

Impact of an Anti-doping Education Session on Knowledge, Attitudes and Beliefs Among University Students in sports-related Programmes

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ABSTRACT

Background: Reports of doping cases have put Kenya's renowned athletic prowess into disrepute. The impact of educational interventions spearheaded by Anti-doping Agency of Kenya (ADAK) is unknown, with sessions hardly being appraised. **Objective:** This study examined the efficacy of an anti-doping education session in impacting the knowledge, attitudes and beliefs (KAB) among university students in sport-related courses. It was postulated that there would be significant changes in the students' KAB after the anti-doping education session, moderated by age, gender, year of study, sport competition experience and study programme clusters. **Methods:** Cross-sectional and quasi-experimental designs were applied. Data were collected through self-administered questionnaires before and after a one day anti-doping education session conducted by the ADAK. Participants ($n=174$) were students from three sports-related academic programmes who are expected to occupy athletes' support personnel positions after graduation. **Results:** Wilcoxon Signed Ranks Test showed significant differences in general knowledge on performance-enhancing substances (PES) ($Z=-6.084$; $p<.001$) and attitude towards doping ($Z=-4.050$; $p<.001$), with the post-session test registering higher positive mean rank scores (72.41 vs 42.75 and 72.64 vs 61.79, respectively). There were significant differences across study programmes in prior knowledge of anabolic steroids ($p=.003$) and stimulants ($p=.018$) as doping agents. Regression analyses showed significant influence (*Adjusted R Square* =.109; $p<.001$) by year of study ($p=.001$), degree programme ($p=.007$) and athlete status ($p=.030$). **Conclusion:** There is a need to customize students' anti-doping intervention sessions based on age category, athletic status, and courses of study to optimise doping prevention education outcomes.

Key words: Doping In Sports, Performance-enhancing Substances, Physical Education and Training

INTRODUCTION

In the recent past, spanning the first two decades of 21st century, a number of Kenyan elite distance runners, bodybuilding, boxing and swimming have been implicated in anti-doping rule violations (ADRV's). For example, between 2004 and 2018, a total of 138 Kenyan athletes from different sports had tested positive for prohibited substances (WADA, 2018).

In the current (year 2024) Global List of Ineligible Persons, the country is ranked third by number of violators -behind Russia and India (Athlete Integrity Unit [AIU], 2024). These put the country's renowned athletic prowess into disrepute. Some studies suggest that the use of performance-enhancing substances (PES) among athletes in Kenya is driven by several factors, including the desire to excel (Boit et al., 2014; GOK, 2014), lack of awareness (Kamenju et al., 2016;

Chebet, 2014), external pressures (Boit et al., 2014), and the aim to boost performance (GOK, 2014). Doping prevention efforts should assess the knowledge, attitudes and beliefs (KAB) of students in sport-related courses to appraise their orientation in regard to use of PES in sports (Kamenju et al., 2016; Mwangi et al., 2019; Zelli et al., 2010). This is apt, as their future professional careers will place the students in decision-making positions such as physical education (PE) teachers, sport officers, coaches, technical officials of anti-doping agency of Kenya (ADAK) and gym instructors. Moreover, university students are generally influential among their peers and the wider community, and thus, their favourable attitudes towards doping or otherwise could permeate the wider society (Fung & Yuang, 2006).

Previous studies have indicated a link between attitudes and intentions regarding doping behaviour, with these intentions potentially predicting the future use of doping substances among both non-athletes and professional athletes (Alaranta et al., 2006; Petroczi et al., 2008; Wiefferink et al., 2007). Among sport science students, there is a belief that using PES can result in improved sports performance and muscle development (Bassoli et al., 2004; Bondarev et al., 2008). Moreover, it appears that a good proportion of sports science students are naïve about sources of reliable information on PES, the side effects of doping, and testing procedures (Aguilar-Navarro et al., 2022; Blank et al., 2021; Garcia-Marti et al., 2022).

