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"Time May Change me, but you Can't Trace Time": The (In)Stability of Psycho-Social Doping Profiles among Adolescent Athletes

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Abstract

The Adolescent Sport Doping Inventory (ASDI; Nicholls, Levy, et al., 2019) was one of the first questionnaires designed specifically to measure psycho-social doping constructs among adolescent athletes. Little is known about the reliability of this scale, and nor the stability of the psychosocial variables that the ASDI assesses. The aim of this paper was to assess the reliability of the ASDI, along with the extent to which key psychosocial constructs are stable, and whether there was variance across four clusters. Three independent samples of athletes were recruited. Athletes completed the ASDI one week apart (Sample 1), 8 weeks apart (Sample 2), and 16 weeks apart (Sample 3). Findings revealed that the ASDI is a robust and reliable measure. While there was little within-subject variance in the data assessed one week apart (Sample 1) and 8 weeks apart (Sample 2), correlation coefficients in Sample 3 were markedly lower than Samples 1 or 2. The data also revealed that there was movement between cluster profiles for the eight- and 16-week gap, but not the one-week gap. In the short-term, psychosocial variables such as attitudes doping and susceptibility towards doping are relatively stable among adolescent athletes, although there is some movement between doping clusters. This could infer that ongoing anti-doping education is required to prevent undesirable changes in these important factors on a regular basis within adolescence.

Keywords: Adolescence; Attitudes; Psycho-social questionnaire; Susceptibility

"Time May Change me, but you Can't Trace Time": The (In)Stability of Psycho-Social Variables Associated with Doping among Adolescent Athletes

According to World Anti-Doping Agency's (WADA, 2021) code, there are 11 different anti-doping rule violations. These include: (1) the presence of a prohibited substance in an athlete's sample, (2) using or attempting to use a banned substance or method, (3) evading, refusing, or failing to provide a sample, (4) failure to declare whereabouts, (5) tampering or attempting to tamper with any aspect of doping control, (6) possession of a banned substance or method, (7) trafficking or attempting to traffic banned substances or methods, (8) administering a banned substance or method to another athlete, (9) complicity or attempted complicity, (10) prohibited associate by an athlete, and (11) discouraging or retaliating against a person who reports doping.

According to Weiss and Bredemeier (1983), adolescence refers to individuals who are aged between 12 and 18 years of age. Worryingly, there is evidence that adolescent athletes take performance enhancing drugs (PEDs) either intentionally (e.g., Lucidi et al., 2013; Mallia et al., 2013) or inadvertently by consuming contaminated nutritional supplements (e.g., Tsarouhas et al., 2018). Understanding more about the underpinning psycho-social constructs that predict doping behaviour (i.e., attitudes towards doping) and how these may change for young athletes, is important for informing how often doping education may be needed among this population. Although researchers have created models to explain doping among adult athletes, adolescents have featured much more sparingly in the doping literature. This is somewhat surprising, given that the former director of WADA, stated that WADA are most worried about young athletes given the temptation they may have to dope (Howman, 2015).

Three models have attempted to explain why young athletes take PEDs. These are the Integrated Model of Doping Behavior (IMDB; Lazuras et al., 2015), the Social-Cognitive Model (Zelli et al., 2010), and the Sport Drug Control Model for Adolescent Athletes (SDCM-AA; Nicholls et al., 2015). The Integrated Model of Doping Behavior (IMBD; Lazuras et al., 2015), includes both proximal predictors of doping intentions (e.g., outcome expectancy beliefs, social norms, and self-efficacy beliefs) and distal (e.g., achievement goals, motivational regulations, and moral orientations), predicted 57.2% of the variance in doping intentions. Furthermore, social norms, self-efficacy beliefs, doping attitudes added 34.4% of the variance in intentions. The Social Cognitive Model (SCM; Zelli et al., 2010) predicts that several factors (e.g., doping attitudes, subjective norms, perceived behavioural control, doping self-regulatory efficacy, and doping moral disengagement) influence doping intentions, which predicts doping behavior. Zelli et al. (2010) found support for this model, as intentions to dope at Time 1 predicted doping use 4-5 months later. Additionally, Girelli et al. (2020) found partial support for the SCM (Zelli et al.), as attitudes towards doping and doping moral disengagement positively predicted intention to use PEDs. These authors, however, did not assess doping behavior so the model could not be fully tested. Interestingly, this study included participants from Italy, Romania, and Turkey. No differences in attitudes towards doping among the participants from different countries were observed.

