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Development of Moral Disengagement and Self-Regulatory Efficacy Assessments Relevant to Doping in Sport and Exercise

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Abstract

Objectives: To develop Moral Disengagement (MD) and Self-Regulatory Efficacy (SRE) instruments relevant to doping in sport and exercise and provide evidence for the validity and reliability of instrument scores.

Design: Cross-sectional, correlational.

Methods: Data were collected from male and female team- and individual-sport athletes and corporate- and bodybuilding-gym exercisers. Two samples ($n_{sample\ 1} = 318$; $n_{sample\ 2} = 300$) were utilized in instrument development and score validation and another ($n_{sample\ 3} = 101$) in examining test-retest reliability and stability of scores. Samples 1 and 2 responded to the newly developed items alongside others assessing theoretically-related variables, whereas Sample 3 completed the new instruments on two separate occasions.

Results: Factor analyses identified the final items and dimensional structures for the Doping Moral Disengagement Scale (DMDS), Doping Moral Disengagement Scale–Short (DMDS–S) and Doping Self-Regulatory Efficacy Scale (DSRES). The DMDS has six lower- and one higher-order factor, whereas the DMDS-S and DSRES are unidimensional. These structures were invariant by sex and sport/exercise context. Evidence supporting external validity, test-retest reliability, and stability of scores was also provided.

Conclusion: This research developed and provided evidence of score validity and internal consistency for three instruments relevant to doping in sport and exercise.

Keywords: Empathy, anticipated guilt, performance-enhancing drugs, measurement

Development of Moral Disengagement and Self-Regulatory Efficacy Assessments Relevant to Doping in Sport and Exercise

Performance and Image Enhancing Drug (PIED) use can have detrimental health and legal consequences for athletes and exercisers (McVeigh & Begley, in press; Pope, Wood, Rogol, Nyberg, Bowers, & Bhasin, 2013) and is a behavior that raises substantive moral questions (Donovan, Egger, Kapernick, & Mendoza, 2002; Petróczi & Aidman, 2008). Although accurate prevalence rates are difficult to obtain, the estimated prevalence of PIED use in athletes is 5-31% (Momaya, Fawal, & Estes, 2015). In light of this nontrivial prevalence, an important aim for researchers is to understand psychological factors that influence PIED use, also known as doping. Successful pursuit of such understanding requires the development of psychometric instruments that provide valid and reliable scores for variables believed to contribute to doping. Thus, we sought to develop psychometric instruments for assessing two psychological variables of conceptual relevance to doping and validate their scores.

The theoretical framework for the current work was Bandura’s (1991) social cognitive theory of morality. Bandura proposed that harmful activities are deterred when people anticipate negative emotional reactions (e.g., guilt) to engaging in them. However, people can reduce or eliminate anticipation of such reactions through any of eight psychosocial mechanisms collectively termed Moral Disengagement (MD). These mechanisms cognitively distort harmful acts, reduce personal accountability for them and/or their consequences, distort/avoid their consequences, or dehumanize or blame the victim of the act (Bandura 1991). Representing the conditional endorsement of harmful acts, MD may facilitate doping by allowing sport and exercise participants to use PIED without experiencing negative emotional reactions.

Qualitative research has shown that sport and exercise participants who dope demonstrate MD when explaining their doping. For example, Boardley and Grix (2014) conducted semi-structured interviews with nine bodybuilders who had doped. Analysis of the interview data revealed evidence of six of the eight MD mechanisms. Boardley, Grix, and Dewar (2014) expanded this work with 64 male bodybuilders from across England, all with experience of doping. Content analysis again revealed evidence of the same six MD mechanisms. Boardley, Grix, and Harkin (2015) extended this line of research by interviewing twelve male team- and individual-sport athletes who had doped; data analysis again revealed the same six MD mechanisms. Therefore, these three studies have provided consistent evidence for use of the same six MD mechanisms across sport and exercise contexts. Further, there is considerable consistency in the way in which sport and exercise participants use these six mechanisms, supporting the potential benefits of developing a single measure of doping MD appropriate for use in both contexts.

Definitions for each of these six MD mechanisms have been provided by Bandura (1991). The first – *moral justification* – occurs when harmful activities are made personally and socially acceptable by portraying how they achieve commendable social or moral purposes. Boardley et al. (2014) found professional bodybuilders used this mechanism to justify PED use by suggesting it allowed them to financially support their families: ‘So the ethics were skewed a bit towards putting food on the table, rather than it is ethically right to take these and to do these things’ (p.838). The second – *euphemistic labelling* – diminishes the damaging nature of actions through palliative or convoluted language. This mechanism was evidenced in Boardley et al. (2015) by a mixed martial artist identifying use of a euphemistic term to hide the socially unaccepted nature of doping: ‘Juice … it kinda hides the fact that they’re frowned upon’ (p.7). The third –

advantageous comparison – makes detrimental conduct appear less damaging by comparing the act to more heinous ones. Bodybuilders demonstrate this mechanism when making favorable comparisons between doping and other harmful lifestyle behaviors, as shown by Boardley and Grix (2014): ‘is doing this any worse than someone who goes out and has three or four pints [of beer] every night’ (p.9).

The fourth mechanism – *displacement of responsibility* – diminishes personal accountability for harmful behavior or its consequences by proffering the act resulted from social pressures. Boardley et al. (2015) provided an example of this when a swimmer stated: ‘because it wasn’t my idea to take them I feel ok about it’ (p.7). The fifth – *diffusion of responsibility* – diminishes personal accountability for harmful acts or their outcomes through group decision making or action. This mechanism is most likely to operate in environments where doping is perceived as highly prevalent, as shown by a bodybuilder explaining the impact of such settings: ‘the longer I’m here the more keen I am to do stuff I shouldn’t really or would never ever of considered’ (Boardley & Grix, 2014, p.8). The final mechanism – *distortion of consequences* – occurs when perpetrators of harmful acts avoid information relating to the harm caused or downplay its significance. Such distortion was evidenced in Boardley et al. (2015) when an American Footballer stated: ‘I didn’t ever see the people I played against as disadvantaged, we’ve all got testosterone in our bodies, I just had more’ (p.7).

Moral disengagement has also been linked with doping in quantitative research. For instance, researchers have identified positive links between MD, intention to dope, and reported doping (e.g., Hodge, Hargreaves, Gerrard, & Lonsdale, 2013; Lucidi, Grano, Leone, Lombardo, & Pesce, 2004; Lucidi, Zelli, & Mallia, 2013; Lucidi, Zelli, Mallia, Grano, Russo, & Violani, 2008; Ring & Kavussanu, in press) using cross-sectional and longitudinal designs. Although these studies provide support for the potential importance of MD to doping in sport, prevalence rates for doping were either low or not assessed. Also, to date researchers have not individually examined the importance of the six relevant MD mechanisms in doping research.

Another variable from Bandura’s (1991) theory that has been empirically linked with doping is self-regulatory efficacy (SRE; Lucidi et al., 2008). Self-regulatory efficacy reflects the belief in one’s capabilities to resist personal and social pressures to engage in harmful conduct (Bandura, Caprara, Barbaranelli, Pastorelli, & Regalia, 2001), and increases in SRE should lead to less frequent engagement in such behavior (Bandura, 1991). This is because SRE should increase one’s ability to resist temptations and inducements to transgress. When applied to doping, SRE represents a person’s belief in his/her ability to forbear personal and social pressures to dope. Athletes with elevated levels of doping SRE should be able to resist pressures to dope as they are able to foresee the potential negative consequences of doping and formulate alternative – licit – means of enhancing performance. In accord with this theorizing, Lucidi et al. (2008) and Ring and Kavussanu (2017), respectively, found negative associations between doping SRE and intention to dope and doping likelihood, in research with university students.

Although Lucidi and colleagues (2008) developed psychometric instruments to assess doping MD and doping SRE, several concerns exist regarding the development of these instruments. One concern relates to the item-development process. Specifically, items were developed based on interviews with 35 high-school students who played sport. However, no information was provided as to whether any of these students had any experience with doping. During these interviews, participants were asked to list situations in which (a) doping would or should not be completely condemned (i.e., to inform doping MD items) and (b) doping would be more likely (i.e., to inform doping SRE items). For the MD measure, the frequencies of common situations were then summed and categorized into the MD mechanisms evoked, leading to the selection of 21 items. Six of these items were then selected for use in the doping MD measure; no information was provided on the process through which items were selected. For the SRE measure, the researchers only described how 10 items were developed based on situations described during the interviews. Thus, items for the two instruments were: (a) developed based on interviews with sport participants with unknown experience of doping when psychometric instruments should be developed using samples representative of intended end users (Clark & Watson, 1995), (b) not appraised for content validity when this should be a key aspect of item development (Haynes, Richard, & Kubany, 1995), and (c) selected based on unknown criteria. Finally, the factor structure of neither instrument was appropriately examined, nor confirmed in a second sample (see Fabrigar, Wegener, MacCallum, & Strahan, 1999).

Kavussanu, Hatzigeorgiadis, Elbe, and Ring (2016) also developed a measure of doping MD, following a more rigorous development process than Lucidi et al. (2008). This scale – the Moral Disengagement in Doping Scale (MDDS) – was developed across three studies with team and individual sport athletes, and evidence supporting the validity and reliability of scale scores was provided. The MDDS is a six-item unidimensional scale assessing doping MD in team and individual sport. However, it should be acknowledged that different versions of the scale are used to assess doping MD in team compared to individual sport. This is potentially problematic for research making comparisons between team- and individual-sport athletes as score comparisons may be confounded by differences in item content.

