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Doping in elite sport
Linking behavior, attitudes, and psychological theory

Kate Kirby, Suzanne Guerin, Aidan Moran, and James Matthews

Recent years have witnessed an upsurge of research interest in the psychosocial factors associated with competitive athletes’ propensity to use prohibited performance-enhancing drugs (PEDs; e.g., see Barkoukis et al. 2013; Hauw and Mohamed 2015; Hodge et al. 2013; Morente-Sánchez and Zabala 2013). This practice is commonly known as “doping” and typically refers to athletes’ proclivity to use “illegitimate performance enhancement substances and methods” (Lazuras et al. 2010: 694). Although the problem of doping in sport may appear to be a relatively new phenomenon, it has a surprisingly long history. For example, prohibited substances such as caffeine and cocaine were used by cyclists in a bid to enhance competitive performance as far back as the 1890s (Hoberman 1998). Unfortunately, studies on doping in elite athletes are afflicted by at least two unresolved issues. First, the links between doping attitudes and doping behavior have not received sufficient research attention to date. Second, the role of psychological theory in elucidating these links has not been addressed adequately. Therefore, the purpose of the present chapter is to address these two issues. We shall proceed as follows. Following an overview of “attitudes” and approaches to attitude measurement, we shall consider the measurement of attitudes to doping in sport. After that, we shall explain how the Theory of Planned Behavior (TPB; Ajzen 1991) has been applied to studies of doping in sport. Finally, we shall explore some potentially fruitful new directions for research in this field.

The nature of attitudes

In psychology, the term “attitudes” refers to the preferences and evaluations (or likes and dislikes) that people form in relation to specific objects of their thought (Banaji and Heiphetz 2010). Reflecting this view, Eagly and Chaiken defined an attitude as “a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour” (1993: 1). Attitudes can be formed to groups of people (e.g., athletes), phenomena (e.g., social media), situations (e.g., competitions), and even to abstract ideas (e.g., sportspersonship), and social practices (e.g., doping in sport). Regardless of the particular target involved, however, attitudes are multidimensional in structure, with cognitive...
(i.e., beliefs about the target of the attitude), affective (i.e., positive or negative feelings toward such targets), and behavioral (i.e., whether or not any actions occur as consequences of one’s evaluations) components. To illustrate how these components may interact, one might believe that athletes who engage in doping are “cheats” (cognitive component) who deserve scorn (affective component) and who should be banned from the sport in which they participate (behavioral component). On the one hand, many theorists have traditionally regarded attitudes as relatively stable and enduring personal dispositions that are stored in memory and can be “pulled out” and used when required. On the other hand, more recent researchers such as Schwartz (2007) favor the view that attitudes are adaptive reactions to environmental demands – and hence, are temporary, context-specific judgments constructed from currently accessible information. In attempting to resolve this disagreement, Bohner and Dickel proposed that researchers should “take into account both stable and situationally variable aspects of attitudes” (2011: 394).

The assumption that attitudes predict behavior accurately is highly questionable. For example, a seminal review by Wicker (1969) of 42 relevant studies found that the correlation between attitudes and behavior ranged between 0.15 and 0.30. He concluded that overall “it is considerably more likely that attitudes will be unrelated or only very slightly related to overt behaviors than that attitudes will be closely related to actions” (1969: 64) because “only rarely can as much as 10% of the variance in overt behavioral measures be accounted for by attitudinal data” (1969: 65). After Wicker’s (1969) review, social psychologists identified a host of variables moderating the relationship between attitudes and behavior. This line of research led to the conclusion that people’s behavior is influenced by many factors (such as situational constraints and peer pressure) other than attitudes.