The SDCM-AA (Nicholls et al., 2015; 2020) was adapted specifically for adolescent athletes from the original Sport Drug Control Model (SDCM; Donovan et al., 2002). The SDCM (Donovan et al.) integrates three different behavioural science frameworks (i.e., threat/fear appeals, instrumental and normative approaches, and social cognition). Donovan and colleagues proposed that doping attitudes was the key factor that influenced whether an athlete would dope or not. In turn, doping attitudes are influenced by six different constructs (i.e., benefit appraisals, threat appraisals, reference group opinions, personality, legitimacy, and morality). Benefit appraisals relates to the athlete considering gains that can potentially occur from doping (e.g., fame, increased earnings, fame, or selection to national teams). Threat appraisals include either, or both, the likelihood of being caught taking banned substances or the negative health effects from doping. Reference group opinion relates to the extent that significant others (e.g., coaches, parents, or friends) can influence they can exert upon athletes and how they view doping. Personality was also believed to influence attitudes towards doping in Donovan's SDCM, and there is evidence to support this, as Nicholls, Madigan, et al. (2017; 2019) reported that the Dark Triads of personality were linked to doping attitudes. Legitimacy relates to the extent to which anti-doping organisations, such as WADA, are valid and can identify athletes who dope. Finally, morality relates to whether athletes believe doping is right or wrong, while legitimacy is about how athletes perceive organizations that police doping. Three studies have quantitatively examined the SDCM (García-Grimau et al., 2021; Gucciardi et al., 2011; Jalleh et al., 2014). With a sample of 670 elite athletes from Australia, Gucciardi et al. (2011) reported that morality (cheating), threat appraisals, and benefit appraisals were strongly associated with doping attitudes. Self-esteem, legitimacy, and reference group opinion, however, were not associated with doping attitudes. In support of Gucciardi et al. (2011), Jalleh et al. (2014) found that morality, reference group opinion, and legitimacy were associated with attitudes towards doping. García-Grimau et al. reported that morality and reference group opinion were the strongest predictors of attitudes towards toping. Further, García-Grimau and colleagues also found that a favorable attitude towards doping was associated with high susceptibility towards doping. These three studies provide empirical support for the SDCM (Donovan et al.).

Nicholls et al. (2015) interviewed 11 coaches and performance directors regarding the applicability of the original SDCM (Donovan et al., 2002) to adolescent athletes. Nicholls et al. (2015) found support for the original SDCM, in that attitudes were key factors that would shape doping behaviour. The importance of doping attitudes among adolescent athletes mirrors the findings from research predominantly with adult athletes. In a meta-analysis (Ntoumanis et al., 2014) and systematic review (Nicholls, Cope, et al., 2017), researchers reported that attitudes were one of the most important factors that predict doping behaviour. Adolescence is the time in which attitudes are typically formed and take shape. As such, it is a period on one's life in which attitudes change (Cieciuch et al., 2016; Döring et al., 2015; Kjellström et al., 2017). At the present time, however, little is known about stability of doping attitudes among either adolescent or adult athletes. This is somewhat surprising given the importance of this construct in relation to doping for both adolescents (e.g., Nicholls, Cope, et al., 2017) and adult athletes (Ntoumanis et al., 2014). Given that attitudes change and are formed during adolescence (Cieciuch et al., 2016; Döring et al., 2015; Kjellström et al., 2017), it could be argued that it is important to understand the longer-term stability of attitudes, particularly when seeking to quantitatively assess them, because this has implications for anti-doping education and potentially how often athletes receive this form of education and when athletes first receive anti-doping education.

A construct within the SDCM-AA (Nicholls et al., 2015) that was not included in Donovan's SDCM (2002) was doping susceptibility. Although susceptibility was not included in the original SCDM (Donovan et al., 2002), the coaches in the Nicholls et al. (2015) study believed that doping susceptibility was a key predictor of doping behaviour. Gucciardi et al. (2010) defined doping susceptibility as "the absence of a firm resolve not to engage in doping activities or to give any consideration at all to an offer to do so" (p. 481). In support of this construct being included in the SDCM-AA, scholars have reported that doping susceptibility was a proxy for doping behaviors, particularly if it is associated with positive attitudes towards doping (Barkoukis et al., 2014; Blank et al., 2016).

The Adolescent Sport Doping Inventory

Based on the SDCM-AA (Nicholls et al., 2015), Nicholls, Levy, et al. (2019) developed the Adolescent Sport Doping Inventory (ASDI) to assess key constructs linked to doping among adolescent athletes. The ASDI was created because there was no valid questionnaire designed to specifically assess psycho-social doping constructs among adolescent athletes. Although scholars had used the Performance Enhancement Attitude Scale (PEAS; Petróczi & Aidman, 2009) to assess doping attitudes among adolescent athletes (e.g., Madigan et al., 2017), the PEAS is not a suitable questionnaire for this age group, because it demonstrated a poor fit among adolescent athletes (Nicholls, Madigan, et al., 2017). As such, the results derived among adolescents from using the PEAS may be questionable. The ASDI (Nicholls et al.) measures nine factors that are linked to doping among adolescents, such as doping attitudes, doping susceptibility, threat, benefit, esteem, cheating, legitimacy, reference group opinion, and stress. Although Nicholls et al. reported that the ASDI is a valid tool, they did not report its test-retest stability.