Multiple studies have indicated that male athletes have a higher likelihood of engaging in doping compared to female athletes (Corbin et al., 2004; Lucidi et al., 2008; Peretti-Watel et al., 2004; Peters et al., 2005). The reported male athletes' reasons for doping are mainly desire to enhance performance and winning, and influence of coaches and peers (Peters et al., 2005). In contrast, Collins et al. (2012) argued that female athletes' feelings of shame and guilt in the event of being caught may deter them from doping. Therefore, male athletes have more positive attitudes towards PES than females (Lucidi et al., 2008; Peretti-Watel et al., 2004). It was, therefore, important to establish whether these gender differences exist among students in sport-related programmes in Kenya.

The correlation between a player's age and playing experience with their anti-doping attitude is anticipated, particularly if these factors are associated with positive experiences (Corluka et al., 2011). It is argued that doping knowledge increases with age and competitive level (Bassoli et al., 2004). According to Singhammer (2012), older individuals tend to exhibit more negative attitudes towards doping. It was apt to examine whether the age and level of study of students in sport-related study programmes will moderate their KAB, and the efficacy of anti-doping education sessions. Several studies have examined doping among university students in various countries and have yielded mixed results (Kumar & Jyoti, 2013; Lucidi et al., 2008; Peretti-Watel et al., 2004; Takahashi et al., 2013). Peretti-Watel et al. (2004) discovered that elite French student-athletes who engage in doping pursue legitimate goals through illegitimate means, often justifying their actions with flawed reasoning. Vangrunderbeek

and Tolleneer (2010) observed that elite student-athletes in human movement studies tend to adopt a more flexible ethical stance on doping, moving away from the zero-tolerance principle towards a more lenient perspective. Consequently, it seems that human movement science students critique the strict and internationally endorsed "Zero tolerance" doping policy. The current study sought to explore the local context in this regard and the possible moderating factors.

A study by Kumar and Jyoti (2013) indicated that the majority of university students perceived doping as cheating and opined that a complete ban on doping in sports was necessary. However, studies conducted by Pavlovic & Pupils (2013) and Pavlovic & Idrizovic (2013) in East Sarajevo reported insufficient knowledge and awareness of the negative effects of doping in sports among PE and sport students. Takahashi et al. (2013) found that among Japanese university students, 79.1% had negative attitudes toward doping, while 20% approved of drug use in sports. The authors reported that 10% of student-athletes had used drugs to enhance sports performance. This is supported by earlier assertions by Petroczi et al. (2008) that college students' view doping as useful for ones' athletic performance. Similarly, after assessing the motives, attitudes, and beliefs regarding the use of legal and prohibited substances among university students ($n=571$), Blank et al. (2016) found that 24.9% of them used legal nutritional supplements, while 9.4% consumed prohibited performance-enhancing substances (PES). The students cited staying awake and enhancing physical performance as the primary motives for using PES. Sanchez et al. (2013) on the other hand reported that education on doping among sports science students, footballers, and technical officials in Spain led to negative attitudes toward doping. Aguilar-Navarro et al. (2022) assessed the anti-doping knowledge of students ($n=1233$) pursuing a Bachelor's degree in sport sciences in Spanish universities and found that students participating in sports competitions had the highest anti-doping knowledge followed by those studying health-related courses. Hence, it seems that university students globally possess limited knowledge about doping, use performance-enhancing substances (PES), and exhibit varied attitudes and perceptions towards doping. Consequently, it was essential to investigate the knowledge, attitudes, and perceptions of PE, sports management, and sport science students towards doping as future athlete support personnel in Kenya. This was conducted in conjunction with ADAK whose mandate is *inter alia* to provide anti-doping prevention education to athletes and their entourage.