Approaches to attitude measurement: from explicit to implicit

Scientific approaches to attitude measurement began in the 1920s (e.g., Thurstone 1928) and 1930s (e.g., Likert 1932) with the use of verbal self-report scales designed to assess people’s beliefs, opinions, and values. The rationale underlying this self-report approach is that people are both willing and able to accurately introspect on, and subsequently report, the contents of their own thoughts. Until the late 1970s, the use of such explicit self-report scales was the most popular approach in this field. However, around that time, two problems occurred which prompted researchers to shift from explicit to implicit (i.e., not accessible to conscious awareness) attitude measurement (Bohner and Dickel 2011; Banaji and Heiphetz 2010). First, response biases such as “social desirability” emerged with the discovery that people tend to hide their true attitudes in an effort to present themselves in a positive light (e.g., by suppressing negative attitudes to groups such as immigrants). Second, the assumption that attitudes are open to introspective access was challenged by evidence (see review by
Nisbett and Wilson 1977) that people often do not know – and hence cannot report reliably on – the reasons for their own behavior. In an effort to address these problems, certain implicit strategies for measuring attitudes (Fazio and Olson 2003) have been developed (see Chapters 3 and 7). According to Bohner and Dickel (2011), the objectives of these strategies are not only to counteract people’s response biases but also to explore those aspects of people’s attitudes that are not open to conscious introspection and control. Briefly, both of these approaches assume that evaluative associations in a respondent’s mind should produce different response times to categorical stimuli that represent the attitude object in question. These differences in response time may be used to infer implicit attitudes on the part of the respondent.

The measurement of attitudes to doping in sport – from athletes to entourage

Numerous studies have measured explicit attitudes to doping among a variety of athletic populations. Among the topics investigated in this largely atheoretical research literature are attitudes to doping in different sports (Alaranta et al. 2006), attitudes to doping and supplementation (Bloodworth et al. 2012), projected motives for doping in sport (Laure and Reinsberger 1995; Özdemir et al. 2005; Scarpino et al. 1990), and attitudes to drug testing and education (Striegel et al. 2002; Waddington et al. 2005). In such studies, researchers typically developed custom-built, doping-related questionnaires. Unfortunately, given the lack of psychometric detail available in this research, definitive conclusions regarding athletes’ attitudes to doping are not possible (Backhouse et al. 2007).

Fortunately, descriptive, “one-shot” studies of attitudes of doping have been increasingly supplanted by theoretically driven research. For example, SasNowosielski and Swiatkowska (2008) found that athletes who were high in ego orientation and low in task orientation displayed significantly more positive (permissive) attitudes to doping than those who displayed a low ego, high task orientation. Similarly, Kirby (2011) reported that certain subscales significantly predicted more lenient attitudes to doping, namely: coach criticism, unequal recognition, and ego orientation. These studies also determined that males tended to have significantly more favorable attitudes toward doping than females – a finding that has been replicated in other studies on doping in sport (Alaranta et al. 2006; Lucidi et al. 2008). The cornerstone of this social science research is the proposition that anti-doping education and deterrence methods cannot be fully effective unless athletes’ attitudes toward doping and their motives for banned substance use are more clearly understood (Lucidi et al. 2008).

In addition to the preceding research, some studies have explored the knowledge and attitudes of coaching staff in relation to doping in sport (Fung and Yuan 2006; Laure et al. 2001; Shirazi and Tricker 2005). Whereas Shirazi and Tricker (2005) set out to explore athletic directors’ policies on drug testing, Laure et al. (2001) investigated the frequency with which coaches are asked for information about doping by their athletes. Unfortunately, little effort has been
made to determine the factors that shape the coaches' attitudes to doping, or to examine the factors that predicted coaches' intentions to promote anti-doping among their athletes (Backhouse and McKenna 2013). Interestingly, according to Waddington and Smith (2009), "if we wish to understand the use of drugs in elite sport then it is crucial that we understand the centrality of the relationship between elite level athletes and practitioners of sports medicine" (2009: 82). However, surprisingly few studies have attempted to understand the doping-related knowledge and attitudes of sports physicians. Indeed, as Backhouse et al. concluded, "the literature in relation to doping and the medical population is weak" (2007: 74). The earliest studies that examined attitudes to doping using physicians as participants focused on estimations of the prevalence of doping (Scarpino et al. 1990). This study was significant because it was the first of its kind in Europe to assess the knowledge, attitudes, and perceived prevalence of doping among people involved in sport. However, very little information is provided about the characteristics and specific responses of the 102 physicians surveyed, except that 21 percent of them (compared to 30 percent of coaches, managers, and athletes) indicated that athletic performance can be enhanced by doping. Laure and colleagues examined attitudes to, and knowledge of, doping in sport among 202 French physicians (Laure et al. 2003) and retail pharmacists (Laure and Kriebitzsch-Lejeune 2000).

