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Measuring explicit attitude toward doping: Review of the psychometric properties of the Performance Enhancement Attitude Scale

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ABSTRACT

Objectives: Doping use is seldom an accident – it is a deliberate action often requiring considerable commitment. Attitudes are known to influence this type of action and hence they are likely to be predictive of doping-related behaviours. To measure 'doping attitude', a valid and reliable tool is required.

Design: This paper briefly reviews methodological issues in doping attitude research, introduces the Performance Enhancement Attitude Scale (PEAS) and provides a comparative analysis of its reliability and validity as a self-reported measure of a generalized doping attitude.

Methods: The scale's reliability was examined with Cronbach's internal consistency coefficient and test–retest correlations using data from 9 independent studies encompassing 7 years. Confirmatory factor analysis was performed to assess the scale's structure. Known-groups' validation strategy was employed to examine construct validity in 4 studies.

Results: Estimates of the PEAS' internal consistency (ranged between .71 and .91 across various samples) provided good evidence of the scale's simultaneous reliability. The chi-square/df ratio in all cases was below the threshold with an average of 1.85 (ranging from 1.370 to 2.291), indicating an acceptable measurement model fit. Theoretically expected difference in doping attitudes was found between doping users and non-users with elevated PEAS scores from users, as well as predictable dynamics of PEAS scores across the repeated measures, provided support for construct validity of the scale.

Conclusion: The psychometric properties of the 17-item unidimensional PEAS suggest that the scale is a useful tool for measuring self-declared attitudes toward doping, with adequate reliability and promising validity estimates. Suggestions are discussed for the continuous scale development and validation process.

The use of performance enhancements has been a problem in competitive sport for decades. In the past four years, even though the proportion of the adverse analytical findings and anti-doping rule violations per year has remained low (<2.3%), there was a steady increase in the relative positive tests from 1.60% in 2003 to 2.13% in 2005 with a small dip to 1.92% in 2006 (WADA, 2006a, 2006b). The increase may have been due to employing increasingly sophisticated testing procedures but it may also signal an increase in doping use; or the combination of both. Not surprisingly, the percentage of positive test results in some Olympic sports in which athletes can benefit from using performance enhancements (by increasing endurance or power) exceeds the usual 2% average (e.g. cycling 4.7%, baseball/softball 5.8%, weightlifting 2.9%, triathlon 2.8% and boxing 2.4%). However, test results in some non-Olympic sports with recognition by the International Olympic Committee (IOC), such as airsport 9.3%, billiard 7.7%, bridge 7.4%, orienteering 3.5%, golf 2.7%, rugby 2.6%, signal that chemically enhanced performance is sought after in many competitive sports – both within and outside the IOC remit. Based on literature evidence (Alaranta et al., 2006; Bamberger & Yesalis, 1997; Baron, Martin, & Magd, 2007; Laure, 1997, 2000), it is safe to assume that the proportion of performance enhancement users is higher than evidenced by the adverse analytical findings and with new technological advances such as gene doping (Lippi & Guidi, 2003; Miah, 2004) and availability of drugs (Greydanus & Patel, 2005), it is likely to grow.

The development of effective anti-doping prevention requires a better understanding of the underlying mechanisms that render

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some athletes or athlete groups more vulnerable to doping than others and the factors that may protect athletes from engaging in doping practices (Petróczi & Aidman, 2008). In order to obtain a reliable view of how widespread doping is in sport, estimating the prevalence of doping is a prime goal of many international and national sport governing bodies (NGBs). Epidemiological studies provide insight into the doping problem but obtaining reliable information on doping behaviour is hindered by the fact that athletes are asked to admit a behaviour that could jeopardise their sports career. In the absence of more objective information on performance-enhancing drug use at the population level, attitudes are often used as a proxy for doping behaviour, assuming that those who use banned performance enhancements show greater leniency towards doping than those who stay clear of doping. Attitudes were also in the foci of doping behavioural models (Dodge & Jaccard, 2008; Donovan, Egger, Kapernick, & Mendoza, 2002; Lucidi et al., 2008; Strelan & Boeckmann, 2003) aiming to identify risk factors that lead to doping. Increased knowledge regarding risk factors and a better understanding of the causes of doping behaviour are among the priorities of WADA (Social Science Research, 2009 Call for Proposal). In preparation for the 2012 Olympics, the House of Commons of UK Parliament produced an extensive report investigating human performance enhancement in sport (HC, 2007). Among the recommendations, an increased effort for research into ethics of doping and evidence-based prevention has been emphasised.

