance Use and Medicine, 52*(7), 950-958. https://doi.org/10.1080/10826084.2016.1267223

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

McVeigh, J., & Begley, E. (2017). Anabolic steroids in the UK: An increasing issue for the public health. *Drugs: Education, Prevention and Policy, 24*(3), 278-285. https://doi.org/10.1080/09687637.2016.1245713

Middendorff, E., Poskowsky, J., & Isserstedt, W. (2012). *Formen der Stresskompensation und Leistungssteigerung bei Studierenden* [Forms of stress compensation and performance enhancement among students]. Hannover: HIS Hochschul-Informations-System GmbH.

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

O'Brien, S. K., Malacova, E., Sherriff, J. L., & Black, L. J. (2017). The prevalence and predictors of dietary supplement use in the Australian population. *Nutrients, 9*(10): 1154. https://doi.org/10.3390/nu9101154

Ommundsen, Y., Roberts, G. C., Lemyre, P. N., & Treasure, D. (2003). Perceived motivational climate in male youth soccer: Relations to social-moral functioning, sportspersonship and team norm perceptions. *Psychology of Sport and Exercise, 4*(4), 397-413. https://doi.org/10.1016/S1469-0292(02)00038-9

Parkinson, A. B., & Evans, N. A. (2006). Anabolic androgenic steroids: A survey of 500 users. *Medicine and Science in Sports and Exercise, 38*(4), 644-651. https://doi.org/10.1249/01.mss.0000210194.56834.5d

Perry, P. J., Lund, B. C., Deninger, M. J., Kutscher, E. C., & Schneider, J. (2005). Anabolic steroid use in weightlifters and bodybuilders: An Internet survey of drug utilization. *Clinical Journal of Sport Medicine, 15*(5), 326-330. https://doi.org/10.1097/01.jsm.0000180872.22426.bb

Pillitteri, J. L., Shiffman, S., Rohay, J. M., Harkins, A. M., Burton, S. L., & Wadden, T. A. (2008). Use of dietary supplements for weight loss in the United States: Results of a national survey. *Obesity, 16*(4), 790-796. https://doi.org/10.1038/oby.2007.136

Pope, H.-G. J., & Katz, D. L. (1994). Psychiatric and medical effects of anabolic–androgenic steroid use. A controlled study of 160 athletes. *Archives of General Psychiatry, 51*(5), 375-382. https://doi.org/10.1001/archpsyc.1994.03950050035004

Radimer, K., Bindewald, B., Hughes, J., Ervin, B., Swanson, C., & Picciano, M. F. (2004). Dietary supplement use by US adults: Data from the National Health and Nutrition Examination Survey, 1999-2000. *American Journal of Epidemiology, 160*(4), 339-349. https://doi.org/10.1093/aje/kwh207

Reisinger, K. B., Rutledge, P. C., & Conklin, S. M. (2016). Study drugs and academic integrity: The role of beliefs about an academic honor code in the prediction of nonmedical prescription drug use for academic enhancement. *Journal of College Student Development, 57*(1), 65-78. http://doi.org/10.1353/csd.2016.0011

Rimal, R. N., & Real, K. (2005). How behaviours are influenced by perceived norms: A test of the theory of normative social behaviour. *Communication Research, 32*(3), 389-414. https://doi.org/10.1177%2F0093650205275385

Tsorbatzoudis, H., Lazuras, L., & Barkoukis, V. (2015). Next steps in doping research and prevention. In V. Barkoukis et al. (Eds.), *The psychology of doping in sport* (pp. 230-243). Abingdon: Routledge.

Sattler, S., & Wiegel, C. (2013). Cognitive test anxiety and cognitive enhancement: The influence of students' worries on their use of performance-enhancing drugs. *Substance Use and Misuse, 48*(3), 220-232. https://doi.org/10.3109/10826084.2012.751426

Sattler, S., Sauer, C., Mehlkop, G., & Graeff, P. (2013). The rationale for consuming cognitive enhancement drugs in university students and teachers. *PLOS One, 8*: e68821. https://doi.org/10.1371/journal.pone.0068821

Smith, M. E., & Farah, M. J. (2011). Are prescriptions stimulants "smart pills"? The epidemiology and cognitive neuroscience of prescription stimulant use by normal healthy individuals. *Psychological Bulletin, 137*(5), 717-741. https://doi.apa.org/doi/10.1037/a0023825

Ulrich, D., Pope Jr, H. G., Cleret, L., Petróczi, A., Nepusz, T., Schaffer, J., Kanayama, G., Comstock, R. D., & Simon, P. (2017). Doping in two elite athletic competitions assessed by randomized response surveys. *Sports Medicine, 48*(1), 211-219. https://doi.org/10.1007/s40279-017-0765-4

Whitaker, L., Long, J., Petroczi, A., & Backhouse, S. H. (2015). Using the prototype willingness model to predict doping in sport. *Medicine and Science in Sports, 24*(5), 398-405. https://doi.org/10.1111/sms.12148

Wiefferink, C. H., Detmar, S. B., Coumans, B., Vogels, T., & Paulussen, T. G. W. (2008). Social psychological determinants of the use of performance-enhancing drugs by gym users. *Health Education Research, 23*(1), 70-80. https://doi.org/10.1093/her/cym004

Zelli, A., Mallia, L., & Lucidi, F. (2010). The contribution of interpersonal appraisals to a social-cognitive analysis of adolescents' doping use. *Psychology of Sport and Exercise, 11*(4), 304-311. https://doi.org/10.1016/j.psychsport.2010.02.008

Zohny, H. (2015). The myth of cognitive enhancement drugs. *Neuroethics, 8*(3), 257-269. https://doi.org/10.1007/s12152-015-9232-9