Unfortunately, as mentioned previously, researchers investigating the attitudes to doping of athletes, coaches and support staff have typically used custom-built measures rather than systematically validated ones. Indeed, many of the preceding studies did not report the rationale underlying their scale development process or provide adequate information on the psychometric adequacy of the scales used (Backhouse et al. 2007) – problems which hamper accurate interpretation of the results of the studies. Accordingly, Backhouse et al. (2007) concluded that direct comparisons across such studies are difficult to make. Furthermore, as the psychometric properties of these scales are rarely reported, doubts exist about the validity and generalizability of findings in this domain. Addressing this issue, Petróczi and Aidman (2009) argued that when test scores are interpreted as attitudes and inferences are made about athletic populations based on these scores, adequate reliability and validity are essential requirements. Unfortunately, many of the studies that report athletes’, coaches’, and physicians’ attitudes to doping fail to adequately define the term “doping” itself – or to give sufficient detail on the development or content of the questionnaires employed. In fact, Backhouse et al. (2007) suggested that the term “doping attitude” had been so poorly defined that frequently the doping knowledge of athletes rather than their explicit attitudes has been surveyed.

An interesting addition to the research literature on doping has been the “Performance Enhancement Attitude Scale” (PEAS; Petróczi and Aidman 2009), which is a self-report measure examining generalized doping attitude (defined as “an individual’s predisposition toward the use of banned performance enhancing substances and methods” Petróczi 2007: 7) (see also Moran et al. 2008). A positive association with elevated PEAS score and self-admitted doping has been
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reported (Petrócz and Aidman 2008). Although this finding does not demonstrate conclusively that permissive attitudes to doping predict doping behavior, however, it does provide preliminary evidence that the two concepts are related.

Nevertheless, self-report scales (such as the PEAS) are marred by problems of response bias – or the tendency of participants to answer questions that reflect what they think the investigator wants to hear rather than as an index of their true beliefs. Recently, Morente-Sánchez and Zabala noted that “there could be a significant difference between what athletes say and what they really think” (2013: 410). Interestingly, this issue of the validity of athletes’ self-reported attitudes to doping was examined by Gucciardi et al. (2010), who showed that, as expected, favorable attitudes to doping were associated with greater susceptibility to doping. However, the strength of this relationship between attitudes to doping and doping susceptibility was moderated by social desirability – a finding that highlights the importance of controlling for this latter variable when conducting self-report studies of doping in athletes.

To conclude this section, a promising new direction in doping measurement reflects the move toward the use of implicit rather than explicit assessment techniques (see also Chapters 3 and 7 of this volume). This move has been prompted by a desire to circumvent the biases afflicting explicit attitude assessment (for a review see Fazio and Olson 2003). Reflecting this new approach, Brand et al. (2014) argued that indirect attitude measures could prove valuable in studies of doping in sport. However, implicit measures are not unanimously favored. For example, Petrócz (2013) provided a critical consideration of the use of response times in the indirect measurement of doping attitudes.

As psychological research in the field of doping has evolved, researchers such as Lucidi et al. (2008) and Barkoukis et al. (2013) have attempted to explain theoretically, rather than simply describe, key issues. More generally, recent studies have moved away from descriptive accounts and turned increasingly to social psychological theories (e.g., self-determination theory, Deci and Ryan 2000; achievement goal theory, Nicholls 1984) in their quest to understand the relationship between athletes’ attitudes to, and engagement in, doping behavior. Of the various psychological theories available to doping researchers, perhaps the most influential (e.g., see Lucidi et al. 2008; Goulet et al. 2010) is the Theory of Planned Behavior (TPB; Ajzen 1991). This theory, which was developed in order to explain behaviors which are not fully under volitional control, has been used extensively to predict health risk behaviors such as self-harm, driving behavior and substance abuse (see Ajzen 2014; Armitage and Conner 2001). Given this latter application, the TPB offers researchers a useful theoretical perspective from which to investigate doping behavior in sport.