While past research into illegal drug use identified a number of possible risk factors (Frisher, Crome, Macleod, Bloor, & Hickman, 2007), their direct application to doping may or may not be appropriate. Lüschen (1993) argues that the difference between illicit drug use and doping lies with intention behind the use of such means. Whilst drug use is typically done for the effect itself, doping is used for the effect with the intention to gain competitive advantage over the opponent.

Attitudes toward doping

Assessing athletes' attitudes toward certain prohibited performance-enhancing substances (mostly anabolic steroids) and doping in general has a long history in sport psychology. In the past 35 years, athletes have been questioned about their beliefs about the positive outcomes of using performance-enhancing substances, providing researchers with a reasonably good insight into individuals' doping behaviour. Laure (1997) summarised publications relevant to doping between 1980 and 1996 and found that the motives for using performance-enhancing substances can be sorted into two main categories. The first category dealt with physiological aspects, such as increasing strength, endurance, dealing with tiredness, injury and/or lack of training. The second category incorporates the psycho-sociological elements, such as achieving external goods, societal expectation, pressure to win, and personal desire to be acknowledged. Common threads across interviews and survey data seem to be mingled around issues like achieving better performance, inner desire to win or perform better (Anshel, 1991; Kersey, 1993; Laure, Lecerf, Friser & Binsinger, 2004; Laure & Reinsberger, 1995; Melia, Pipe, & Greenberg, 1996; Scarpino et al., 1990; Tricker, O'Neill, & Cook, 1989; Williamson, 1993), external pressure to win (Anshel, 1991; ASDA, 1997; Scarpino et al., 1990). The external pressure for "winning at all cost" manifests in many forms, most often comes from coaches who repeatedly warn athletes about the exceptional abilities of the competitors (Anshel, 1991). A constant paranoia about chemically enhanced competitors may also influence athletes' decision regarding doping (ASDA, 1989, 1990, 1997, 2000; Fuller & La Fountain, 1987; Yesalis, Herrick, & Buckley, 1988). Doping substances or methods are also seen as means to cope with the physical demand of training and competition (Yesalis et al., 1988), speeded recovery from or pain relief during injuries (Anshel, 1991; ASDA, 1989; Martin & Anshel, 1991). The cruel race against records once set by predecessors (Silverster, 1973) has also been used as justification for using banned substances.

Beyond the scope of sports performance, improving appearance is also among the reasons of using drugs, more specifically, anabolic steroids (Melia et al., 1996; Williamson, 1993). Interestingly, many athletes see doping as a necessary mean to an end (Curry & Wagman, 1999) and do not consider using performance enhancement as 'cheating'. It is probably the case because athletes do not take the drug to replace hard work and training, but rather to add the extra edge to the work they have already done in order to increase the probability of winning, and having something valuable in return (Laure & Reinsberger, 1995). Many athletes posit that hard work alone cannot compete with chemically enhanced performance of some competitor, thus drugs are necessary part of their training regime (Brisonneau, 2006; Maycock & Howat, 2005). In addition, they also believe that no harm is done by doping since there is no 'victim' involved in their actions, other than perhaps themselves (Fuller & La Fountain, 1987).