Although the above measures[1] exist to assess doping MD and doping SRE, there are several ways in which assessment of these constructs could be further developed. First, although doping is an issue in exercise as well as sport (see Sjöqvist, Garle, & Rane, 2008), there are currently no instruments available to assess doping MD and doping SRE in exercise populations. This is particularly concerning when one considers doping in exercisers is considered a public health issue (see McVeigh & Begley, in press; Pope et al., 2013). Thus, there is a need for the development of instruments assessing doping MD and doping SRE in exercise populations.

As exercise in gymnasia is often part of the training process in sport (i.e., strength and conditioning), many sportspersons frequently interact with exercisers as part of their preparatory activities. Given this, and the suggestion that MD is socially transmitted (see Bandura, 1991), it is perhaps not surprising that research has demonstrated considerable consistency in the way in which sport and exercise participants utilize MD with respect to doping (see Boardley & Grix, 2014; Boardley et al., 2014, 2015). These studies also evidence considerable consistency in the personal and social pressures to dope as perceived by sport and exercise participants. Thus, it would appear logical to develop instruments capable of assessing doping MD and doping SRE across sport and exercise populations. Such instruments would make a significant contribution to doping research not only by allowing researchers to investigate doping MD and doping SRE in exercise populations, but also by facilitating research in which levels of these constructs can be directly compared across different sport and exercise populations.

Assessment of doping MD could also be furthered through the development of a multidimensional measure. Bandura (1991) proposed MD to be multidimensional, describing eight mechanisms of MD. However, there is currently no instrument capable of measuring

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[1] Mallia, Lazuras, Barkoukis, et al. (2016) also developed measures assessing doping MD and doping SRE. However, as these instruments were designed to capture team rather than individual assessments of these constructs, a detailed review of their development and properties is not included here.

individual mechanisms of doping MD in either sport or exercise contexts. This is particularly important when one considers six different mechanisms of MD have been shown to be relevant to doping (see Boardley & Grix, 2014; Boardley et al., 2014, 2015). A multidimensional measure of doping MD capable of measuring individual mechanisms of doping MD would make a significant contribution, as it would allow researchers to investigate whether certain MD mechanisms are of greater importance to doping than others.

A key consideration when developing psychometric instruments is that they are validated with samples representative of the target population/s (Clark & Watson, 1995). As such, doping-specific instruments should be developed and validated with participant groups representing the wide range of doping prevalence rates estimated across athletic populations (e.g., Momaya et al., 2015). To ensure this, sub-samples should be specifically targeted to represent such populations when developing measures, and doping prevalence should be assessed. To date, this has not been the case in research developing doping MD scales (Kavussanu et al., 2016; Lucidi et al., 2008).

A prominent issue when developing measures is the provision of evidence supporting the convergent validity of scores (Messick, 1995). Such evidence is established if scores correlate at least moderately with scores from instruments assessing variables within the target construct's nomological network (Vaughn & Daniel, 2012). One variable that should be associated with doping MD and doping SRE is anticipated guilt, representing a distasteful emotional state experienced as tension and regret, resulting from the personal responsibility felt – and empathic feelings for – someone suffering anguish (Hoffman, 2000). Anticipation of guilt is thought to be diminished by MD, as tension and regret are less likely to be anticipated for actions we view favorably, do not feel responsible for, and/or are perceived to be harmless (Bandura, 1991). In contrast, doping SRE should increase anticipated guilt as we are likely to feel highly responsible for engaging in harmful behaviors we feel capable of resisting. As such, doping MD and doping SRE, respectively, should have negative and positive associations with anticipated guilt.

Another variable that should be linked with doping MD is empathy, which represents a tendency to vicariously experience emotional and cognitive responses to another individual’s emotional state (Davis, 1983). Two sub-components of empathy shown (e.g., Kavussanu, Stamp, Slade, & Ring, 2009) to be of specific relevance to sport are perspective taking (i.e., tendency to spontaneously adopt the psychological point of view of others) and empathic concern (i.e., tendency to experience feelings of sympathy, compassion, and concern for unfortunate others). Combining these two sub-components to form an overall measure of empathy has been shown to be a suitable approach to assessing empathy in sport (e.g., Kavussanu et al., 2009) and non-sport (e.g., Carlo, Raffaelli, Laible, & Meyer, 1999) research. Empathy is thought to impair MD because endorsement of harmful conduct is more problematic when one can anticipate and experience the consequences of one’s actions for others (Bandura, 1991; Hoffman, 2000). A negative relation between doping MD and empathy would therefore be expected.

Evidence for the discriminant validity of scores obtained with new measures is also important to establish (Messick, 1995). Discriminant validity represents the degree to which scores are empirically distinguishable (i.e., $r \leq .90$) from those of closely related but conceptually distinct constructs (Vaughn & Daniel, 2012). For doping MD, a suitable construct for examining discriminant validity is sport MD. Sport MD represents use of MD to justify and rationalize engagement in transgressive acts on the sports field (Boardley & Kavussanu, 2007). Doping MD and sport MD are closely related due to the incorporation of equivalent mechanisms of MD, but distinct due to the differences in the acts to which the mechanisms are applied. For doping SRE, an apposite construct for assessing discriminant validity is peer pressure SRE, representing the belief in one’s ability to resist peer pressure to engage in high-risk activities (e.g., use of drugs; Bandura et al., 2001). Doping SRE and peer pressure SRE represent beliefs in one’s capacity to resist personal and social pressure to engage in harmful behavior, yet are distinct due to their focus on different transgressive acts.

The overall objective of the current project was to develop instruments assessing doping MD and doping SRE for use across sport and exercise populations, and to evaluate the validity of their scores. High quality instruments assessing these constructs will allow researchers to investigate doping MD and doping SRE in both contexts. Further, for doping MD, we aimed to develop long and short versions of the new instrument. Researchers with aims pertaining to individual mechanisms of doping MD could therefore use the long version, whereas those aiming to study overall doping MD could take advantage of the conciseness of the short version. Guided by theory and instruments developed to assess MD in other contexts, we anticipated the long version would assess six dimensions of MD (Bandura, 1991; Boardley & Kavussanu, 2007; Boardley & Grix, 2014, Boardley et al., 2014, 2015). In contrast, we expected the short version of the MD instrument and the doping SRE instrument would be unidimensional (Boardley & Kavussanu, 2008; Bandura et al., 2001). We also anticipated the dimensionality of all three instruments would be invariant by sex and across four sport and exercise contexts (Boardley & Kavussanu, 2008; Bandura et al., 2001). Finally, we expected scores on the respective instruments to show stability over brief time periods.

When developing these new instruments and validating their scores, we considered five of the six aspects of construct validity identified by Messick (1995). These were content, substantive, structural, generalizability, and external. The content aspect relates to the relevance, representativeness and technical quality of item content and was assessed presently through expert opinion. We considered the substantive aspect – relating to the theoretical rationale for the observed test responses – by ensuring item content was consistent with qualitative research studying the process being assessed (e.g., Boardley & Grix, 2015; Boardley et al., 2014, 2015) and examining theory-based relations between scores generated with the new measures and conceptually associated variables. The structural aspect pertains to the fidelity of the scoring structure to the structure of the construct domains being assessed and was examined through factor analysis. We addressed the generalizability aspect – the extent to which score properties and interpretations generalize to and across groups and settings – through multisample analyses. The external aspect relates to evidence for convergent and discriminant validity as well as criterion relevance, and was considered currently through relations with theoretically relevant instrument scores. Evidence for the final aspect of construct validity – consequential – is represented through positive and negative consequences stemming from application of new measures. As such, this final aspect was more relevant to future application of the measures rather than initial instrument development and score validation.

In sum, through this research we sought to develop three psychometric instruments: a) the Doping Moral Disengagement Scale (DMDS), b) the Doping Moral Disengagement Scale – Short (DMDS-S), and c) the Doping Self-Regulatory Efficacy Scale (DSRES). Across the two studies below we followed appropriate procedures for developing such instruments and validating their scores (i.e., Clark & Watson, 1995; Fabrigar et al., 1999; Haynes et al., 1995).

Study 1

Method

Item Development. Informed by a review of existing instruments assessing the target constructs, qualitative papers investigating the constructs in physical-activity contexts, and consultation with relevant experts (i.e., sport psychologists, sport coaches, exercise leaders, sport and exercise participants), we developed large pools of items for doping MD and doping SRE (see Clark & Watson, 1995)[2]. Thirty-eight items representing doping MD and 13 for doping SRE were generated. These items then underwent initial pilot testing with a sample of sport and exercise participants (*N* = 280). For DMDS/DMDS-S items a 7-point Likert scale anchored by 1 (*strongly disagree*) and 7 (*strongly agree*) was used during pilot testing and all subsequent data collections. This is consistent with existing MD instruments in sport (e.g., Boardley & Kavussanu, 2007, 2008) and supported by research suggesting this format offers the best compromise between reliability, validity, discriminatory power, and respondent preference (Preston & Colman, 2000). However, to be consistent with existing SRE instruments (e.g., Bandura et al., 2001) the DSRES used a 5-point Likert scale anchored by 1 (*no confidence*) and 5 (*complete confidence*). Inter-item correlations were computed with the pilot data to ensure mean values were between .15 and .50 for each subscale (see Clark & Watson, 1995); items with inter-item correlations inconsistent with this range were eliminated or adapted. As a result of these analyses, 28 doping MD items were retained and 10 were adapted. Also, five additional items were generated based on participant feedback and pilot data analyses. For doping SRE, 11 items were retained and two adapted; no additional items were developed. Following these changes, the item pool consisted of 43 doping MD[3] and 13 doping SRE items.