The ASDI (Nicholls, Levy, et al., 2019) was also used to formulate distinct clusters among adolescent athletes. That is, 2,208 adolescent athletes aged between 12 and 18 years of age completed the ASDI (Nicholls et al.) and four distinct profiles of athletes emerged in the Nicholls et al. (2020) study. These were the Susceptibles, Chancers, Pragmatists, and Fair Players. Susceptibles identified with the benefits of doping, were willing to cheat, were highly influenced by their reference group, viewed little threat, did not value the legitimacy of testing, and were below average in self-esteem. Chancers also identified with the benefits of doping, scored high on willingness to cheat, and were highly influenced by their reference group, but had an average score for threat, self-esteem, and legitimacy. The Pragmatists did not engage with any aspects of doping but were more susceptible than the fair players. Finally, Fair Players were unwilling to cheat, viewed doping as a threat to their health and being caught, and were not unduly influenced by their reference group.

The purpose of this study was to assess test-retest stability of the ASDI (Nicholls, Levy, et al., 2019), with measurements been taken one week apart. The second purpose of this study was to assess longer-term changes in the variables assessed within the ASDI among the four clusters identified by Nicholls et al. (2020). To do this, we applied a test-retest design to two other independent groups at eight- and 16-weeks apart, respectively. In total, three independent samples of athletes involved in competitive sport, were recruited to avoid over-burdening the participants with having to complete the ASDI too many times. It has been suggested that adolescence is a period in which attitudes changes (Cieciuch et al., 2016; Döring et al., 2015; Kjellström et al., 2017), but very little is known about how attitudes towards doping may change over time, among adolescent athletes. Based on data from other studies, we hypothesised that attitudes would change at eight and 16 weeks (e.g., Cieciuch et al.; Döring et al.; Kjellström et al.). These time periods were selected because they allow time for attitudes to change among the sample.

Method

Participants

Three independent samples were collected. Sample 1 contained 92 participants (male *n* = 55, female *n* = 37) aged 17-18 ($M = 17.96$, $SD = 0.21$). Participants represented 17 different sports from four countries (UK *n* = 79, Australia *n* = 10, US *n* = 2, Malaysia *n* = 1), which were performed at beginner (*n* = 8), club – amateur (*n* = 67), club – semi-professional (*n* = 10), county/state (*n* = 4), and international (*n* = 3) level. On average, participants had been playing their sport for 9.24 years (*SD* = 3.84). Sample 2 contained 134 participants (male *n* = 82, female *n* = 52) aged 14-18 (*M* = 17.09, *SD* = 1.42). Participants represented 20 different sports from the UK. On average, participants had been playing their sport for 8.51 years (*SD* = 3.66). Sample 3 contained 86 participants (male *n* = 58, female *n* = 28) aged 14-17 (*M* = 14.83, *SD* = 0.87). Participants represented 17 different sports from the UK. On average, participants had been playing their sport for 6.70 years (*SD* = 2.90).

Measure

Adolescent Sport Doping Inventory (ASDI). The ASDI (Nicholls, Levy, et al., 2019), is a 43-tiem questionnaire that assesses psycho-social variables linked to doping. The ASDI contains the following nine subscales: attitudes (e.g., "Legalizing PEDs would benefit my sport"), threat ("I would suffer serious health complications if I took PEDs"), benefit (e.g., "Taking PEDs could help me keep my place in the team or training squad"), self-esteem (e.g., "I am worth being in the team/squads that I am currently play for"), cheating (e.g., "I would cheat if I knew I won't get caught"), legitimacy (e.g., "Drug tests are very thorough"), reference group opinion (e.g., "What other people think about PEDs influences my decision on whether I would ever take them or not"), stress (e.g., "Competing in sport makes me feel anxious or worried"), and susceptibility (e.g., "I would be tempted to take PEDs, if I knew they would increase my performance"). Questions are answered on a 7-point Likert-type scale, anchored at 1 = 'Strongly Disagree' and 7 = 'Strongly Agree.' Nicholls et al. reported a good confirmatory factor analysis model fit for the ASDI: $\chi2(824) = 1440.403$, CFI = .954, TLI = .950, SRMR = .039, RMSEA = .035 (90% CI = .032, .038). Further, Nicholls et al. provided support for the convergent validity of the ASDI, as psycho-social doping variables were associated with honesty and humility, maturation, situational temptation, motivational climate, stress, coping, achievement goals, the coach-athlete relationship, stress, coping, achievement goals, and coach behavior.

Procedure

Participants completed the ASDI (Nicholls, Levy, et al., 2019) twice with no intervention in-between. Sample 1 had a gap of one week between tests, Sample 2 had a gap of 8 weeks between tests, and Sample 3 had a gap of 16 weeks between tests.