Applying the Theory of Planned Behavior to doping in sport

The TPB has exerted a seminal influence on recent studies of doping in sport (e.g., Barkoukis et al. 2013; Chan et al. 2015). Although space limitations preclude a detailed explanation of the TPB, one of its central tenets is the idea that
the most proximal determinant of behavior is a person’s intention to engage in that behavior (i.e., the conscious decision to perform a behavior in the future). This theory also postulates that behavioral intentions are determined by three other factors – the individual’s attitude toward the behavior, his or her subjective norms (i.e., the perceived social pressures the person feels to perform the behavior) and perceived behavioral control (PBC; the extent a person believes the behavior is under their active control). Attitudes, subjective norms, and PBC are thought to be underpinned by corresponding salient beliefs, namely behavioral, normative, and control beliefs. The TPB suggests that these beliefs not only reflect the underlying cognitive structure of these variables but also that behavior is ultimately a function of salient beliefs regarding the behavior. Specifically, attitudes are held to be determined by behavioral beliefs which, in turn, reflect the perceived likely consequences of engaging in the targeted behavior, weighted by an evaluation of these consequences. Normative beliefs are thought to influence subjective norms and are comprised of the expectations of important others and the extent to which an individual is motivated to comply with such expectations. Finally, “perceived behavioral control” is underpinned by control beliefs which refer to the factors that can enable or inhibit performance of the targeted behavior and the perceived impact these factors may have on the behavior (Ajzen 1991; Armitage and Conner 2001). The components of the TPB and how they interact can be seen in Figure 1.1. Typically, behavioral intention is reported as the strongest predictor of behavior, while attitude has the largest effect on behavioral intention (Armitage and Conner 2001). From this brief synopsis of TPB, an important implication is that attitudes, subjective norms, and PBC may serve as proxy indices of behavior through their direct relationship with behavioral intention and their indirect relationship with behavior.

Building on the preceding assumption, researchers guided by the TPB have reported how variables such as doping attitudes and subjective norms can predict doping intention and behavior (Ntoumanis et al. 2014). Consequently, some doping researchers have argued that it is not necessary to collect data on actual

![Figure 1.1 Overview of the TPB (source: adapted from Armitage and Conner 2001).]
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doping behavior from competitive athletes. Instead, assessing an athlete’s behavioral intention to dope and other TPB variables such as attitudes toward doping may be sufficient to better understand doping behavior and its antecedents. This assumption is the cornerstone of several early models of PED use in sport (e.g., those of Donovan et al. 2002; Petróczi and Aidman 2008) and has also influenced more recent models (e.g., Whitaker et al. 2014). However, caution must be applied when considering this type of approach, as troubling issues remain. First, there are concerns regarding self-reporting and social desirability when exploring athletes’ attitudes toward doping and doping intentions. Therefore, the effects of social desirability must be accounted for in future studies (Lazuras et al. 2010). Second, there is a lack of empirical evidence to support the assumption that doping-related attitudes can reliably predict doping behavior. As a result, future research should consider using experimental studies to examine the causal relationships between these theoretical variables (Ntoumanis et al. 2014).

Overall, however, there are distinct advantages in the TPB assumption that attitudes can serve as proxies of behavior. For example, at a methodological level, it is helpful because it enables researchers to collect data from large samples of athletes conveniently and systematically. These data can then be included in multiple regression models, thereby increasing the statistical power of the analysis and allowing greater confidence in study results. A further advantage of measuring attitudes to doping—as opposed to doping behavior—is that it facilitates the recruitment of samples of elite athletes rather than those of students and/or recreational gym users.