The item pools were then subjected to content-validity assessment to determine whether they characterized their intended domain (Dunn, Bouffard, & Rogers, 1999; Haynes et al., 1995).

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[2] The term "athlete" was used to refer to participants regardless of sport or exercise context. This was based upon qualitative research that shows participants from a range of physical-activity contexts (e.g., sport, exercise) use this term to refer to participants (i.e., Boardley & Grix, 2014, Boardley et al., 2014, 2015).

[3] Moral Justification = 8 items; Euphemistic Labelling = 9 items; Advantageous Comparison = 6 items; Displacement of Responsibility = 6 items; Diffusion of Responsibility = 6 items; Distortion of Consequences = 8 items

Content validity was examined through expert opinion, and the size and composition of the expert panel was informed by relevant guidelines (Dunn et al., 1999). Assessment packs were emailed to 12 academics[4], none of whom were involved in the item-writing phase. Each expert had a PhD in sport psychology or psychology, had published in peer-reviewed international sport psychology journals, and was employed in a psychology, kinesiology, or sport science department in Europe, North America, or Australia. Packs consisted of ten sections: a) introduction and instructions, b) moral justification, c) euphemistic labelling, d) advantageous comparison, e) displacement of responsibility, f) diffusion of responsibility, g) distortion of consequences, h) response format, scale, and general comments (MD), i) doping SRE, and j) response format, scale, and general comments (doping SRE). Sections b-g, and i consisted of a definition of the relevant construct followed by the items developed to assess the relevant construct. Experts were asked to rate each item using a Likert-type scale ranging from -3 (*Not at all Representative*) to 3 (*Very Representative*), and were provided with the opportunity to comment on the relevance of each item to the context and definition. Sections h and j presented the proposed response format and scale, and asked the experts to comment on these, the match of the instrument's attributes to its function, and suggested additions, deletions, and modifications.

For each item, we took the mean expert rating after removing any ratings that deviated notably from the other judges (see Hambleton, 1980); such ratings were defined as those that were two or more response options lower than the next lowest score (e.g., scoring -2 when the next lowest was 0). Items with mean expert rating scores of 2.0 or above were retained; those with scores below 2.0 were revised based on expert comments or removed. Of the 56 items assessed, 26 were retained without change, 17 underwent minor content revisions, and 13 were

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[4] 16 potential experts were contacted, 12 of whom agreed to act as content-validity assessors.

removed; six new doping MD items were created[5]. The content validity of revised and newly created items was examined by members of the research team not involved in item creation.

These 49 items (i.e., 36 doping MD) were then pilot tested with a sample of 122 sport and exercise participants to: (a) ensure correlations among theoretically related items remained consistent with the target mean inter-item correlation for subscales (i.e., .15 to .50), (b) examine the internal consistency of scores from all subscales, and (c) obtain feedback on item difficulty and wording (Clark & Watson, 1995). Correlation analyses demonstrated 86% of doping MD items were correlated in the target range; items not correlated as expected were adapted to improve wording. All doping SRE items were correlated in the target range. Cronbach alpha coefficients ranged from .70 to .85 ($M = .78$) for the doping MD subscales and was .94 for the doping SRE items. Feedback on item difficulty and wording was positive, with only minor adjustments to wording needed for three items. Following item development, these 49 items were taken forward into the main construct-validity phase.

Participants.

Sample 1. Participants were team- (e.g., American football, soccer) ($n = 181$) or individual- (e.g., swimming, athletics) ($n = 70$) sport or bodybuilding[6]- ($n = 44$) or corporate[7]- ($n = 23$) gym participants ($n_{\text{male}} = 203$; $n_{\text{female}} = 115$); ages ranged from 16 to 70 years ($M = 23.3$, $SD = 8.2$). Sport participants competed at a recreational ($n = 6$), local ($n = 3$), university ($n = 131$), regional ($n = 20$), national ($n = 40$), or international ($n = 44$) level (seven failed to report). Participants had been training/competing for an average of 7.3 years ($SD = 5.4$), spent an average

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[5] Only one of these items was ultimately selected for use in a final doping MD measure.
[6] Bodybuilding gymnasia are those targeting and designed for serious and experienced bodybuilders. Such gymnasia have no aerobic fitness programmes and the equipment within them is largely free weights.
[7] Corporate gymnasia are those targeting and designed for users training for general health and fitness. Such gymnasia have comprehensive aerobic fitness programmes and the equipment within them is largely resistance and aerobic fitness machines.

of 8.6 hours (*SD* = 3.9) per week training, and had trained in/with their current gym/team for an average of 4.1 years (*SD* = 4.5). Self-reported lifetime prevalence of doping was 14.5%[8].

Sample 2. Participants were team- (e.g., Australian rules football, soccer) (*n* = 14) or individual- (e.g., athletics, triathlon) (*n* = 99) sport or bodybuilding- (*n* = 89) or corporate- (*n* = 98) gym participants (n_{male} = 172; n_{female} = 128); ages ranged from 17 to 73 years (*M* = 29.6, *SD* = 12.4). Sport participants competed at a recreational (*n* = 18), local (*n* = 18), university (*n* = 25), regional (*n* = 16), national (*n* = 21), or international (*n* = 10) level (five failed to report). Participants had been training/competing for an average of 9.1 years (*SD* = 8.6), spent an average of 7.9 hours (*SD* = 5.0) per week training, and had trained in/with their current gym/team for an average of 3.8 years (*SD* = 4.9). Self-reported lifetime prevalence of doping was 15.3%.

Measures. To help evaluate the scores obtained with the new instruments, a series of existing measures were administered when collecting data from Samples 1 and 2. These included instruments assessing sport MD, peer pressure SRE, anticipated guilt, and empathy.

Sport moral disengagement. The eight-item moral disengagement in sport scale-short (MDSS-S; Boardley & Kavussanu, 2008) was used to measure sport MD. Participants read statements representing MD (e.g., ‘Insults among players do not really hurt anyone’) and indicated their level of agreement using a Likert scale anchored by 1 (*strongly disagree*) and 7 (*strongly agree*). Scores on this instrument have shown very good levels of internal consistency and evidence for factorial and convergent validity (Boardley & Kavussanu, 2008). Good levels of internal consistency were demonstrated in the present study ($\alpha_{\text{Sample 1}}$ = .87; $\alpha_{\text{Sample 2}}$ = .89).

Peer pressure SRE. The five-item SRE scale (Bandura et al., 2001) was used to assess peer-pressure SRE. Items (e.g., ‘Resist peer pressure to drink beer, wine or alcohol’) assess

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[8] Prevalence rates by gender and sport/exercise context were as follows: males = 19.3%; females = 8.2%; individual sport = 5.9%; team sport = 10.3%; hardcore gym = 39.8%; corporate gym = 7.4%.

peoples' beliefs regarding their ability to resist peer pressure to engage in high-risk activities involving alcohol, drugs and transgressive behavior. For each item, participants rated their confidence using a Likert scale anchored by 1 (*no confidence*) and 5 (*complete confidence*). Scores on this instrument have shown good levels of internal consistency and evidence for construct validity (Bandura et al., 2001). Acceptable levels of internal consistency were demonstrated in the present study ($\alpha_{\text{Sample 1}} = .77$; $\alpha_{\text{Sample 2}} = .81$).

Anticipated guilt. To assess anticipated guilt in response to doping, participants were asked to imagine being in the following situation:

> *Having returned to training following a period of injury, you are feeling very out of shape. As such, you feel the need to get back in shape as soon as possible. A friend who you train with has been taking a training supplement that he/she says really helped him/her get back in shape quickly following a similar injury. He/she offers to give you some and you decide to take it. Subsequently you get back in shape much quicker than expected, but then discover the supplement you have been taking is a banned performance-enhancing substance. However, due to the improvements you have experienced, you decide to continue taking the substance.*

Participants expressed how they anticipated feeling about continuing to dope by responding to the five items (e.g., 'I would feel remorse, regret') of the guilt scale from the State Shame and Guilt Scale (SSGS; Marschall, Saftner, & Tangney, 1994). Participants responded on a 5-point scale ranging from 1 (*not at all*) to 5 (*extremely*). Marschall et al. (1994) provided evidence supporting the internal consistency and validity of scores from this subscale. This method of assessing anticipated guilt has been used successfully in sport (Stanger, Kavussanu, Boardley, &

Ring, 2013). Excellent levels of internal consistency were demonstrated in the present study ($\alpha_{\text{Sample 1}} = .94$; $\alpha_{\text{Sample 2}} = .95$).