Assuming that top performing athletes are all highly motivated and achievement oriented individuals, the difference between those who use prohibited means and those who do not lies elsewhere. Among the usual suspect constructs, attitudes toward doping have seen repeated attempts to quantify them (Alaranta et al., 2006; Lucidi, Grano, Leone, Lombardo, & Pesce, 2004; Peretti-Watel, Guagliardo, Verger, Pruvost, & Obadia, 2004; Sas-Nowosielski & Swiatkowska, 2008; Wanjek, Rosendahl, Strauss, & Gabriel, 2007). However, this research typically reports findings derived from ad hoc measurements, while other scales focused on attitudes toward specific substances, mainly steroids (Anshel & Russell, 1997; Schwerin & Corcoran, 1992, 1996a, 1996b; Tricker & Connolly, 1997). As an attitude is response of liking or disliking (Bem, 1970), resulting from the processes of evaluation and associated behavioural choice that are dynamic and ubiquitous in daily life (Petty, Wegener, & Fabrigar, 1997), it can be expressed as either evaluative judgments or behavioural tendencies (e.g. approach-avoidance) or both. The sense that something is good or bad, positive or negative, pleasant or unpleasant; to be avoided or approached is critical to most behaviour (Cunningham & Johnson, 2007). A conceptual shift from treating attitudes as representations directly retrieved from memory in response to perceptual cues to viewing attitudes as constructed dynamically in situational, cognitive and motivational contexts (Schwarz & Bohner, 2001) has highlighted the importance of subjective experiences associated with attitudes that integrate into behavioural tendencies of approach or avoidance – some more automatically while others with more reflection. Both the valence and intensity of attitudes have the capacity to motivate. As a result, attitudes form a distinct type of motives. Doping use is assumed to be a deliberate action often requiring considerable commitment. As attitudes are known to influence this type of action and hence they are likely to be predictive of doping-related behaviours (Lucidi et al., 2008), rigorous investigation of athletes' attitudes toward performance enhancements can yield important information to inform anti-doping effort.

Aims

A recent comprehensive review (Backhouse, Atkin, McKenna, & Robinson, 2007) concluded that the current research methodologies used to examine athletes and their support networks attitudes to doping in sport are weak. For the majority of the measurement tools, the scale development process was not reported (or not in sufficient details) and the scales used were not subjected to psychometric testing, which seriously undermines the validity and

reliability of any inference made based on the test scores obtained from these scales.

Ad hoc measures, or 'disposable scales', developed and used for a single research project hinder the scientific rigour. When test scores are interpreted as one's attitude and inferences are made for the athlete population, demonstrated reliability and validity are fundamental. Methodologically, repeated use of a scale is encouraged because it provides researchers with empirical evidence regarding the test's validity and reliability. Conceptually, if attitudes are assumed to be dynamic (Eiser, 1994) then they need to be measured more than once over the period of time and change in attitudes is just as important information as their base levels. Therefore, the aim of this paper is to draw attention to the lack of psychometric assessment of tools used in doping attitude research, to introduce the Performance Enhancement Attitude Scale (PEAS, Petróczi, 2002) and to examine its reliability and validity as a self-reported measure of a generalized doping attitude.

Methods

To date, the dominant method for measuring attitude has been a collection of self-reports on one's own attitude, which yields a measurement of the declared (explicit) attitude toward an attitude object, in this case: the use of performance enhancements in sport. In this paper, doping is defined as the use of prohibited methods, including using performance-enhancing drugs were prohibited, using of masking agents, as well as physical or medical manipulation to enhance performance and/or gain competitive advantage. Terms such as 'doping' and 'use of prohibited performance enhancements', or 'performance-enhancing methods' are used interchangeably throughout the paper and refer to using any substance or method prohibited by the World Anti-Doping Agency. Doping attitude is defined as an evaluative judgment (Fazio, 1995) of doping practice, where this evaluation is based on personal experience with the attitude object (doping situation) but filtered through individual values and dispositions.

This paper summarizes a series of studies that used the PEAS as a measure of doping attitudes. The PEAS was developed in 2000 (Petróczi, 2002) and used subsequently in studies aiming to test a doping behavioural model (Petróczi, 2002), social desirability effect (Petróczi & Nepusz, 2006), compare implicit or explicit attitudes toward doping (Petróczi, Aidman, & Nepusz, 2008) or used in connection with investigating doping-related false consensus effect (Petróczi, Naughton, Nepusz, Backhouse, & Mazanov, 2008).

The Performance Enhancement Attitude Scale

The PEAS is a 17-item unidimensional self-report instrument. Its items are attitude statements, such as "Doping is necessary to be competitive". In the first studies, attitude statements were judged by selecting the appropriate answer on a 4-point Likert-type scale, which has been expanded to 6 points at a later stage. The final response format is a 6-point Likert-type scale, with points anchored from strongly disagree (1) through disagree (2), slightly disagree (3), slightly agree (4), agree (5) to strongly agree (6). No neutral response option is offered and all 17 items are scored in the same direction (Table 1). The PEAS total score ranges from 17 to 102, giving a theoretical middle-point of 59.5.