The one-week gap was designed to examine the test-retest stability of the ASDI (Nicholls, Levy, et al., 2019). A study using health status self-report measures by Marx et al. (2003) found no difference in stability coefficients if the retest was conducted two days or two weeks apart, so any point within this time frame appeared appropriate. Deviations in scores within this period can be considered as negatively reflecting on the stability of the measurement. It was not possible to continue to test this sample over a longer period. Using independent samples therefore, we sought to examine the stability of the constructs over eight weeks and 16 weeks rather than further test-retest stability of the ASDI.

Data Analysis

Preliminary analyses tested for outliers, univariate normality, and internal consistency. To examine scale stability, item-level and subscale-level correlations were conducted on data collected one-week apart from Sample 1. As Samples 2 and 3 were not direct examinations of scale stability, these were only tested at subscale level. The most common method of quantifying the test-retest stability of a scale is the use of correlation, with Pearson's r scores > .80 considered stable (Anastasi & Urbina, 1997; Kline, 1993). Paired sample t-tests were conducted to test for no difference, calculating *p*-values and 95% bootstrapped confidence intervals. Following the recommendations of Nevill et al. (2001) and Lane et al. (2005), the percentage of responses within (±1) for were calculated for Sample 1, examining change at item level. At least 80-90% of tests retest responses ±1 was considered as supportive of temporal stability.

Nicholls et al. (2020) suggested that ASDI respondents could be associated with one of four categories based on their cluster analysis: pragmatists, fair players, chancers, or Susceptibles. To determine the extent to which these remained stable, we examined the proportion of participants that moved from one cluster to another within the two time points in each sample. Using data obtained from 2,208 participants who completed ASDI previously in the Nicholls et al. (2020) study to identify cut-offs for each cluster membership, we determined the cluster for which each participant in each sample would lie, relative to the normative sample. Movement between clusters was then examined using through chi-square analyses. Data that support the findings of this study are available from the corresponding author, [AN], upon reasonable request.

Results

Preliminary analysis demonstrated no issues with outliers or normality in any sample, as all items and subscales presented acceptable skewness (< 2) and kurtosis (< 2) estimates. McDonald's omega point estimates confirmed internal consistency in each of the samples at each data collection point (Tables 2, 3, & 4).

Sample 1: One-week gap

Item level relationships are presented in Table 1, while subscale level relationships are in Table 2. All items and subscales demonstrated a significant ($p < .001$) relationship between test and retest in all correlations. Typically, this was moderate to strong. A very similar pattern emerged for item-level correlational analyses. Only three of the 43 items produced a statistically significant *t*-value, as did one of the six subscales (reference group). The percentage of responses (±1) for each item ranged from 77.17% to 95.65% for all items and 80.43% to 95.65% for subscales.

To determine the magnitude of the difference in legitimacy, we used the recommendations of Ferguson (2009) for minimum practical effect size for Cohen's $d \geq 0.41$. Here, $d = 0.23$. As such, the effect size is small to negligible in the only subscale that reported any effect.

Finally, we explored the extent to which cluster membership changed between the first and second data point. Overall, cluster size remained stable (Figure 1). Cross-tabulation suggested no significant movement between cluster ($\chi^2(9) = 2.86$, $p = .97$).

Sample 2: Eight-week gap

Subscale analysis for Sample 2 is presented in Table 3. Only reference group presented a statistically significant change over time, but with a negligible effect size ($d = 0.17$). Overall, results remained stable over an eight-week period with no intervention.

Cluster membership indicated a statistically significance change between time points ($\chi^2(9) = 152.46$, $p < .001$). Specifically, this was brought about by participants moving equally between the Pragmatists cluster and the Fair Players cluster, with 19.36% of participants moving from the former to the latter and 24.39% moving in the opposite direction. Susceptibles largely remained in their cluster (86.11%), while Chancers demonstrated the most pliable cluster membership (61.54% remained, 15.39% moved to Susceptibles, 11.54% moved to Pragmatists, and 11.54% moved to Fair Players).

Sample 3: 16-week gap

Subscale analysis for Sample 3 is presented in Table 4. Only esteem presented a statistically significant change over time, but short of minimum practical effect (d = 0.36). The correlation estimates however highlight a substantive decrease from the estimates in Sample 2, suggesting that there is variance over a 16-week period without intervention.

Cluster membership indicated a statistically significance change between time points ($\chi^2(9) = 21.59$, $p = .010$). Movement between Pragmatists and Fair Players was again shown to be likely, with 33.33% moving from the former to the latter and 29.03% moving in the opposite direction. Only 45.46% of Chancers remained in their cluster. With 27.27% becoming Pragmatists, and 22.73% becoming Susceptibles. Timepoint 1 had only identified 13 Susceptibles in this sample, but seven of those (53.85%) had become Chancers by the second time point.