In summary, the TPB has been used frequently in doping research, and related theoretical variables such as attitudes toward doping and doping intentions are suggested to predict doping behavior. However, researchers have begun to use variables outside of the TPB to enhance the predictive value of this theoretical framework, and some of these variables will be considered in the next section of this chapter. This leads to the intriguing question as to whether an extended TPB or integrated theoretical frameworks as proposed by Barkoukis et al. (2013; see also Chapter 4) may further develop our understanding of doping behavior.

Empirical research on doping in sport influenced by the Theory of Planned Behavior

One of the earliest applications of the TPB on the study of doping in sport was that undertaken by Tricker and Connolly (1997). These researchers investigated the attitudes to doping of a large (over 500 respondents) sample of student athletes and succeeded in identifying athletes “at risk” of doping based on their stated behavioral intention to use steroids, human growth hormone, amphetamines, cocaine, and marijuana. However, the way Tricker and Connolly’s (1997) items were generated in order to measure attitude, subjective norm, and behavioral control variables was unclear, so, in the absence of data on questionnaire reliability and validity, their findings need to be evaluated cautiously. With that
caveat in mind, these authors reported that the most significant factors influencing the decisions of their participants in relation to PED use were subjective norms that related to the impact of drug testing, peer influence, and a fear of detection. Despite some conceptual confusion, the studies by Tricker and colleagues were valuable because they provided some initial empirical insights into the complex relationship between attitudes, subjective norms, perceived behavioral control, and behavioral intent. Interestingly, these studies also showed that the decisions of at-risk athletes not to use drugs were determined primarily by perceived external rather than internal influences – a discovery that yielded useful information for the future development of drug education programs. More recently, Wiefferink et al. (2008) surveyed 144 gym users to identify the social psychological determinants underlying PED use among bodybuilders, powerlifters, and combat-sport athletes. They examined numerous variables including behavioral intention, attitudes to doping, personal norms, social influences, background characteristics, and self-efficacy. About a third of the respondents had used PEDs in the past, and 29 percent reported an intention to use them in the future. The strongest predictors of future doping intentions were previous PED use, followed by personal norms and beliefs about the performance outcomes of drug use. Nonusers had a more restrictive morality toward drug use than current or ex-users. This abstinence group also estimated the number of significant others who were drug users as lower than did current or ex-PED users, who tended to attribute greater advantages to the use of banned substances, and minimized the risks involved.

Based on their results, Wiefferink et al. (2008) concluded that the decision by a gym population to use PEDs may not be due to a rational individual choice. Instead, it may reflect norms and past behaviors. So, Wiefferink et al. (2008) argued for the inclusion of a “personal norms” variable in the TPB. Unfortunately, although they did publish some of the items that made up the personal norm subscale of their questionnaire, they did not adequately define the term.

Additional doping research spawned by the TPB was conducted by Lucidi et al. (2004, 2008) and Zelli et al. (2010). To illustrate, Lucidi et al. (2004) aimed to evaluate whether behavioral intention to use doping substances can be predicted by TPB variables. In order to improve the predictive power and relevance of the TPB to the specific, ethically questionable behavior under observation, they also added the variable moral disengagement. This study was strengthened by the large population employed (n=952), 3.1 percent of whom reported doping use in the preceding three months. Attitude toward doping use was the strongest predictor of intention to dope, followed by subjective norms. Perceived behavioral control showed a small but significant relationship to doping intent. This finding is unusual, since subjective norms are very often the weakest predictor of intentions in TPB testing (Armitage and Conner 2001). Just like Wiefferink et al. (2008), Lucidi et al. (2004) explained this unexpected finding by highlighting the crucial role played by significant others (e.g., peers, coaches, and athlete support staff) in an individual’s decision to engage in doping. Moral reasoning and past use of ergogenic aids each made a significant contribution to
adolescents’ intentions to engage in doping. Although Lucidi et al.’s (2004) findings are promising in identifying the various determinants of intentions to engage in doping, they are limited in their application to elite-level sport, since less than one-third of the respondents were classified as “competitive athletes.” Furthermore, the authors highlighted the need to establish a relationship between the intention to engage in doping and subsequent actual use of PEDs to definitively test the determinants of doping behavior using a longitudinal research design, rather than simply relying on evidence of doping intent.