The scale was developed from the original 97 items, by eliminating poorly performing items in a stepwise process using corrected items-to-total correlations and Principal Component Analysis. Scale dimensionality was tested with higher order exploratory factor analysis using UniMult 1.1. (Gorsuch, 1991), whereas the number of factors extractable was checked by Velicer's Minimum Average Partial Correlation rule and Parallel Analysis, using SAS routines (O'Connor, 2000).

Table 1
Items of the Performance Enhancement Attitude Scale (PEAS), in the order of the final scale.

PEAS items
Legalizing performance enhancements would be beneficial for sports.
Doping is necessary to be competitive.
The risks related to doping are exaggerated.
Recreational drugs give the motivation to train and compete at the highest level.
Athletes should not feel guilty about breaking the rules and taking performance-enhancing drugs.
Athletes are pressured to take performance-enhancing drugs.
Health problems related to rigorous training and injuries are just as bad as from doping.
The media blows the doping issue out of proportion.
Media should talk less about doping.
Athletes have no alternative career choices, but sport.
Athletes who take recreational drugs, use them because they help them in sport situations.
Recreational drugs help to overcome boredom during training.
Doping is an unavoidable part of the competitive sport.
Athletes often lose time due to injuries and drugs can help to make up the lost time.
Doping is not cheating since everyone does it.
Only the quality of performance should matter, not the way athletes achieve it.
There is no difference between drugs, fiberglass poles, and speedy swimsuits that are all used to enhance performance.

Results of the exploratory and confirmatory factor analyses are summarised in Table 2. Factor loadings on the 17 items of the PEAS ranged between .40 and .66. Standard errors were around the acceptable value of .7. The *t*-values were obtained by dividing the factor loading by the corresponding standard error. As the *t*-value has an underlying *z* distribution, $t > 1.96$ (equates to 2 standard deviation) are considered statistically significant (Byrne, 2001). For all 17 items of the PEAS, *t*-values ranged between 4.3 and 9.2, hence were significant. The multiple correlation (R^2) values indicating the reliability of PEAS items for the proposed latent factor ranged from .11 to .41. The overall squared multiple correlation, which represents the proportion of the variance explained by the predictors of the latent variable in question (Byrne, 2001), was .85 which showed an acceptable overall proportion of explained variance of the PEAS measurement model.

Table 2
EFA structure coefficients, CFA factor loadings, squared multiple correlations (R^2), and *t*-values of the 17 items of the PEA Scale in the developmental sample ($n = 193$).

Item	EFA		CFA			
	Component structure pattern[a]	Factor structure pattern[b]	Standardized factor loadings	Standard errors	*t*-values	*R*-square
1	.499	.451	.6422	.0716	8.9660	.4124
2	.529	.494	.5960	.0730	8.1662	.3552
3	.575	.516	.6538	.0713	9.1735	.4274
4	.498	.439	.6331	.0719	8.8053	.4008
5	.405	.355	.6185	.0723	8.5512	.3826
6	.656	.627	.5949	.0730	8.1480	.3539
7	.266	.232	.5325	.0747	7.1326	.2835
8	.602	.570	.4591	.0763	6.0144	.2107
9	.534	.505	.5366	.0746	7.1977	.2879
10	.444	.390	.5004	.0754	6.6355	.2504
11	.543	.490	.4290	.0769	5.5766	.1841
12	.555	.495	.3887	.0777	5.0037	.1511
13	.325	.272	.3666	.0781	4.6966	.1344
14	.450	.398	.3894	.0777	5.0131	.1516
15	.636	.602	.3645	.0781	4.6681	.1329
16	.609	.571	.4030	.0774	5.2055	.1624
17	.595	.555	.3329	.0786	4.2659	.1108
R^2	1.000[c]	.847[c]				

[a] Principal component analysis.
[b] Maximum Likelihood factor analysis.
[c] Squared multiple correlation of the variables with the factor.