Empathy. The 7-item perspective taking (e.g., 'before criticizing somebody, I try to imagine how I would feel if I were in their place') and 7-item empathic concern (e.g., 'I am often quite touched by things that I see happen') subscales of the Interpersonal Reactivity Index (Davis, 1983) were used to measure empathy. Participants indicated how well each statement described them by responding on a scale from 1 (*does not describe me well*) to 7 (*describes me very well*). Scores from these respective subscales have shown internal consistency reliability and validity (Davis, 1983). In line with previous research (Kavussanu, Stanger, & Boardley, 2013), we combined these subscales to produce one empathy score. Good levels of internal consistency were demonstrated in the present study ($\alpha_{\text{Sample 1}} = .86$; $\alpha_{\text{Sample 2}} = .84$).

Reported Doping. Reported doping was assessed using a method based on that of Lucidi et al. (2008). Specifically, participants were provided with a list of nine categories of doping substances (e.g., Ephedrine stimulants) and methods (e.g., Blood manipulation) and asked to indicate which they currently used, had used in the past three months, had used prior to the past three months, or had never used. The list was based on substances/methods banned by the World Anti-Doping Agency. Lifetime use of doping was indicated by use of one or more of the substances/methods during any of the time points indicated.

Procedures.

Recruitment and data collection. Recruitment for the primary samples commenced once approved by the ethics committee of the first author's institution. Our approach to recruitment differed for sport versus exercise participants. For sport participants, we contacted sport coaches and sought permission to visit a designated training session to introduce the project to athletes and invite them to participate. For exercise participants, we contacted gym managers and sought permission to visit their gymnasia to introduce the project to exercisers and invite them to participate. Before completing the questionnaire, all volunteers were informed that honesty in responses was vital to the study, and that all responses would be kept confidential and be used only for research purposes. Participants signed an informed consent form prior to participating and the questionnaire pack took 10–15 minutes to complete. Data were collected across two phases. Data from the first phase (i.e., Sample 1) were analyzed before the second phase (i.e., Sample 2) commenced. This allowed for item adjustment/generation between phases.

***Factorial, convergent, and discriminant validity, and internal consistency*.** To provide further evidence for construct validity, we sought to establish evidence for the factorial, convergent and discriminant validity of scores from the new instruments, as well as for internal consistency. Factorial validity relates to the number of separate dimensions represented in a measure and was analyzed by identifying the factor structure in the first sample before confirming it in the second. To establish evidence for convergent validity, associations of DMDS, DMDS-S, and DSRES scores with empathy and anticipated guilt were computed. To establish evidence for discriminant validity, we analyzed correlations of DMDS and DMDS-S scores with sport MD scores, and of DSRES scores with peer pressure SRE scores. Here and elsewhere, the magnitudes of correlation coefficients were interpreted based on the guidelines provided by Cohen (1992), with coefficients of 0.10, 0.30, and 0.50 representing small, moderate, and large effect sizes, respectively. Finally, the internal consistency of scores for the overall scales plus the DMDS subscales were estimated using Cronbach’s alpha.

Results

Preliminary analyses. Only 0.83% of data points were missing, and missing data were assumed missing at random (see Enders, 2006). The expectation maximization algorithm was used to impute missing values. Before seeking to establish evidence for the factorial validity of instrument scores, we used a two-stage process to identify the most effective items for measuring each construct; selected items were retained for use in subsequent testing. First, inter-item correlations were examined within each construct and all item scores were intercorrelated as anticipated (see Clark & Watson, 1995).

Exploratory factor analysis (EFA) was then conducted on each of the seven constructs (i.e., six MD mechanisms plus doping SRE) using principal axis extraction, with extraction based on an eigenvalue ≥ 1.00. Prior to conducting these analyses, we determined the appropriateness of the matrices using the following criteria as suggested by Dziuban and Shirkey (1974): (a) a significant Bartlett's test of sphericity and (b) a Kaiser-Meyer-Olkin measure of sampling adequacy of > .80. All seven matrices satisfied these criteria. Each EFA produced a unidimensional factor structure, and except for one item, all items had factor loadings ≥ 0.61. The one exception was a displacement of responsibility item (i.e., "Seeing athletes achieve goals through doping encourages others to dope too"), with a factor loading of .32. Given this, we removed the item from further analyses and replaced it with a newly developed item (i.e., "Athletes shouldn't be held responsible for doping if they feel pressured to do it to keep up with others") before data collection for Sample 2 commenced[9]. All other items were retained.

Factorial validity. Confirmatory factor analysis was used in the next step because it offers a rigorous and appropriate method for confirming hypothesized factor structures (Fabrigar et al., 1999). EQS 6.1 (Bentler & Wu, 2002) software and the Maximum Likelihood method were used. In initial analyses, the normalized estimate of Mardia's coefficient indicated deviation

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[9] This item was not used in either of the final MD instruments.

from multivariate normality. Thus, the Robust Maximum Likelihood estimation method was used for all analyses. This method provides more accurate standard errors, chi-squared values, and fit indices when data are non-normally distributed (Bentler & Wu, 2002). The cases with the largest contribution to normalized multivariate kurtosis minimally impacted the analyses and therefore no cases were deleted. Standard indices and criteria were used to estimate model fit (Hu & Bentler, 1999). Fit indices for all models appear in Table 1.

In the first DMDS model, six items were specified for each of the six MD mechanisms, except for displacement of responsibility which was represented by five (M1a). Results showed an inadequate fit for the model (Row 1). Subsequently, 17 items implicated in large modification indices as indicated by the Lagrange multiplier (LM) test and/or large standardized residuals were removed in a series of CFAs. This iterative process was guided by an aim to develop an instrument that would contain 18 items (i.e., three for each MD mechanism). A final model (M1b) with 18 items produced a six-factor solution with excellent fit (Row 2). Theoretically the six factors represent different dimensions of an overriding construct, and as such we also examined whether the associations amongst the six first-order factors could be represented by a higher-order factor. Although the fit of this model (Row 3) was reduced compared to that of the corresponding first-order model (Row 2), as the fit of a second-order model cannot be better than the fit of the equivalent first-order one, it was sufficient to support the presence of a second-order structure (Marsh, 1987). This second-order factor was named doping MD.

Although our hypothesized model was supported, it was important to rule out alternative models. For instance, the development of MD instruments for other contexts has shown that pairs of MD mechanisms sometimes converge to form single factors (e.g., Boardley & Kavussanu, 2007) or can all converge to form a unidimensional measure (e.g., Bandura, Barbaranelli, Caprara, & Pastorelli, 1996). Thus, once the final item content for the DMDS was confirmed, we compared the fit of the six-factor model with two other possible structures based on those seen in existing instruments. Specifically, these were a three-factor model in which the six mechanisms were grouped according to the aspect/s of detrimental conduct they operate upon (M2; Osofsky, Bandura, & Zimbardo, 2005) and a unidimensional model in which all items loaded on a single factor (M3; Bandura et al., 1996). Also, based on very strong factor correlations between advantageous comparison/distortion of consequences (i.e., .93) and displacement/diffusion of responsibility (i.e., .91), we also tested a four-factor model (M4) in which these respective mechanism pairs were combined into single factors. As shown in Table 1, the fit of the six-factor model (M1b) was superior to any of these alternative models. Thus, the six-factor model was accepted as the best model for the DMDS. Factor correlations for this model can be found in Table 2, and items, factor loadings, and error variances are shown in Table 3.

Although the 18-item instrument provides the capability of measuring the six MD mechanisms individually, some users may only need to measure overall doping MD. For such instances, a short version would reduce the time needed for completion. For these reasons, we also developed the DMDS-S. Our aim was to develop a six-item instrument with one item for each of the six relevant mechanisms of MD. Two main steps were involved in selecting items for the DMDS-S. Potential items were first selected based on item content, with the 12 (i.e., two for each MD mechanism) shortest and simplest items retained for further analysis. Then, the factor structure underlying these 12 items was examined using EFA and CFA with the data from Sample 1; the suitability of the matrix for EFA was determined using the same approach as described earlier, and EFA conducted using the same approach. This resulted in a single factor being extracted. Then, for each of the six MD mechanisms the item with the stronger factor loading was retained. Once these six items had been identified, a single-factor CFA was specified (i.e., M5a). As seen in Table 1 (Row 7), this model had a very good fit. However, the LM Test results indicated the presence of a correlated error between the advantageous comparison and distortion of consequences items. Testing of a subsequent model (M5b) with this correlation specified resulted in an excellent model fit. Specifying correlated errors when present is important to prevent possible inaccurate parameter estimates (see Kline, 2015). However, such associations can be sample specific, so this model was accepted under the proviso that the presence of this correlated error would be confirmed in Sample 2.

When developing psychometric instruments, it is important to confirm factor structures using a separate sample (Fabrigar et al., 1999). As such, we used the data from Sample 2 to confirm the factor structures for the DMDS and DMDS-S. As shown in Table 1, the final DMDS model from the Sample 1 analyses showed excellent model fit (Row 11) and again supported the presence of a second-order doping MD factor (Row 12). This was also the case for the DMDS-S model (Row 13), where the significant correlated error identified in Sample 1 (i.e., $r = .30$, $p < .05$) was again present (i.e., $r = .25$, $p < .05$).

Similar procedures were followed for the development of the DSRES. Using the Sample 1 data, initially all 13 items were specified to load on a single factor (M6a). This model had an inadequate fit (Row 9). Guided by modification indices and/or standardized residuals, 7 items were removed in a series of CFAs. This iterative process was guided by an aim to develop an instrument that would contain items representing the six main personal and social influences on doping use identified in past research (e.g., Boardley & Grix, 2014; Boardley et al., 2014, 2015). A final six-item model (M6b) demonstrated an excellent model fit (Row 10). Subsequent testing of this model using the data from Sample 2 also resulted in excellent fit (Row 14), confirming the structure of the DSRES scores. Items, factor loadings and error variances for the DMDS-S and DSRES appear in Table 4.