In a follow-up study, Lucidi et al. (2008) attempted to overcome the preceding limitations by surveying a very large (n = 762) sample of adolescent students and repeating the process again after three months. The aim of this longitudinal research was to analyse the effects of social-cognitive mechanisms on adolescents’ substance use over time. Just like Wiefferink et al. (2008), Lucidi et al. (2008) measured doping-specific, self-regulatory efficacy (i.e., participants’ beliefs in their ability to withstand pressure to engage in doping) and their levels of moral disengagement.

Testing at time 1 showed that strong positive doping attitudes, beliefs that others would approve of doping, convictions that doping can be justified and a low capacity to resist situational pressure were related to positive intentions to engage in doping. Intentions to engage in doping behavior significantly predicted differences between doping users and nonusers, even if this effect was quite small (0.17) and over a short time period of three months. However, this study provided preliminary evidence supporting the value of measuring doping intent in the absence of reliable and objective data on doping behavior. Specifically, at time two participants with stronger moral disengagement scores were more likely to have doped or used supplements. Favorable attitudes toward doping and strong subjective norms also predicted doping use. In contrast, adolescents with strong self-regulatory efficacy were more likely to resist PED use. In this study the final model accounted for 55 percent of the variance, and all psychological factors measured, with the exception of perceived behavioral control, exerted significant effects on behavioral intentions to dope.

Influenced by Lucidi et al.’s (2008) findings, Zelli et al. (2010) examined the additional contribution of social influences as potential moderators of the relationship between personal beliefs and doping intentions and behavior. They reported that adolescents who were more inclined to assign positive meaning to someone’s motives for soliciting substance use also held stronger favorable attitudes toward doping, assigned a stronger value to significant others’ approval for using PEDs, and expressed stronger intentions to engage in doping in the future. For example, athletes who considered that solicitation to use doping substances was motivated by a concern for their welfare showed stronger intentions to dope than those who interpreted such solicitations as being motivated by the counterparty’s personal interest. Unfortunately, the participants who held problematic appraisals of doping situations did not report any actual doping use during the longitudinal study, so the prediction model was only applied to doping intent and not to doping behavior.
Overall, Zelli et al. (2010) found that doping beliefs accounted for about 50 percent of the variance in doping intentions. Longitudinal analysis revealed that intentions accounted for nearly 75 percent of the variation in adolescents’ actual doping behavior, again providing evidence for the suitability of the TPB in social and psychological research on doping in sport. However, by selecting as participants a cross section of adolescents (rather than exclusively competitive athletes), the study assumed that either performance enhancement or physical appearance motives characterize possible doping use.

A more recent study by Lazuras et al. (2010) examined other contextual factors in the doping process by extending beyond the traditional TPB variables to include “situational temptation.” This latter construct was defined as an external control mechanism which reflects people’s eagerness to endorse behaviors under specific circumstances. Lazuras et al. (2010) also extended the measurement of subjective norms (beliefs about what ought to be happening) to include the concept of “descriptive norms” (beliefs about what is happening). These authors recruited impressive participant numbers of elite adult athletes ($n=750$) for their study. However, athletes’ classification as “elite” is questionable. Overall, their model predicted 69 percent of the variance in doping intentions. Traditional TPB variables, as well as descriptive norms and situational temptation, significantly predicted doping intentions. The strength of the relationship between doping intentions and behavior was not reported due to the cross-sectional nature of the research design. However, the overall significance of the model justifies the inclusion of these additional variables in research on doping with elite athletes, and highlights the relative importance of contextual, as well as individual, factors in influencing athletes’ doping decisions.

In one of the few studies attempting to understand the predictors of coaches’ doping-related behaviors, Fung and Yuan (2006) tested the relationships between perceived and actual knowledge, subjective norms, attitudes and behavioral intent of over 100 “community coaches” in Hong Kong. Partial support for the TPB was reported, in that coaches’ behavioral intent was significantly related to their attitudes to doping. However, the relationship between subjective norm and behavioral intent was not found to be significant. One of the clear limitations of the study may account for this finding. Specifically, the questions relating to subjective norm explored the notion of international sport and world records, but the population tested were described as “community coaches.” Therefore, the questionnaire items may not have adequately captured their “recreational” sport experience. The subjective norm subscale was also criticized by Backhouse et al. (2007), as being more about what is happening (descriptive norms), than about what ought to be happening (subjective norms). Unfortunately, the basic correlation statistics employed in the study also precluded any inferences about predictors of coaches’ behavioral intent.