Samples

After the development stage, PEAS has been used in various research projects among American, Canadian and UK sport and exercise science students, athletes and elite athletes. Participants in the athletes samples were all involved in organised competitive sports at the club level, whereas 'elite athletes' samples were recruited from those who compete at the national level or internationally. Students were undergraduate sports and exercise science students with an evident interest in sports performance and the majority was involved in regular sports activities. In the latter groups, questions were limited to attitude, hence behavioural questions (whether using performance-enhancing substances) were not asked. Details on samples, sample sizes, age (mean ± standard deviation) and gender distribution (expressed as ratio) are summarised in Table 3. The scale was also translated into and validated in Hungarian.

The participation in all projects was voluntary and completely anonymous. In the case of the repeated measure design, participants were assigned a two-digit number during the first administration and they were asked to note and use the same number again for the second administration. Participants in all studies gave their implied consent by completing and returning the questionnaires. The research projects were approved by the relevant Institutional Review Board (2000–2002) and Faculty Research Ethics Committee (2002–2008).

Data collection

Data collection took place for various doping-related projects. In the first 10 projects, participants were provided with a paper-based survey pack. The data were collected by the first author as principal investigator, with assistance of coaches and team managers in distributing and collecting the questionnaires. In these cases, participants were provided with uniquely marked envelope and were instructed to place the completed questionnaires into the envelope and sign across the seal before they returned them to their coaches or other sport personnel who administered the test.

The questionnaires used between 2000 and 2007 were a paper-and-pencil instruments that required self-completion. Questionnaires were handed out at the end of the training sessions and/or lectures, allowing non-participation. Participants completed the questionnaires individually but in small group settings. In 2008, an electronic version of the questionnaire has been developed and placed on a web-based test site as part of a battery of sport and doping-related psychology tests. Participants in the 2008 sample completed the questionnaire during a computer practical session.

Analysis

This paper aims to provide evidence of the scale's reliability and convergent validity through results from repeated use of the scale across multiple samples over a period of seven years. To serve this purpose, the scale reliability was examined by calculating internal consistency coefficients (Cronbach alphas) for each time the scale was used. To determine acceptable reliability, the customary cut-off value of .7 (Nunnally, 1978) was used. Test–retest reliability was examined with Pearson product moment correlation of PEAS scores obtained in repeat administrations of the scale. Normality of the distribution of the PEAS scores was tested with Kolmogorov–Smirnov tests. Owing to the unequal group sizes, between group differences were tested using non-parametric statistical procedures (Mann–Whitney test) and effect sizes were calculated for non-significant differences using GPower 3.0.1.0 (Faul, Erdfelder, Jang, & Buchner, 2007). Between measures difference was tested with repeated measures *t*-test. The measurement model fit was tested by using confirmatory factor analysis and the goodness of model fit was expressed as the ratio between the chi-square statistics and the degrees of freedom, with the highest acceptable level set to the recommended 3:1 range (Kline, 1998). Statistical analyses were carried out using SPSS version 15.0 and AMOS 7.0. Standard error of measurement was estimated by multiplying the scale's standard deviation by the square root of 1 minus Cronbach α (Kline, 2000).

Results

In all studies, the mean PEAS scores remained below the theoretical mid-point (59.5 with a 6-point scale and 42.5 with a 4-point scale), indicating a general less favourable explicit attitude toward doping. However, attitude scores were normally distributed for most samples analysed, suggesting substantive individual differences in doping attitudes across the majority of researched population. Means, standard deviations and Kolmogorov–Smirnov test statistics for each sample are displayed in Table 3.

Confirmatory factor analysis was performed on all datasets obtained from subsequent use of the PEAS. Model fit of the measurement model was estimated by the ratio of the goodness of fit index (χ^2) and its corresponding degree of freedom (df). Given the smaller sample size (between 150 and 200), a conservative cut-off for the χ^2/df ratio < 2.5 was used (Kline, 1998). The χ^2/df ratio in all cases was below the threshold with an average of 1.85 (ranging from 1.370 to 2.291), indicating an acceptable measurement model fit. Results for the independent samples are presented in Table 4.

Table 3
Sample characteristics and PEAS score distribution statistics and reliability estimates.