Discussion

Firstly, test-retest stability, as examined in Sample 1, where the ASDI (Nicholls, Levy, et al., 2019) was completed twice with a one-week gap, was supported at item and subscale level. Researchers can use the ASDI with confidence that it has consistency over a short period. As such the ASDI is now a valid (Nicholls, Levy, et al.) and a reliable tool to assess the psycho-social constructs associated with doping among adolescents. Although other questionnaires have been used to assess doping attitudes among adolescents (e.g., PEAS; Petróczi & Aidman, 2009), the PEAS demonstrated a poor fit among adolescent athletes (Nicholls, Madigan, et al., 2017). The ASDI appears a more appropriate questionnaire to assess attitudes towards doping among athletes.

The second purpose of this study was to examine the extent to which the psycho-social variables assessed in the ASDI (Nicholls et al., 2019) were stable over an 8- and 16-week period. There was little within-subject variance in over the 8-week measurement period, indicating that the psycho-social constructs assessed by the ASDI are relatively stable. The correlation coefficients, however, across the 16-week measurement period were markedly lower in comparison to the 8-week measurement period. This finding would imply researchers could consider this when assessing psycho-social constructs to gauge the effectiveness of anti-doping interventions. It could be argued that scholars could carefully match control and intervention groups. One way of doing this would be matching athletes by adopting the normative values to generate clusters, as reported by Nicholls et al. (2020). By carefully matching the control group with the experimental group, researchers can be more confident that changes were caused by the intervention, as opposed to changes in the psycho-social doping that seem to occur with time.

Interestingly, the movement between clusters among the sample infers that these are not fixed and that athletes can change clusters in becoming more in favor or more against performance enhancing drugs. It appears that the Chancers are most likely to move clusters and appear to vulnerable to joining the Susceptibles cluster. From and education perspective, the notion that adolescents can change clusters over a relatively short period of time is both a cause for concern and optimism, in equal measures. It is a concern, because an adolescent athlete could move from a less risky doping cluster to a much riskier doping cluster, such as going from the Pragmatists to the Chancers, and then the Susceptibles. It is also a source of optimism because it infers that clusters are not fixed, indicating that exposure to anti-doping education may prevent Chancers moving into the Susceptibles cluster and may help them become either Pragmatists or Fair Players. Research is required to assess this assertion. In applied terms, national anti-doping organizations or sport federations who deliver anti-doping education could focus on trying to change the profiles of athletes and worry less about specific scores. That is, an intervention could be judged a success if there are fewer Susceptibles and Chancers at the end of an education intervention, in comparison to the start.

A limitation of this study is that three independent samples were used rather than a sample measured several times over a lengthy period. As individual differences are not accounted for, some samples could be more pre-disposed to change than others. This was a pragmatic decision to ensure sufficient sample sizes. A further limitation is that the athletes in Sample 3 were younger than Sample 1 or Sample 2. This might have contributed to the lower correlation coefficients at 16 weeks, in comparison to the eight-week period among Sample 2. This is because attitudes are actively formed during early adolescence (Cieciuch et al., 2016; Döring et al., 2015; Kjellström et al., 2017). It would be interesting to monitor the psycho-social variables across older adolescents and for a longer period. Although this research was conducted with adolescents, it might be worthwhile assessing the stability of attitudes and susceptibility towards doping among adults too. Results pertaining to the movement between clusters should also be treated with some caution, as sample sizes are relatively small and therefore, such analysis is likely to exaggerate the volatility of cluster membership, but the finding that seven athletes moved from being a Susceptible to a Chancer in 16 weeks is still concerning, given that these seven athletes are much more at risk of committing a doping offence. Cluster membership has excellent applied potential but requires further empirical research. Researchers could recruit athletes based on cluster membership to ensure that enough athletes are recruited in each cluster and then monitor change in cluster membership over time. It would be also interesting to see the extent to which education programmes influence cluster membership too.

The findings that key psycho-social doping variables are less stable over time among adolescent athletes has implications for the delivery of anti-doping interventions that target constructs such as attitudes and susceptibility towards doping. Although interventions have been successful at reducing favorable attitudes towards doping among adolescent athletes (e.g., Nicholls et al., 2020), the effectiveness of such interventions might waiver over time, given the changing nature over time. Furthermore, adolescence is a period of a person's life when he or she is susceptible to peer pressure. Indeed, peer pressure accounts for why people may engage in delinquent or risky behavior (Simons-Morton et al., 2005), such as taking banned substances. Some adolescent athletes may dope to impress their friends, as Moffitt (1993) found that one of the main reasons why adolescents engage in delinquent behavior is to impress their peers. Regularly providing adolescent athletes with anti-doping education could circumvent any negative influences and address any changes in attitudes, should they occur.