As outlined above, research using the TPB has provided some encouraging evidence to support certain factors that are predictive of doping behavior in sport. However, as a large proportion of the variance in PED use among elite athletes remains unexplained, there is clearly a need to extend beyond the
traditional TPB variables and to develop a more comprehensive doping explanatory theory. The addition of individual psychological variables such as motivational profiles, morality, and efficacy beliefs, as well as the inclusion of additional situational and systemic variables, should further enhance our understanding of the problem.

New directions for research on doping in sport

At least four new directions may be identified for future research on doping in sport. To begin with, a major limitation of current research on doping behavior is the lack of theoretically driven studies using elite athletes as participants. Although psychological theories such as the TPB provide a fertile framework for hypothesis testing in doping research, there is a dearth of elite athlete participants in studies in this field. Existing studies of doping behavior have struggled to elicit information about athletes’ experiences with PEDs, even when anonymity is assured (Petróczí et al. 2010; Uvacsek et al. 2009). Accordingly, many studies on doping in sport use participants sampled from proxy populations such as recreational gym users, bodybuilders and/or student athletes. Acknowledging this limitation, Quirk (2009) urged doping researchers to try to recruit more elite athletes for their studies in order “to confirm or disconfirm results from amateur or collegiate sporting contexts” (2009: 389). Unfortunately, even when athletes are persuaded to participate in doping research, sample sizes are invariably small. To illustrate, assuming a doping prevalence rate of approximately 2 percent (Petróczí et al. 2008) researchers would need to survey about 2,500 athletes in order to obtain an actual sample of 50 suitable participants. Clearly, such large-scale surveys are prohibitive for financial and logistical reasons. Overall, however, it is essential that researchers should continue to recruit elite athletes for studies of doping in sport. Second, a major challenge facing doping researchers is the issue of how to establish the degree to which doping-related attitudes and intentions can reliably predict doping behavior. In this regard, one promising strategy (see Barkoukis et al.’s 2013 “meta-theory” perspective) is to develop integrated theoretical models designed to explore the risk factors that might help to explain doping intentions. Another strategy could involve the use of longitudinal research designs to test the relationship between doping-related attitudes and intentions (e.g., see Lucidi et al. 2008). Such studies suggest that athletes’ beliefs and intentions can predict their actual doping behaviors. However, the strength of this relationship is unclear. Third, in the light of recent research by Chan et al. (2015), it would be interesting to explore the nature of doping avoidance intentions and behavior among elite athletes. Changing the target behavior under investigation from doping behavior to doping avoidance behavior in TPB studies would also further facilitate better quality, theoretically driven research with athlete support staff, given that questions around personal consumption of PEDs are irrelevant to them. Finally, future research on doping in sport could benefit significantly from developments in neuroscience. Specifically, as brain regions such as the amygdala are known to be activated during
evaluative judgments (Banaji and Heiphetz 2010), it would be intriguing to investigate the patterns of cortical activation elicited among athletes during tasks that require rapid responses to doping-related scenarios/dilemmas.

**Note**

1 Tricker and Connolly defined subjective norms as the students’ “perception of the norms within his/her social environment” (i.e., of the penalties for using) (1997: 116). Curiously, however, this definition seems at odds with Ajzen’s definition of the same variable: “the perceived social pressure to perform or not to perform the behaviour” (1991: 188). In fact, Ajzen’s definition of perceived behavioral control, “perceived ease or difficulty of performing the behaviour . . . assumed to reflect past experience as well as anticipated impediments and obstacles” (1991: 188), seems to better reflect Tricker and Connolly’s (1997) interpretation of subjective norms.

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