	Sample	*N*	Gender (M/F)	Age ($M \pm SD$)	Kolmogorov–Smirnov *Z*	PEAS score (mean ± SD)	PEAS Cronbach alpha	PEAS SEM
1	College athletes (USA)	193	116/77	20.10 ± 1.64	1.655 (.008)	31.61 ± 8.00	.85	3.12
2	General public (USA)	77	36/41	31.34 ± 11.22	0.968 (.306[a])	32.25 ± 7.39	.79	3.36
3	Coaches (USA)	40	25/15	37.30 ± 9.353	1.289 (.072[a])	30.86 ± 9.28	.91	2.76
4	Div. I football players (USA)[b]	71	–	–	0.778 (.581[a])	44.68 ± 13.02	.71	5.79
5a	College athletes[c] (HUN)	73	–	–	1.068 (.204[a])	37.02 ± 9.22	.77	5.05
5b	College athletes[c] (HUN)	73	–	–	1.642 (.009)	35.35 ± 9.08	.76	4.39
6	College athletes (USA)	91	66/25	20.06 ± 1.27	0.884 (.416[a])	39.64 ± 13.01	.86	4.97
7	Elite athletes (HUN)	102	45/56[d]	22.28 ± 6.27	0.894 (.401[a])	36.31 ± 10.64	.77	5.10
8	College athletes (CAN)	74	51/21[d]	20.96 ± 2.04	1.035 (.234[a])	37.94 ± 11.25	.81	4.90
9	College athletes (USA)	187	133/53[d]	20.12 ± 2.18	1.260 (.083[a])	37.57 ± 12.60	.86	4.71
10	Elite athletes (HUN)	32	26/6	24.77 ± 7.58	0.934 (.348[a])	35.83 ± 12.12	.82	5.14
11	Students/athletes (UK)	70	58/11[d]	21.78 ± 6.23	1.094 (.183[a])	35.71 ± 10.25	.81	4.47
12	Student athletes (UK)	124	78/46	21.47 ± 5.53	1.325 (.060[a])	36.23 ± 13.00	.87	4.67

[a] Denotes normal distribution (H_0: normal distribution).
[b] Demographic information is not recorded, students are 18+.
[c] Test–retest design.
[d] Missing values.

Table 4
Confirmatory factor analysis results (chi-square goodness of fit statistics, significance and chi-square/degrees of freedom ratio) from subsequent use of PEAS.

	Sample	N	χ^2 (df = 119)	p	χ^2/df
2	General public (USA)	77	163.082	.005	1.370
3	Coaches (USA)	40	167.480	.002	1.407
4	Div. I football players (USA)	71	272.588	<.001	2.291
5a	College athletes[a] (HUN) test	73	264.000	<.001	2.219
5b	College athletes[a] (HUN) retest	73	272.000	<.001	2.286
6	College athletes (USA)	91	177.100	<.001	1.489
7	Elite athletes (HUN)	102	244.464	<.001	2.054
8	College athletes (CAN)	74	205.000	<.001	1.723
9	College athletes (USA)	187	261.900	<.001	2.201
10	Elite athletes (HUN)	32	209.000	<.001	1.757
11	Students/athletes (UK)	70	167.100	.002	1.404
12	Student athletes (UK)	124	234.800	<.001	1.973

[a] Test–retest design.

Reliability

In order to make meaningful conclusions about the construct being measured, researchers need to have an accurate estimate of the proportion of true scores in the measured score. Both simultaneous reliability (internal consistency) of the scale and its temporal stability (typically measured by test–retest correlations) were examined. Cronbach's alpha values for the PEAS scale were assessed for each sample and ranged between .71 and .91 (see Table 3), with the majority grouped around the .8 level, indicating a good internal consistency for the scale. Temporal stability of the total PEAS score was assessed on one sample of Hungarian college athletes ($n = 73$) over a two-week interval. The two-week test–retest reliability of the PEAS was evidenced by the correlation coefficient of $r = .752$ ($p < .001$), indicating that PEAS measures a relatively stable construct. In the same sample, a statistically significant difference was found between the two measures taken two weeks apart ($t = 2.078$, $p = .042$), evidencing a relatively dynamic nature of doping attitudes. Respondents obtained a lower score ($M = 35.35 \pm 9.08$) on the retest in comparison to the first administration of the same test ($M = 37.02 \pm 9.22$).