In Kenya, various studies have explored doping knowledge, attitudes, perceptions, sources of information on doping, and sources of performance-enhancing substances (PES) among athletes across different sports and levels of competition (Boit et al., 2014; GOK, 2014; Kamenju et al., 2016; Mwangi et al., 2019; Rintaugu & Mwangi, 2020; Chebet, 2014). Kamenju (2014) found that among teacher-trainees, college athletes exhibited low knowledge and awareness of doping, as well as wrong perceptions. Mwangi et al. (2019) found that 29% of East African university student-athletes were likely to engage in future doping behaviors. In a related

study, Rintaugu and Mwangi (2020) reported that there were significant associations between the sources of information on doping and the selected demographic variables of age, gender, year of study and playing experience among university students studying PE and sport science. They concluded that most university students had anti-doping attitudes and right perceptions about doping, but a substantive proportion required more information on doping. However, these studies were inconclusive, calling for further investigation of the doping-related matters among university students in the country.

In order to enhance the knowledge, attitudes and beliefs on doping among students and athletes, numerous interventions have been implemented by World Anti-Doping Agency (WADA) and National Anti-Doping Organizations (NADOs), but reports about their efficacy in changing attitudes towards doping are scanty and conflicting. For example, Barkoukis et al. (2015) investigated the effectiveness of a school-based intervention aimed at promoting anti-doping culture in adolescents and found significantly weaker attitudes towards doping and increased norm salience among the intervention group participants. In a similar study, Medina et al. (2019) assessed the effectiveness of a school-based programme to improve KAB about doping among adolescents ($n=540$) in eight Spanish schools. They found that KAB towards doping improved in the experimental group compared to the control group, and concluded that school-based programme may be useful for improving KAB about doping among adolescents. Codella et al. (2019) sought to cause a cultural shift in young people by taking anti-doping seminars to high schools. This involved a 2-hour seminar based on WADA-play true quiz (15 items). Upon completion of the 2-hour seminar, majority of the answers given by the students resulted in correct (13 out of 15 items) answers confirming the value of the initiative. Garcia-Marti (2022) investigated the impact of an anti-doping education program on the perceived efficacy, ill-health, short and long-term effects, and morality of doping substance use among Spanish Sport Science students ($n=145$). The study revealed that the course reduced students' ignorance regarding the effects of these substances on performance and health, while also enhancing their moral judgment and attitudes against doping. There is a paucity of data on the effectiveness of interventions at local level, in a country experiencing an increasing doping menace. Therefore, the primary purpose of this study was to examine the knowledge, attitudes and beliefs towards doping among students taking sport-related courses—a crucial population expected to occupy pivotal sport leadership positions upon completion of their studies, in the foremost university offering sports-related studies in the country and the East and Central African region. The study's secondary purpose was to evaluate the efficacy of an anti-doping education session in modifying the students' KAB. It was hypothesized that the students' age will moderate the above dependent variables, gender, programme and year of study as well as sport participation experience.

The study was based on the theory of attitude structure (tripartite model of attitudes), which proposes that an atti-

tude comprises three components: affective, cognitive, and behavioural. The affective component pertains to the emotions related to the attitude object. The cognitive component is based on information, knowledge, and beliefs about the attributes of the attitude object. The behavioral component is linked to past behaviors and future intentions concerning the attitude object (Fabrigar et al., 2014). The theory helps understand the complexity and the potential relationship between attitudes and behavior. In case of this study, the information shared during the ADAK session was expected to largely influence the cognitive component of attitude towards doping (attitude object), and by extension the affective and behavioral components.

METHODS

Research Design and Study Participants

Cross-sectional and quasi-experimental research designs were applied. Questionnaires were administered before (pre-test) and after (post-test) one-day seminar organized by ADAK, among 174 participants derived from the three sports-related academic programmes: physical education (PE), exercise and sport science (ESS) and recreation and sport management (RSM) of Kenyatta University—the leading institution teaching these programmes in the East and Central Africa region. The three programmes have students who are taught units/courses relating to use of performance-enhancing substances. These students are expected to occupy prime positions after graduation such as PE teachers, coaches, sport administrators, fitness instructors and team managers, all considered athletes' support personnel by the World Anti-Doping Code. Convenience and census sampling were utilized to pick the study participants, with all the students invited for the anti-doping session requested to fill the study questionnaires.