Multisample analyses. When developing instruments for use in diverse populations, it is important to determine their measurement invariance across sub-groups. As such, we tested for measurement invariance by sex and across the four sport and exercise groups represented using multisample analyses. Different aspects of invariance can be tested depending on the research question (Cheung & Rensvold, 2002). As we were interested in construct validity and whether the instruments were appropriate for making comparisons amongst groups, we tested three relevant aspects of invariance (Byrne, 2006): a) configural invariance (i.e., items are indicators of the same factors in all groups), b) metric invariance (i.e., all factor loadings are equal across groups), and c) equivalence of construct variance and covariance (ECVC; i.e., variances and covariances of latent variables are equivalent across groups). Prior to invariance testing, we estimated baseline model fit for each sub-group (see Byrne, 2006). We then tested for configural invariance, metric invariance and ECVC, respectively, by progressively imposing the appropriate constraints. We examined ΔCFI at each step; values of less than 0.01 indicate no significant difference between models (Cheung & Rensvold, 2002). Results are presented in Table 5.

Sex invariance. For the DMDS, model fit for the baseline models was very good for male participants and acceptable-to-good for female participants, and configural invariance was demonstrated by good model fit. Metric invariance was also established by a ΔCFI of .00. The ECVC was not established though, as imposing such constraints resulted in a ΔCFI > .01. For the DMDS-S, model fit for baseline models was very good for male participants and excellent for female participants, and configural invariance was demonstrated by the very good fit of the relevant model. Metric invariance was also established, as shown by a ΔCFI < .01. However, like the DMDS, the ECVC was not established as ΔCFI > .01. Finally, for the DSRES, model fit for the baseline models was excellent for male and female participants, and configural invariance was demonstrated by excellent model fit. Like the DMDS and DMDS-S, metric invariance was established, as shown by a ΔCFI < .01, and the ECVC was not supported, as ΔCFI > .01.

Sport/exercise group invariance. For the DMDS, model fit for the baseline models ranged from acceptable-to-good for corporate-gym exercisers to excellent for bodybuilding-gym exercisers and individual-sport athletes. Configural invariance was established through good model fit. Metric invariance was also established, as shown by a ΔCFI < .01. However, the ECVC was not established as ΔCFI > .01. For the DMDS-S, model fit for the baseline models was excellent for all groups, and configural invariance was demonstrated by excellent model fit. Complete metric invariance was not established, as the LM test results for this model indicated two of the specified constraints (i.e., factor loadings for the advantageous comparison and diffusion of responsibility items between corporate gym exercisers and individual-sport athletes) led to an increase in χ^2 of ≥ 5.0/df. Respecification of the model with these constraints released led to excellent model fit and a ΔCFI < .01. This supports partial metric invariance (see Byrne, Shavelson, & Muthén, 1989). However, ECVC was again not established. Finally, for the DSRES, model fit for the baseline models was excellent for all groups, and configural invariance was demonstrated by excellent model fit. Metric invariance was also established, as shown by a ΔCFI < .01. However, the ECVC was again not supported.

Convergent and discriminant validity. We examined convergent validity by computing associations of DMDS, DMDS-S, and DSRES scores with scores for empathy and anticipated guilt. As shown in Table 6, correlations of DMDS, DMDS-S, and DSRES scores with empathy and anticipated guilt scores support convergent validity in both samples. This is also true for all

DMDS subscale scores, although the degree of convergence was weaker for the euphemistic labelling subscale in comparison to the other five subscales. Collectively these correlations also provide evidence of distinct predictive capabilities, supporting some degree of conceptual separation between the subscales despite their largely strong inter-correlations (see Table 2).

We examined discriminant validity by computing the correlations of sport MD (Boardley & Kavussanu, 2008) with DMDS and DMDS-S scores and of peer pressure SRE with DSRES scores. In both samples, DMDS (Sample 1 $r = .59$, $p < .01$; Sample 2 $r = .58$, $p < .01$) and DMDS-S (Sample 1 $r = .56$, $p < .01$; Sample 2 $r = .58$, $p < .01$) scores were positively related to sport MD, and DSRES scores were positively related to peer pressure SRE (Sample 1 $r = .41$, $p < .01$; Sample 2 $r = .56$, $p < .01$). Thus, overall the findings support the convergent and discriminant validity of DMDS, DMDS-S, and DSRES scores.

Internal consistency. Cronbach alpha values showed internal consistency to be either good or very good for all subscales of the DMDS in both samples (see Table 2). Alpha values for overall doping MD for the DMDS were excellent in both samples (i.e., Sample 1 = .95; Sample 2 = .96). Similarly, alpha values were very good for the DMDS-S in both samples (i.e., Sample 1 = .86; Sample 2 = .89) and excellent for the DSRES in both samples (i.e., Sample 1 = .93; Sample 2 = .94). Thus, overall the findings support the internal consistency reliability of DMDS, DMDS-S, and DSRES scores.

Study 2

Method

Participants. Participants were team- (e.g., netball, soccer) ($n = 9$) or individual- (e.g., athletics, triathlon) ($n = 78$) sport or bodybuilding- ($n = 5$) or corporate- ($n = 9$) gym exercisers ($n_{male} = 60$; $n_{female} = 41$); ages ranged from 16 to 70 years ($M = 35.2$, $SD = 13.5$). Sport participants competed at a recreational (*n* = 25), local (*n* = 21), university (*n* = 7), regional (*n* = 14), national (*n* = 9), or international (*n* = 10) level (15 didn't report). Participants had been training/competing for an average of 9.4 years (*SD* = 7.4), spent an average of 7.9 hours (*SD* = 4.8) per week training, and had trained in/with their current gym/team for an average of 4.4 years (*SD* = 5.0)[10].

Measures.

***Doping Moral Disengagement*.** Doping moral disengagement was measured using the 18-item DMDS developed in Study 1.

Doping Self-Regulatory Efficacy. Doping self-regulatory efficacy was measured using the 6-item DMDS developed in Study 1.

Procedures. Test-retest reliability represents consistency of scores across time in a population with stable scores on the construct being assessed (Lohr, 2002). It can be examined by administering a measure to the same sample twice and examining the relation between the two scores (Pedhazur & Schmelkin, 1991). Given both doping MD and doping SRE should be stable over the short term, evidence of score reliability and stability would support the temporal reproducibility of scores obtained using the DMDS, DMDS-S, and DSRES. To determine this, doping MD and doping SRE data were collected on two occasions using paper and online versions of the new instruments. Recruitment procedures for face-to-face data collections at Time 1 matched procedures used in Study 1. Recruitment of online participants involved advertising the study through sport-club and gymnasia websites, and discussion groups, social media, and personal contacts. Adverts included the basic information on the study, as well as a

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[10] Prevalence of doping was not assessed in Sample 3. This was because some respondents who acknowledged doping at Time 1 may subsequently have been reluctant to participate again at Time 2. Further, prevalence of doping was not central to the aims of this phase, as Study 3 data were only used to determine temporal stability of instrument scores and not for instrument development.

link to the survey webpage; the webpage provided full details of the study. Prior to starting the online questionnaire, participants were informed that by clicking on the link to start the questionnaire they were providing informed consent to participate. For both face-to-face and online collections, participants were informed that participation involved providing data on two occasions, and that data provided on the two occasions would be linked.

Relatively short between-administration intervals are recommended for examining test-retest reliability (Pedhazur & Schmelkin, 1991). Such intervals ensure any differences in scores are largely due to random measurement error rather than changes in participants' scores on the assessed constructs. As such, we used an inter-administration interval of nine to 16 days. For face-to-face participants, arrangements were made to collect data again within this window. For online participants, reminder emails were sent nine days following initial completion, and continued each day until day 16. At which point the online questionnaire closed for participants who had not completed their second administration. Of the 101 participants who completed the instruments on two occasions, 87 were online participants. Overall, 50% of those who participated on one occasion completed the instruments again on a second occasion within the allotted timeframe (online = 63%; face-to-face = 22%[11]).

Results

Intraclass correlation coefficients for overall scores obtained using the DMDS, DMDS-S and DSRES were .94, .93 and .87, respectively, and ranged from .87 to .93 (*M* = .91) for the individual DMDS subscales. Overall, the findings demonstrate very good to excellent levels of score reliability for all three instruments. We also investigated individual-item stability in accordance with the recommendations of Nevill, Lane, Kilgour, Bowes, and Whyte (2001; see

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[11] The low retention rate for face-to-face collections was largely due to non-attendance at the training session where the second collection took place, as opposed to athletes choosing not to participate.