Validity

Scale validation is considered to be a continuous process, extending well beyond the initial scale development. Thus, presented below are preliminary estimates of PEAS validity. Evidence for the construct validity of the PEAS has been demonstrated using the known-group analysis (e.g. Aidman, 2005, 2007). In particular, we examined the convergent validity by analyzing differences between self-admitted users or potential users and non-users of doping. It was hypothesized that those who used, use or would consider using banned performance-enhancing substances should show greater leniency toward doping. In order to establish convergent validity, data on self-reported doping behaviour or hypothetical behavioural intention were used to establish the contrast groups.

Associations with the intention to use doping

In the questionnaire used among UK students and athletes, participants were asked about their intention to use banned performance enhancements in 5 hypothetical situations modified from Tangen and Breivik (2001). The starting assumption was that the drug increases performance and was undetectable. Respondents were asked whether they would use the drug based on their assumption of their opponents' actions. The situations range from almost certainty that the opponent does not use doping to almost certainty that he/she does.

For comparing attitude scores by intention, indication of doping use in any of the five scenarios, was pooled together. In the first student/athlete sample ($n = 70$), a majority (55/63) answered that under no circumstances they would use doping. Those who claimed staying away from doping scored on an average lower on the PEAS than those who would use performance enhancement if the opponent was using it ($M = 33.00 \pm 6.97$ and $M = 53.75 \pm 12.54$, respectively). The difference was statistically significant (Mann–Whitney $U = 27.50$, $p < .001$). Statistically significant difference was also observed in the second UK athlete sample ($n = 124$). Sixty-eight percent of the athletes (85) reported that there were circumstances under which they would consider using doping and their mean PEAS score was significantly higher than those who would not use doping ($M = 37.59 \pm 12.06$ and $M = 33.28 \pm 14.58$, respectively; $U = 1184.00$, $p = .011$).

Associations with self-reported doping use

In 7 projects, participants were asked to report (under the conditions of anonymity) whether they were using doping. The prevalence rate of self-reported doping use ranged from 4.4% to 13.7% (Table 5) and were congruent with the existing literature (e.g. Clarkson & Thompson, 1997; Dickinson et al., 2005; Laure, 1997; Waddington, 2005; Yesalis & Bahrke, 1995) except those for body building and power lifting, where the reported use of steroids is considerably higher. When the mean PEAS scores were compared between those who admitted having personal experience with prohibited performance enhancements and those who claimed not using doping, a positive association was observed between the elevated attitude score and use. Those who use or used doping scored higher on the attitude tests in all samples but one (US sample, $n = 91$), where the difference between the mean scores was very small ($\Delta M = 1.2$). The differences in doping attitude between the user groups were statistically significant in 4 cases. Means, standard deviations, test results and corresponding p-values are

Table 5
Self-reported use of doping and PEAS score means, standard deviations, test statistics and corresponding p-values by doping user groups.

	Sample	N[a]	$M \pm$ SD		U[b] (D)	p
			User	Non-user		
1	College athletes (USA)[c]	193	41.71 ± 6.47; $n = 7$	31.17 ± 7.61; $n = 149$	145.00 (.643)	.001
6	College athletes (USA)	91	38.50 ± 8.02; $n = 4$	39.70 ± 13.24; $n = 79$	150.50 (.109)	.878
7	Elite athletes (HUN)	102	39.20 ± 17.54; $n = 5$	35.85 ± 10.12; $n = 82$	198.00 (.234)	.898
8	College athletes (CAN)	74	51.86 ± 14.64; $n = 7$	36.23 ± 9.81; $n = 54$	67.00 (1.250)	.004
9	College athletes (USA)	187	54.25 ± 17.14; $n = 12$	34.25 ± 11.01; $n = 56$	105.00 (1.388)	<.001
10	Elite athletes (HUN)	32	46.00 ± 15.10; $n = 3$	34.65 ± 11.50; $n = 26$	20.50 (.846)	.196
12	Student athletes (UK)	124	43.00 ± 17.44; $n = 17$	35.16 ± 11.90; $n = 107$	587.00 (.525)	.019

[a] Discrepancies in sample sizes are owing to the 'do no wish to answer' option.
[b] Mann–Whitney U and Cohen's D.
[c] Measured on a Likert-type 4-point scale (min = 17, max = 67, scale mid-point = 42.5).

summarised in Table 5. In cases of the non-significant differences, effect sizes (*D*) were also included.