The adolescent athletes in this study were all involved in competitive sport. Doping among young people is not solely confined to competitive sport, as there is evidence of doping within recreational sport. That is, Christiansen et al. (2023) examined doping prevalence among 7, 260 individuals who participate in recreational sport and found that 10.4% reported using over-the-counter medications to enhance their performance and that 6.9% of participants involved in games (e.g., football, tennis, volleyball) doped. Whether individuals are involved in competitive or recreational sport, the United Kingdom Anti-Doping (2021) report suggested that doping is a 'public health timebomb.' PEDs are associated with very serious side effects such as liver and kidney disease, cancer, heart disease, mood disorders, and suicide ideation and attempt, and early and preventable mortality (Lindqvist et al. 2013; McNamee, 2015; Piacentino et al., 2022). The costs to treating illnesses cause by doping places a burden on healthcare services by increasing the demand for treatment along with these associated costs (McVeigh et al., 2021). For these reasons, it appears important to offer people involved in competitive and recreational sport education about PEDs.

Conclusion

The ASDI (Nicholls, Levy, et al., 2019) is reliable measure of assessing key psycho-social variables that are linked to doping behavior, particularly over shorter periods of time. It appears that psycho-social variables towards doping, such as attitudes and susceptibility are less stable over a period of 16 weeks, certainly among young adolescent athletes, but that athletes can move cluster profiles, with those in the Chancer cluster being vulnerable to moving into the Susceptibles cluster. This could infer that an adolescent athlete would require repeated anti-doping education rather than just receiving one intervention.

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Table 1.
The minimum and maximum test-retest differences, means and standard deviations per item per test, *t* statistic, product-moment correlations (*r*), intraclass correlations (ICC), and percentage of participants with differences within (±1) for Sample 1

Item	Test 1				Test 2				*t*	*r* (95% CI)	ICC (95% CI)	% (±1)
	Min	Max	Mean	SD	Min	Max	Mean	SD				
1	1.00	5.00	2.01	1.29	1.00	6.00	2.00	1.33	.13	.80*** (.67, .90)	.89 (.83, .93)	93.48
2	1.00	5.00	2.52	1.49	1.00	6.00	2.45	1.49	.82	.82*** (.70, .91)	.90 (.85, .94)	93.48
3	1.00	6.00	2.23	1.44	1.00	6.00	2.23	1.43	.00	.86*** (.76, .93)	.92 (.88, .95)	95.65
4	1.00	6.00	2.47	1.55	1.00	7.00	2.58	1.60	-1.18	.84*** (.75, .92)	.92 (.87, .94)	89.13
5	2.00	7.00	4.82	1.56	2.00	7.00	4.65	1.56	1.27	.69*** (.51, .82)	.81 (.72, .88)	83.70
6	1.00	7.00	4.86	1.42	2.00	7.00	4.84	1.60	.16	.61*** (.46, .75)	.75 (.63, .84)	80.43
7	2.00	7.00	4.93	1.40	1.00	7.00	4.65	1.54	2.12*[1]	.63*** (.46, .77)	.77 (.65, .85)	81.52
8	1.00	7.00	4.93	1.41	2.00	7.00	4.89	1.41	.35	.64*** (.50, .75)	.78 (.66, .85)	82.61
9	1.00	7.00	2.77	1.60	1.00	7.00	2.80	1.65	-.20	.55*** (.35, .73)	.71 (.55, .81)	77.17
10	1.00	6.00	2.66	1.63	1.00	7.00	2.83	1.63	-1.24	.70*** (.56, .81)	.82 (.73, .88)	82.61
11	1.00	7.00	2.77	1.67	1.00	7.00	2.60	1.60	1.12	.58*** (.41, .74)	.74 (.60, .83)	77.17
12	1.00	6.00	2.62	1.54	1.00	7.00	2.52	1.52	.80	.71*** (.57, .82)	.83 (.74, .89)	80.43
13	1.00	6.00	2.23	1.47	1.00	6.00	2.14	1.41	.71	.66*** (.51, .81)	.80 (.69, .87)	81.52
14	1.00	7.00	4.95	1.61	1.00	7.00	4.76	1.55	1.83	.81*** (.72, .89)	.90 (.84, .93)	88.04
15	1.00	7.00	5.02	1.50	2.00	7.00	4.88	1.39	1.31	.75*** (.65, .84)	.85 (.78, .90)	90.22
16	1.00	7.00	5.07	1.52	2.00	7.00	4.91	1.45	1.69	.83*** (.73, .90)	.91 (.86, .94)	92.39
17	2.00	7.00	5.14	1.52	2.00	7.00	5.07	1.32	.87	.83*** (.72, .91)	.91 (.86, .94)	94.57
18	2.00	7.00	4.60	1.33	2.00	7.00	4.66	1.31	-.61	.70*** (.55, .82)	.82 (.73, .88)	89.13
19	1.00	6.00	2.53	1.45	1.00	6.00	2.62	1.54	-.78	.75*** (.58, .88)	.85 (.78, .90)	88.04
20	1.00	5.00	2.46	1.47	1.00	7.00	2.63	1.52	-1.43	.70*** (.53, .85)	.82 (.73, .88)	86.96
21	1.00	5.00	2.09	1.29	1.00	6.00	2.10	1.36	-.14	.85*** (.74, .94)	.92 (.87, .95)	95.65
22	1.00	7.00	2.47	1.59	1.00	6.00	2.46	1.54	.13	.86*** (.79, .93)	.93 (.89, .95)	94.57
23	1.00	7.00	2.67	1.69	1.00	7.00	2.55	1.65	.99	.76*** (.60, .89)	.86 (.79, .91)	90.22