Table 7). For each item, we calculated test-retest differences and reported the minimum and maximum difference scores. In addition, we calculated the percentage of participants whose test-retest difference scores were within ± 1, termed proportion of agreement. For 5-point scales (i.e., DSRES items) acceptable levels of score stability are evidenced by proportion of agreement scores of ≥ 90% (Nevill et al., 2001). Although such criterion values are not available for 7-point scales (i.e., DMDS and DMDS-S items), past research applying this method with such scales has shown proportion of agreement scores significantly below 90% (e.g., Uphill, Lane, & Jones, 2012). This is logical given the greater potential for scores to fluctuate between administrations with 7-point scales compared to 5-point scales. For DMDS items, for 11 items at least 90% of participants had test-retest difference scores within ±1, for six items 80-90% of participants had test-retest difference scores within ±1, whereas for one item the percentage in this range was just below 80%. For DMDS-S items, for four items at least 90% of participants had test-retest difference scores within ±1, whereas for two items 80-90% of participants had test-retest difference scores in this range. For DSRES items, for all 6 items at least 90% of participants had test-retest difference scores within ±1. Finally, we computed the median-sign test (i.e., the number of participants with test-retest differences above and below zero) to ascertain the amount of possible bias in scores increasing or decreasing from test to retest. The median-sign test indicated the scores of five DMDS items, two DMDS-S items, and one DSRES item decreased significantly between test and retest.

Discussion

Research has highlighted the potential importance of doping MD and doping SRE to doping in sport and exercise (e.g., Boardley & Grix, 2014; Boardley et al., 2014, 2015; Lucidi et al., 2004, 2008). However, valid instruments are needed to measure these constructs and substantively advance the knowledge base. The relevant extant psychological assessments tied to doping have shortcomings, and there is currently no multidimensional measure of doping MD available nor any instrument to assess doping MD in exercise populations. Therefore, we sought to develop psychometrically sound instruments assessing doping MD and doping SRE, pursuing item development and assessment of score validity and reliability using an expert panel, two pilot samples, and three primary samples.

Bandura (1991) described eight mechanisms of MD and research in sport and exercise contexts has shown six of these mechanisms to be utilized to rationalize and justify doping (Boardley & Grix, 2014; Boardley et al., 2014, 2015). Consequently, we developed items for these six mechanisms and expected scores from the final instrument to evidence six lower-order factors. Consistent with this expectation, results from both samples suggested doping MD – as assessed by the DMDS – incorporates six lower-order dimensions. This is consistent with the only other multidimensional measure of MD developed for use in a sport context – the MDSS (Boardley & Kavussanu, 2007) – which also has six lower-order factors. However, it is important to acknowledge the six dimensions in the DMDS represent six MD mechanisms, whereas the six dimensions in the MDSS represent eight mechanisms.

Convergent validity of overall DMDS scores was evidenced by the strong negative correlation between doping MD and anticipated guilt, and the moderate negative correlation between doping MD and empathy. These associations are consistent with theory and research (Bandura, 1991; Bandura et al., 1996). Evidence for the convergent validity of scores for most DMDS subscales was also provided, with relationships of the subscales with anticipated guilt and empathy generally consistent with those obtained using all 18 instrument items. However, evidence for the convergent validity of scores obtained for euphemistic labelling was weaker than for scores obtained with the other five subscales. Because use of euphemistic terms regarding doping (e.g., gear, juice, etc.) is a key aspect of doping culture (see Andrews, Sudwell, & Sparkes, 2005), people may at times use such terminology to fit in with this culture and not exclusively for making doping appear less harmful.

Discriminant validity of the DMDS was evidenced through the associations of DMDS and MDSS-S scores, which showed the DMDS scores to be related to – but distinct from – MDSS-S scores. This supports the context-specific nature of MD proposed by Bandura (1991). Evidence for discriminant validity was also provided internally by the strength of the associations amongst the DMDS subscale scores. Euphemistic labelling had weaker relationships with the other five mechanisms than those mechanisms did amongst themselves, suggesting discriminant validity was highest for this mechanism. In contrast, the very strong correlations between the remaining mechanisms demonstrated substantial redundancy. The highest redundancy was observed between displacement and diffusion of responsibility and between advantageous comparison and distortion of consequences. These findings are not out of line with past research showing similar levels of convergence between these mechanisms (Boardley & Kavussanu, 2007), and the six-factor DMDS model was superior to alternative models.

We also developed a short version of the DMDS termed the DMDS-S, enabling a concise measure of overall doping MD. Following procedures used successfully to develop previous short versions of MD instruments (e.g., Boardley & Kavussanu, 2008), we found evidence for the factorial validity of DMDS-S scores, as well as discriminant and convergent validity. Specifically, CFA supported the unidimensionality of scale scores, negative correlations with empathy and guilt evidenced convergent validity, and strong – but not overly strong – positive relations with MDSS-S scores evinced discriminant validity. Importantly, the instrument has items representing all six of the relevant mechanisms of MD (see Boardley & Grix, 2014; Boardley et al., 2014, 2015), ensuring that the DMDS-S generates doping MD scores that are equally representative of each of the six mechanisms. Although for us the DMDS is the preferred option for most research given it is representative of underlying theory (i.e., Bandura, 1991), the development of the DMDS-S provides a generalized and brief assessment suitable for use when the DMDS is not practical to administer.

Another important context-specific variable from Bandura's (1991) theory is doping SRE. Although past research had identified the potential importance of this variable to doping (e.g., Lucidi et al., 2008), prior to the current research scores of doping SRE measures had not been appropriately validated. Based on theory (Bandura, 1991) and the factorial structure of existing instruments assessing SRE (e.g., Bandura et al., 1996), the DSRES was constructed and scores demonstrated the expected unidimensional structure. Moreover, positive associations with empathy and guilt supported the convergent validity of DSRES scores, while positive moderate-to-strong (i.e., Sample 1) and strong (i.e., Sample 2), yet empirically distinguishable, associations with peer-pressure SRE supported the discriminant validity of DSRES scores.

We additionally assessed internal consistency and test-retest reliability of scores obtained using the three new instruments. The internal consistency of all higher- and lower-order scales surpassed the minimum criterion level recommended when developing new instruments (i.e., 0.80; Clark & Watson, 1995). Also, test-retest reliability levels across a nine- to 16-day period, using a separate sample, were good to excellent. Thus, scores obtained using the DMDS, DMDS-S and DSRES are reliable over the short term. On the whole, item stability analyses suggest the majority of items in the three scales are stable across this period too. These findings suggest that scores obtained using the three instruments are relatively stable over the short term, and that situational factors may not impart much error into scale responses. Overall, across all samples and analyses, the instruments performed well in measuring their target constructs.

Beyond the main validity and reliability analyses, we also utilized multisample analyses to examine the measurement invariance of scores from all three instruments. In each case, we performed two sets of multisample analyses. The first examined measurement invariance by sex whereas the second examined measurement invariance across four sport/exercise groups. All three instruments showed configural invariance, meaning across all groups the same subsets of items are associated with the same constructs (Cheung & Rensvold, 2002). In all but one case, complete metric invariance was established. This demonstrates the strength of the relationship between all items and their underlying constructs was the same (Cheung & Rensvold, 2002). The one exception was across the four sport/exercise groups with the DMDS-S, where partial metric invariance was evidenced (Byrne et al., 1989). This is present when most items for a given latent variable have loadings that are invariant across groups. If this is the case, cross-group comparisons can still safely be made (Reise, Widaman, & Pugh, 1993). Thus, the DMDS, DMDS-S and DSRES are suitable for research testing substantive hypotheses regarding group differences by sex and among the four sport/exercise types tested.

Equivalence of construct variance exists when the range of responses given to each item is the same across groups, whereas equivalence of construct covariance is apparent when structural relationships are equivalent across groups (Cheung & Rensvold, 2002). As with our analyses, these two forms of invariance are often tested simultaneously (see Byrne, 2006). In contrast to the other forms of equivalence tested, our analyses showed ECVC was not evident for any of the instruments by sex or across the four sport/exercise groups. This suggests the range of item responses and/or the strength of the relations between MDMS subscales varied among these groups. Importantly, prevalence of doping differed markedly between genders and across sport/exercise context. Given that levels of doping MD and doping SRE are likely to be more extreme in athletes with experience of doping, these differences in prevalence may have led to greater construct variance in samples with higher prevalence rates. In addition, the degree of association between MD subscales may be influenced by doping prevalence. Future research should address what may lead to differences in construct variance and covariance across groups.

Limitations and Future Directions

The current project developed three psychological assessments relevant to doping in sport and exercise that each provide scores with good psychometric properties. Nevertheless, limitations relating to certain aspects of the research should be acknowledged. First, whilst we achieved our aim of sampling from populations showing doping prevalence rates in line with existing estimates (see Momaya et al., 2015), the use of self-report to assess doping prevalence has known limitations when applied to socially sensitive behaviors such as PIED use. Specifically, assessing doping through self-report is thought to underestimate the true prevalence of doping. Accordingly, the prevalence of doping in our samples may be higher than reported. Next, although the test-retest analyses presented evidence for fairly good levels of short-term reliability and stability of DMDS, DMDS-S, and DSRES scores, the sample for these analyses largely consisted of individual-sport athletes. Future research should assess test-retest reliability with samples more representative of the other three sub-populations. Also, difficulties in accessing the same participants on two occasions across the stipulated period resulted in a low percentage of athletes completing the measure twice, especially for face-to-face collections. These difficulties also required us to allow some flexibility on the period between test and retest completions, when ideally this would have been standardized across participants. In future work attempts should be made to increase retention rates and standardize the test-retest period.

Validation is a continuous process (Clark & Watson, 1995) and further aspects of validity remain to be examined, such as predictive validity over time and associations with key variables not assessed here. For example, associations of test scores with socially situated emotions such as shame could be examined. Further, validity and reliability of test scores in other doping populations and cultures require investigation. For instance, researchers could examine their measurement invariance across different categories of bodybuilders (see Christiansen, Vinther, & Liokaftos, 2017). Finally, the multidimensional nature of the DMDS – and the divergent associations of its subscales with anticipated guilt – present the opportunity for research determining which MD mechanisms have the greatest potential to facilitate doping.