Discussion

Existing literature agrees that attitudes toward doping are likely to be a strong predictor of behavioural intention (Lucidi et al., 2004, 2008). However, attitude measurement findings (e.g. Wanjek et al., 2007) are to be interpreted with caution, often due to the questionable reliability of attitude measures employed. This paper examined evidence of reliability and validity for the PEAS, which is intended to complement the existing ad hoc, "disposable" doping attitude measures. PEAS scores were normally distributed in most samples examined, indicating that the scale is tapping substantive individual differences. Over the repeated use, the mean PEAS scores remained under or were close to the theoretical mean, suggesting that athletes hold a generally non-endorsing explicit attitude toward doping, which is consistent with the existing literature (Gilberg, Breivik, & Loland, 2006; Kindlundh, Isacson, Berglund, & Nyberg, 1998; Peretti-Watel et al., 2004; UK Sport, 2006; Wiefferink, Detmar, Coumans, Vogels, & Paulussen, 2007).

The PEAS appeared to be reliable across several samples and in addition to its face validity, it showed encouraging convergent validity. The temporal stability of the scale was evidenced by a significant test–retest correlation. Test–retest has also shown a shift in the mean attitude scores over the two-week period, without specific intervention, toward a stronger non-endorsement of doping. This difference is consistent with both Eiser's (1994) theory of dynamic attitudes and Fazio's (1995) attitude priming model. In particular, if attitudes are interpreted as stored object-evaluation links that are automatically activated upon exposure to the attitude object (Fazio, 1995), then it is plausible that the first administration of the questionnaire may have primed athletes' doping-related cognitions, leading to an increased inclination for giving socially desirable responses at the repeated test.

The different modes of administration (paper-and-pencil vs. computerised) did not have appear to have an effect on the scale's properties (Table 3). However, because data were collected separately from different populations, direct comparisons or associations cannot be made. Future research should investigate the difference (if any) between the two types of administration, using single dataset.

Overall the current psychometric evaluation of PEAS suggests that the scale is characterised by good reliability and acceptable validity estimates. It can therefore be considered a sound candidate measurement tool for further studies of doping attitudes. Further validation of the scale is also justified, especially in the area of discriminant and criterion-related validity.

Limitations

It is plausible that the source of error in PEAS scores may be influenced by i) partial inability to self-report attitude accurately and/or ii) deliberate response distortion. Explicit attitude measures assume that respondents are able and willing to provide accurate self-report on their own attitudes (Kihlstrom, 2004). Violation of any or both of these assumptions may distort the explicit attitude measure.

Researchers using explicit attitude measure should control strategic responding by reducing the incentives for distortion (i.e. ensuring anonymity) or including specific measures for response bias. Previous research showed (Petróczi & Nepusz, 2006) that strategic responding is present even if data were collected under complete anonymity. Using measures in which participants are not aware of the purpose of the test or techniques that do not require direct verbal reporting could also be considered. Evidence for the predictive validity of the scale, indicated by the known-group differences, has likely been compromised by the small sample size resulting in statistical non-significance of the differences in doping attitude scores between self-reported users and non-users.

Conclusion

The psychometric properties of the PEAS suggest that the scale is a valid and reliable tool for assessing athletes' general attitude toward doping. Systematic research into athletes' dispositions toward performance enhancements seems a worthwhile effort. If we define doping attitude as an outcome vector of multiple factors of a doping situation, such as personal experiences, individual differences and situational factors, then the presence of a more positive attitude signals the presence of vulnerability to use (but not necessarily actual use) prohibited doping methods. Results are likely to inform sport managers, officials and policy makers about better-targeted intervention and prevention approaches. Understanding attitudes toward doping will be increasingly important as the anti-doping movement is shifting from detection and punishment to prevention-based deterrence.

However, results from using tools with poor psychometric properties may do more harm than good. Any conclusion that is made based on unreliable or invalid measurement is inevitably questionable and should be used with caution. Researchers are encouraged to pay attention to the psychometric properties of the measurement tools when selecting or developing one. Sharing valid and reliable scales and encouraging the multiple uses will serve the scientific community involved in doping research.

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