24	2.00	7.00	4.67	1.45	1.00	7.00	4.42	1.41	1.93	.62*** (.45, .77)	.77 (.64, .84)	83.70
25	1.00	7.00	4.77	1.45	1.00	7.00	4.58	1.26	1.56	.61*** (.45, .76)	.75 (.63, .84)	83.70
26	2.00	7.00	4.79	1.33	1.00	7.00	4.65	1.35	1.25	.67*** (.52, .80)	.81 (.71, .87)	83.70
27	2.00	7.00	4.59	1.26	1.00	7.00	4.55	1.30	.29	.65*** (.49, .76)	.79 (.68, .86)	88.04
28	1.00	7.00	4.53	1.42	1.00	7.00	4.72	1.39	-1.38	.58*** (.37, .78)	.74 (.60, .83)	86.96
29	1.00	7.00	2.93	1.63	1.00	7.00	2.57	1.65	2.29*[1]	.58*** (.37, .77)	.74 (.60, .82)	79.35
30	1.00	7.00	2.67	1.60	1.00	6.00	2.53	1.59	1.16	.73*** (.57, .87)	.84 (.76, .90)	86.96
31	1.00	7.00	2.50	1.50	1.00	7.00	2.37	1.49	1.14	.73*** (.55, .88)	.84 (.76, .90)	90.22
32	1.00	7.00	2.65	1.61	1.00	7.00	2.34	1.48	2.44*[1]	.68*** (.51, .83)	.81 (.71, .87)	84.78
33	1.00	7.00	2.60	1.55	1.00	6.00	2.42	1.43	1.58	.75*** (.58, .88)	.86 (.78, .91)	90.22
34	1.00	7.00	3.63	1.37	1.00	6.00	3.42	1.41	1.53	.57*** (.36, .73)	.72 (.58, .82)	82.61
35	1.00	7.00	3.11	1.50	1.00	7.00	3.02	1.44	.63	.60*** (.40, .77)	.75 (.62, .83)	82.61
36	1.00	7.00	3.15	1.54	1.00	6.00	3.21	1.43	-.36	.54*** (.34, .71)	.70 (.54, .80)	76.09
37	1.00	7.00	3.32	1.48	1.00	7.00	3.35	1.49	-.25	.65*** (.46, .79)	.79 (.68, .86)	83.70
38	1.00	6.00	3.45	1.44	1.00	7.00	3.35	1.46	.79	.67*** (.52, .79)	.80 (.70, .87)	80.43
39	1.00	7.00	2.13	1.44	1.00	7.00	2.13	1.44	.00	.77*** (.55, .92)	.87 (.80, .91)	93.48
40	1.00	7.00	2.17	1.40	1.00	6.00	2.16	1.30	.11	.74*** (.52, .90)	.85 (.77, .90)	94.57
41	1.00	7.00	2.35	1.54	1.00	7.00	2.30	1.49	.41	.78*** (.59, .92)	.87 (.81, .92)	92.39
42	1.00	6.00	2.33	1.50	1.00	6.00	2.30	1.36	.28	.87*** (.80, .92)	.93 (.89, .95)	95.65
43	1.00	7.00	2.24	1.51	1.00	6.00	2.14	1.33	.89	.73*** (.54, .87)	.84 (.76, .89)	90.22

Notes: *Statistically significant at $p < .05$, **$p < .01$, ***$p < .001$. [1]95% bootstrapped confidence interval does not include zero

Table 2.

Means and standard deviations per subscale per test, *t* statistic, product-moment correlations (*r*), and intraclass correlations (ICC) for Sample 1

Subscale	Test 1					Test 2					*t*	*r* (95% CI)	ICC (95% CI)	% (±1)
	Min	Max	Mean	SD	ω	Min	Max	Mean	SD	ω				
Attitudes	1.00	5.25	2.31	1.28	.91	1.00	6.25	2.31	1.35	.94	-.09	.90*** (.83, .95)	.95 (.92, .96)	94.57
Threat	2.50	7.00	4.89	1.24	.87	2.00	7.00	4.76	1.35	.91	1.40	.77*** (.66, .87)	.87 (.81, .92)	83.70
Benefit	1.00	5.60	2.61	1.39	.93	1.00	6.40	2.58	1.38	.93	.32	.74*** (.60, .85)	.85 (.78, .90)	81.52
Esteem	2.00	7.00	4.95	1.35	.94	2.60	7.00	4.86	1.23	.93	1.42	.87*** (.78, .94)	.93 (.90, .95)	94.57
Cheating	1.00	5.20	2.44	1.27	.90	1.00	6.00	2.47	1.34	.93	-.49	.91*** (.85, .96)	.95 (.93, .97)	95.65
Legitimacy	1.80	7.00	4.67	1.08	.83	1.00	7.00	4.59	1.22	.89	1.04	.73*** (.61, .84)	.85 (.77, .90)	85.87
Reference Group	1.00	7.00	2.67	1.42	.94	1.00	6.60	2.45	1.40	.95	2.24*[1]	.77*** (.58, .92)	.87 (.80, .91)	90.22
Stress	1.20	6.20	3.33	1.18	.87	1.00	5.80	3.27	1.22	.90	.60	.67*** (.49, .81)	.80 (.70, .87)	80.43
Susceptibility	1.00	6.00	2.24	1.35	.95	1.00	5.80	2.21	1.27	.95	.46	.85*** (.68, .95)	.92 (.87, .94)	93.48