Conclusion

Through a rigorous set of processes, we developed three psychometric instruments relevant to the psychology of doping, and supported the validity of scores obtained with them. The final versions of the DMDS, DMDS-S, and DSRES are found in the Appendix. Evidence for the construct validity, internal consistency and test-retest reliability of scores for all three instruments was provided. Items for the instruments have high levels of face and content validity, making them particularly suitable for use with athletes and exercisers who have experience in environments where doping is a salient aspect of the culture. The DMDS makes a particular contribution to the literature, being the first measure capable of capturing the individual doping MD mechanisms, and for use with exercise populations. The DSRES is also the first doping-contextualized instrument developed for use with exercise populations. We look forward to seeing these instruments employed and further evaluated in future research.

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Table 1

Summary of Fit Indices for All CFA Models Tested During Development of the Doping Moral Disengagement Scale (DMDS), the Doping Moral Disengagement Scale – Short (DMDS-S) and the Doping Self-Regulatory Efficacy Scale (DSRES)

Model	*df*	Rχ^2	RCFI	SRMR	RMSEA
		Sample 1 (N = 318)			
DMDS Models					
1. M1a, 35 items	545	1183.39	.873	.050	.061
2. M1b, 18 items	120	222.54	.955	.034	.052
3. 2nd order, M1b	129	333.48	.910	.052	.071
Alternative DMDS Models					
4. M2, 18 items	132	667.24	.765	.079	.113
5. M3, 18 items	135	779.76	.717	.088	.123
6. M4, 18 items	129	303.92	.923	.043	.065
DMDS-S Models					
7. M5a, 6 items	9	21.35	.968	.031	.066

8. M5b, 6 items	8	7.38 (ns)	1.000	.020	.000
DSRES Models					
9. M6a, 13 items	65	210.48	.871	.060	.084
10. M6b, 6 items	9	12.17 (ns)	.991	.028	.033
Sample 2 (N = 300)					
DMDS Models					
11. M1b, 18 items	120	248.14	.974	.032	.061
12. 2nd order, M1b	129	272.04	.953	.046	.061
DMDS-S Model					
13. M5b, 6 items	8	15.83	.987	.023	.058
DSRES Model					
14. M6b, 6 items	9	12.44 (ns)	.991	.020	.036

Note. *df* = degrees of freedom; $R\chi^2$ = Satorra–Bentler scaled chi-square; RCFI = robust comparative fit index; SRMR = standardized root mean square residual; RMSEA = root mean square error of approximation; ns = $p > .05$. M1 = 6-factor DMDS model; M2 = 3-factor DMDS model; M3 = 1-factor DMDS model, M4 = 4-factor DMDS model; M5 = 1-factor DMDS-S model; M6 = 1-factor DSRES model.

Table 2

CFA Factor Correlations for the Doping Moral Disengagement Scale (DMDS) Subscales in Sample 1 (*N* = 318) and Sample 2 (*N* = 300)

Factor	1	2	3	4	5	6
1. Moral Justification	.86/.93	.55	.76	.88	.86	.83
2. Euphemistic Labelling	.51	.86/.90	.55	.57	.51	.49
3. Advantageous Comparison	.80	.54	.82/.87	.74	.81	.92
4. Displacement of Responsibility	.88	.48	.72	.91/.95	.90	.76
5. Diffusion of Responsibility	.84	.46	.79	.91	.88/.90	.84
6. Distortion of Consequences	.84	.44	.93	.72	.78	.83/.86

Note. Sample 1 correlations are below the diagonal and those from Sample 2 are above. Alpha coefficients in Sample 1 / Sample 2 are presented on the diagonal. For all correlations, $p < .01$.

Table 3

Items, Standardized Factor Loadings and Error Variances for the Doping Moral Disengagement Scale (DMDS)

Factor Item	Factor Loading	Error Variance
Moral Justification		
1. It is okay to dope if it helps an athlete to provide for his/her family.	.76/.82	.65/.57
2. Doping is okay if it helps an athlete advise others on how to do it right.	.87/.95	.49/.32
3. It is acceptable to dope if knowledge gained helps an athlete advise others on safe doping.	.87/.96	.49/.30
Euphemistic Labelling		
4. Saying you "take steroids" feels worse than saying you "use some gear".	.67/.75	.75/.66
5. Using words like "roids", "gear" and "pinning" makes doping feel more acceptable.	.93/.93	.37/.36
6. Using terms such as "gear" or "juice" makes doping sound less harmful.	.91/.93	.41/.37
Advantageous Comparison		
7. Compared to most lifestyles in the general public, doping isn't that bad.	.82/.86	.57/.51
8. Compared to smoking, doping is pretty safe.	.79/.87	.62/.49
9. Compared to physical violence, doping isn't that serious.	.75/.76	.66/.65
Displacement of Responsibility		

10. Athletes shouldn't be blamed for doping if training partners/teammates pressure them to do it.	.87/.92	.50/.39
11. An athlete shouldn’t be blamed for doping if a member of his/her training group has encouraged it.	.92/.94	.39/.33
12. An athlete shouldn't be held responsible for doping if his/her coach encouraged him/her to do it.	.88/.92	.47/.39
Diffusion of Responsibility		
13. If most athletes in a sport dope, no one athlete should be held responsible for doing it.	.77/.81	.64/.59
14. It’s not right to condemn individuals who dope when many in their sport are doing the same.	.87/.92	.50/.38
15. If an athlete trains/competes in an environment in which doping is the norm, he/she shouldn't be held accountable for doing it.	.90/.87	.43/.50
Distortion of Consequences		
16. Risks associated with doping are exaggerated.	.85/.86	.53/.52
17. Doping doesn’t really harm anyone else.	.70/.77	.72/.64
18. The negative aspects of doping are exaggerated by the media.	.82/.85	.58/.53

Note. Factor Loadings and Error Variances are presented as follows: Sample 1 / Sample 2.

Table 4

Items, Standardized Factor Loadings and Error Variances for the Doping Moral Disengagement Scale – Short (DMDS-S) and Doping Self-Regulatory Efficacy Scale (DSRES)

Item (*mechanism*)	Factor Loading	Error Variance
DMDS-S		
Doping is okay if it helps an athlete advise others on how to do it right (*moral justification*).	.61/.86	.79/.52
Using terms such as "gear" or "juice" makes doping sound less harmful (*euphemistic labelling*).	.44/.52	.90/.86
Compared to most lifestyles in the general public, doping isn't that bad (*advantageous comparison*).	.70/.76	.72/.65
Athletes shouldn't be blamed for doping if training partners/teammates pressure them to do it (*displacement of responsibility*).	.76/.88	.65/.48
It’s not right to condemn individuals who dope when many in their sport are doing the same (*diffusion of responsibility*).	.83/.88	.56/.48
Risks associated with doping are exaggerated (*distortion of consequences*).	.67/.74	.74/.68
DSRES		
1. …resist doping even if your training group encouraged you to do it?	.84/.83	.55/.56
2. …resist doping even if you knew you could get away with it?	.82/.83	.57/.55
3. …ignore the temptation to dope even if you knew it would improve your performance?	.86/.88	.51/.48
4. …resist peer pressure to dope?	.80/.87	.60/.50
5. …reject doping even if most of your training partners did it?	.84/.87	.54/.50
6. …ignore the temptation to dope when feeling down physically?	.81/.77	.59/.63

Note. Factor Loadings and Error Variances are presented as follows: Sample 1 / Sample 2.

Table 5

Fit Indices for multisample analyses on the Doping Moral Disengagement Scale (DMDS), Doping Moral Disengagement Scale-Short (DMDS-S) and Doping Self-Regulatory Efficacy Scale (DSRES)

Model	*df*	$R\chi^2$	RCFI	SRMR	RMSEA
		Sex DMDS			
Baseline Male	120	245.22	.968	.040	.053
Baseline Female	120	214.90	.922	.040	.057
Configural Invariance	240	461.00	.950	.040	.055
Metric Invariance	252	470.88	.950	.044	.053
ECVC	273	567.21	.933	.223	.059
		Sex DMDS-S			
Baseline Male	8	21.48	.981	.028	.067
Baseline Female	8	12.96(ns)	.978	.023	.051
Configural Invariance	16	34.69	.977	.025	.062
Metric Invariance	21	41.43	.975	.049	.056
ECVC	22	62.26	.951	.225	.077
		Sex DSRES			
Baseline Male	9	13.43(ns)	.992	.021	.036
Baseline Female	9	13.60(ns)	.981	.036	.046
Configural Invariance	18	27.04(ns)	.989	.029	.040
Metric Invariance	23	34.04(ns)	.986	.054	.039
ECVC	24	48.74	.969	.398	.058
		Sport/Exercise Group DMDS			
Baseline Corporate	120	166.66	.925	.047	.057
Baseline Bodybuilding	120	209.66	.970	.050	.075
Baseline Team	120	172.91	.948	.038	.048

Baseline Individual	120	157.59	.966	.060	.043
Configural Invariance	480	703.75	.951	.050	.055
Metric Invariance	516	760.55	.946	.071	.056
ECVC	579	911.77	.926	.282	.061
Sport/Exercise Group DMDS-S					
Baseline Corporate	8	11.00 (ns)	.978	.028	.056
Baseline Bodybuilding	8	8.27 (ns)	1.000	.023	.016
Baseline Team	8	10.68 (ns)	.985	.035	.042
Baseline Individual	8	9.25 (ns)	.992	.035	.030
Configural Invariance	32	39.67 (ns)	.991	.030	.040
Metric Invariance	47	78.85	.961	.093	.066
Metric Invariance Revised	45	56.66 (ns)	.986	.076	.041
ECVC	48	121.78	.910	.342	.100
Sport/Exercise Group DSRES					
Baseline Corporate	9	12.38 (ns)	.970	.050	.056
Baseline Bodybuilding	9	14.53 (ns)	.985	.023	.068
Baseline Team	9	11.75 (ns)	.989	.042	.040
Baseline Individual	9	9.16 (ns)	.998	.028	.010
Configural Invariance	36	47.06 (ns)	.983	.037	.045
Metric Invariance	51	66.53 (ns)	.976	.088	.045
ECVC	54	77.07	.964	.242	.053

Note. *df* = degrees of freedom; $R\chi^2$ = Satorra–Bentler scaled chi-square; RCFI = robust comparative fit index; SRMR = standardized root mean square residual; RMSEA = root mean square error of approximation; ns = $p > .05$.