Notes: *Statistically significant at $p < .05$, ** $p < .01$, *** $p < .001$. [1]95% bootstrapped confidence interval does not include zero

Table 3.

Means and standard deviations per subscale per test, *t* statistic, and product-moment correlations (*r*) for Sample 2

Subscale	Test 1					Test 2					*t*	*d*	*r* (95% CI)
	Min	Max	Mean	SD	ω	Min	Max	Mean	SD	ω			
Attitudes	1.00	6.50	2.56	1.42	.91	1.00	7.00	2.75	1.63	.95	-1.12	-0.10	.48*** (.34, .60)
Threat	1.00	7.00	4.59	1.48	.95	1.00	7.00	4.45	1.61	.96	1.06	0.09	.51*** (.37, .63)
Benefit	1.00	6.60	2.87	1.56	.96	1.00	6.40	3.03	1.46	.96	-1.44	-0.12	.61*** (.49, .71)
Esteem	1.20	7.00	5.26	1.40	.94	1.40	7.00	5.12	1.34	.93	1.44	0.13	.66*** (.56, .75)
Cheating	1.00	7.00	2.62	1.43	.93	1.00	6.20	2.62	1.46	.95	-0.05	-0.00	.68*** (.58, .76)
Legitimacy	1.00	7.00	4.81	1.19	.85	1.00	7.00	4.70	1.26	.91	1.13	0.10	.59*** (.47, .69)
Reference Group	1.00	7.00	2.56	1.54	.95	1.00	6.60	2.37	1.40	.95	2.02*[1]	0.17	.72*** (.62, .79)
Stress	1.00	6.40	3.25	1.27	.86	1.00	5.80	3.28	1.28	.90	-0.34	-0.03	.63*** (.51, .72)
Susceptibility	1.00	7.00	2.37	1.48	.96	1.00	6.60	2.43	1.46	.98	-0.59	-0.05	.71*** (.62, .79)

Notes: *Statistically significant at $p < .05$, **$p < .01$, ***$p < .001$. [1]95% bootstrapped confidence interval does not include zero

Table 4.

Means and standard deviations per subscale per test, *t* statistic, and product-moment correlations (*r*) for Sample 3

Subscale	Test 1					Test 2					*t*	*d*	*r* (95% CI)
	Min	Max	Mean	SD	ω	Min	Max	Mean	SD	ω			
Attitudes	1.00	7.00	2.36	1.56	.94	1.00	7.00	2.47	1.55	.97	-0.50	-0.05	.18 (-.03, .38)
Threat	1.00	7.00	4.56	1.67	.95	1.00	7.00	4.25	1.72	.94	1.27	0.14	.09 (-.12, .30)
Benefit	1.00	7.00	3.28	1.76	.97	1.00	7.00	3.21	1.54	.98	0.31	0.03	.29** (.08, .47)
Esteem	2.80	7.00	6.13	0.86	.77	1.40	7.00	5.64	1.34	.93	3.33*[1]	0.36	.31** (.10, .49)
Cheating	1.00	7.00	2.89	1.83	.94	1.00	7.00	2.77	1.66	.96	0.51	0.05	.25* (.04, .44)
Legitimacy	1.00	7.00	5.06	1.46	.92	1.00	7.00	4.76	1.45	.93	1.78	0.19	.20 (-.02, .40)
Reference Group	1.00	7.00	2.34	1.69	.94	1.00	7.00	2.50	1.56	.95	-0.77	-0.08	.31** (.10, .49)
Stress	1.00	7.00	3.11	1.46	.89	1.00	6.20	3.04	1.38	.89	0.46	0.05	.36*** (.16, .53)
Susceptibility	1.00	7.00	2.54	1.78	.96	1.00	7.00	2.49	1.57	.96	0.56	0.06	.31** (.10, .49)

Notes: *Statistically significant at $p < .05$, ** $p < .01$, *** $p < .001$. [1]95% bootstrapped confidence interval does not include zero

Figure 1:

Cluster membership within each data point for all three samples.