Table 6

Correlations of the Doping Moral Disengagement Scale (DMDS), Doping Moral Disengagement Scale-Short (DMDS-S), and Doping Self-Regulatory Efficacy Scale (DSRES) Scores and DMDS Subscale Scores with Empathy and Anticipated Guilt

	Sample 1 (*N* = 318)		Sample 2 (*N* = 300)	
	Empathy	Guilt	Empathy	Guilt
DMDS	-28	-.68	-.32	-.60
DMDS-S	-.26	-.66	-.33	-.59
DSRES	.15	.38	.36	.48
DMDS Subscales				
Moral Justification	-.24	-.67	-.34	-.58
Euphemistic Labeling	-.18	-.30	-.10 (ns)	-.24
Advantageous Comparison	-.25	-.56	-.25	-.54
Displacement of Responsibility	-.21	-.60	-.33	-.54
Diffusion of Responsibility	-.20	-.61	-.31	-.57
Distortion of Consequences	-.32	-.65	-.32	-.61

Note. Correlations significant at $p < .01$ unless indicated by ns, where $p > .05$.

Table 7

Results of item stability analyses in Study 2 (*N* = 101)

Item No.	Time 1		Time 2		Test-Retest Difference		PA	Median Sign Test		
	M	*SD*	*M*	*SD*	Min.	Max.	% (±1)	≥ 1	0 diff	≤ -1
Doping Moral Disengagement Scale / Doping Moral Disengagement Scale – Short										
1	1.57	1.03	1.61	0.95	-2	3	98.0	15	77	9
2	1.52	0.86	1.43	0.74	-1	3	97.0	9	79	13
3	1.56	0.89	1.48	0.83	-2	3	95.0	12	74	15
4	2.70	1.73	2.35	1.58	-4	6	81.2	11	61	29*
5	2.19	1.44	2.16	1.48	-3	3	88.1	11	73	17
6	2.27	1.52	2.30	1.60	-3	3	92.1	12	73	16
7	2.34	1.34	2.12	1.35	-4	4	89.1	13	61	27*
8	2.52	1.48	2.31	1.42	-3	3	90.1	16	56	29
9	3.25	1.75	2.76	1.63	-3	4	78.2	15	42	44*
10	1.74	1.02	1.70	1.02	-3	3	94.1	13	71	17
11	1.64	0.94	1.65	1.06	-2	3	95.0	12	78	11
12	1.72	0.96	1.69	1.07	-3	2	93.1	15	65	21
13	1.87	1.31	1.74	1.02	-4	6	89.1	19	59	23
14	1.82	1.13	1.73	1.00	-3	3	93.1	17	60	24
15	1.62	0.90	1.67	0.99	-2	2	97.0	16	73	12
16	2.43	1.39	2.07	1.27	-2	3	87.1	10	59	32*
17	1.54	0.82	1.60	0.87	-3	2	97.0	17	71	13
18	2.29	1.44	1.94	1.20	-2	4	87.1	12	58	31*
Doping Self-Regulatory Efficacy Scale										
1	4.77	0.51	4.68	0.63	-1	2	99.0	4	85	12
2	4.69	0.64	4.50	0.82	-1	2	93.1	5	78	18*
3	4.66	0.67	4.54	0.77	-2	2	95.0	8	76	17
4	4.78	0.52	4.71	0.61	-1	1	100.0	5	84	12
5	4.67	0.74	4.60	0.74	-3	2	98.0	5	83	13
6	4.64	0.72	4.56	0.75	-2	2	94.1	8	77	16

Note. Item numbers relate to those presented in Tables 3 and 4. PA = Proportion of Agreement. Underlined items are those used in the Doping Moral Disengagement Scale – Short.

* $p < .05$

Appendix A
The Doping Moral Disengagement Scale

*A number of statements describing **thoughts that athletes might have about doping** are listed below. Please read these statements carefully and indicate your level of agreement with each one by circling the appropriate number. Please respond **honestly.***

*What is your **level** of **agreement** with the following **statements**?*	**Strongly Disagree**	**Disagree**	**Slightly Disagree**	**Neutral**	**Slightly Agree**	**Agree**	**Strongly Agree**
1. It is okay to dope if it helps an athlete to provide for his/her family.	1	2	3	4	5	6	7
2. Saying you "take steroids" feels worse than saying you "use some gear".	1	2	3	4	5	6	7
3. Compared to most lifestyles in the general public, doping isn't that bad.	1	2	3	4	5	6	7
4. Athletes shouldn't be blamed for doping if training partners/teammates pressure them to do it.	1	2	3	4	5	6	7
5. If most athletes in a sport dope, no one athlete should be held responsible for doing it.	1	2	3	4	5	6	7
6. Risks associated with doping are exaggerated.	1	2	3	4	5	6	7
7. Doping is okay if it helps an athlete advise others on how to do it right.	1	2	3	4	5	6	7
8. Using words like "roids", "gear" and "pinning" makes doping feel more acceptable.	1	2	3	4	5	6	7
9. Compared to smoking, doping is pretty safe.	1	2	3	4	5	6	7
10. An athlete shouldn't be blamed for doping if a member of his/her training group has encouraged it.	1	2	3	4	5	6	7
11. It's not right to condemn individuals who dope when many in their sport are doing the same.	1	2	3	4	5	6	7
12. Doping doesn't really harm anyone else.	1	2	3	4	5	6	7
13. It is acceptable to dope if knowledge gained helps an athlete advise others on safe doping.	1	2	3	4	5	6	7
14. Using terms such as "gear" or "juice" makes doping sound less harmful.	1	2	3	4	5	6	7
15. Compared to physical violence, doping isn't that serious.	1	2	3	4	5	6	7
16. An athlete shouldn't be held responsible for doping if his/her coach encouraged him/her to do it.	1	2	3	4	5	6	7
17. If an athlete trains/competes in an environment in which doping is the norm, he/she shouldn't be held accountable for doing it.	1	2	3	4	5	6	7
18. The negative aspects of doping are exaggerated by the media.	1	2	3	4	5	6	7

Appendix B

The Doping Moral Disengagement Scale – Short

A number of statements describing ***thoughts that athletes might have about doping*** *are listed below. Please read these statements carefully and indicate your level of agreement with each one by circling the appropriate number. Please respond* ***honestly.***

What is your ***level*** *of* ***agreement*** *with the following* ***statements****?*	**Strongly Disagree**	**Disagree**	**Slightly Disagree**	**Neutral**	**Slightly Agree**	**Agree**	**Strongly Agree**
1. Doping is okay if it helps an athlete advise others on how to do it right.	1	2	3	4	5	6	7
2. Using terms such as "gear" or "juice" makes doping sound less harmful.	1	2	3	4	5	6	7
3. Compared to most lifestyles in the general public, doping isn't that bad.	1	2	3	4	5	6	7
4. Athletes shouldn't be blamed for doping if training partners/teammates pressure them to do it.	1	2	3	4	5	6	7
5. It’s not right to condemn individuals who dope when many in their sport are doing the same.	1	2	3	4	5	6	7
6. Risks associated with doping are exaggerated.	1	2	3	4	5	6	7

Appendix C

The Doping Self-Regulatory Efficacy Scale

Here we would like to get a better ***understanding*** *of* ***experiences*** *that can be* ***difficult*** *to* ***manage****. For each of the questions listed below, please* ***circle the number*** *that best corresponds to* ***your level*** of ***confidence right now****. Please respond* ***honestly.***

How ***confident*** *are* you ***right now*** *in your* ***ability*** *to ...*	**No Confidence**		**Moderate Confidence**		**Complete Confidence**
1. …resist doping even if your training group encouraged you to do it?	1	2	3	4	5
2. …resist doping even if you knew you could get away with it?	1	2	3	4	5
3. …ignore the temptation to dope even if you knew it would improve your performance?	1	2	3	4	5
4. …resist peer pressure to dope?	1	2	3	4	5
5. …reject doping even if most of your training partners did it?	1	2	3	4	5
6. …ignore the temptation to dope when feeling down physically?	1	2	3	4	5