Intervention Programme Session

The ADAK anti-doping education session covered the following areas: overview; principles and values; athletes' anti-doping rules; roles and responsibilities; consequences of doping; Anti-doping rule violations (ADRV's); result management; food supplements; Therapeutic use exemptions (TUE's); Sample collection process; Athletes declaration of whereabouts and Speaking (whistle blowing) about doping food supplements, principles and values associated with clean sport and sports nutrition. The content was closely aligned with that of similar topics covered in the WADA e-learning platform (WADA, 2023). The facilitators of the session were ADAK education and training officers who have been trained by Anti-Doping Norway (ADNO) through a collaborative partnership with WADA/ADAK (WADA, 2015) on how to facilitate education sessions to athletes and athlete support personnel. Delivery of the session included power point presentation, scenario analysis, problem-solving and group discussions, as well as question and answer sessions. The session lasted from 9am to 4pm -including short health breaks.

Instruments

Data were collected using a self-administered questionnaire that comprised four sections. The questionnaire was designed by lecturers who are experts in research methods and anti-doping together with the director in charge of education and research at ADAK. Items were majorly derived from the WADA e-learning platform (WADA, 2023) to ensure high validity. Section 1 gathered demographic details of the respondents, including age, gender, and year of study. Section 2 assessed students’ knowledge on doping, such as sources of information, substances that enhance sports performance, and the use of anabolic steroids and stimulants. These items were scored using Yes/No or True/False options. Section 3 examined attitudes towards doping, utilizing a modified version of the Performance Enhancement Attitude Scale (PEAS) (Petroczi & Aidman, 2009). The scale included 17 items measuring self-declared attitudes towards doping, with statements like “doping is necessary to be competitive,” “doping is not cheating since everyone does it,” and “athletes often lose time due to injuries, and drugs can help make up the lost time.” Participants responded to each item on a 5-point Likert scale, ranging from strongly agree to strongly disagree -thus the lower aggregate score indicated more pro-doping attitude and the higher aggregate score indicated more negative attitude towards doping. An acceptable reliability index (>.70) of the scale has been reported in previous studies involving college and elite athletes (Petroczi & Aidman, 2009). Section 4 sought information on the beliefs/perceptions about doping, with 7 items weighted on a 5-point Likert scale. The questionnaire was administered in the morning before the start of the session and subsequently in the evening after the session was concluded, indicating a time difference of eight hours. Split-half reliability analyses for the combined questionnaire items showed an acceptable level (Spearman-Brown Coefficient =.674).

Ethical Considerations

The study protocol was agreed upon by the parties involved -ADAK and Kenyatta University. Before data collection, the purpose and procedures of the study were explained to the students, who were also informed that their participation is voluntary, thus they were free to decline to participate in the study at any stage without any repercussion. Data were collected from the participants, who gave verbal informed consent. They were assured of confidentiality and instructed to be as honest and candid as possible in their responses

Data Analysis

Data were coded and analyzed using SPSS Version 26. Data from the 5-point Likert scale were transformed to linear percentage of maximum possible (POMP) scores as recommended by Cohen et al. (1999). Descriptive statistics, including means, standard deviations and median were calculated. Inferential statistics included Mann Whitney U, Kruskal-wallis, Wilcoxon Signed Ranks tests and regression analyses. Shapiro-Wilk tests of normality showed that the

data distribution ($p <.05$) did not meet the assumption of parametric analyses for most variables (apart from attitude pre-test POMP scores, where $p=.073$), thus informing the choice of the above statistical methods. For inferential statistics, a probability level of 0.05 or less was taken to indicate significance.

RESULTS

Characteristics of the Participants

Of the total sample of 174 participants, 86 (49.4%) were males and 88 (50.6%) females. In regards to age, the majority (126; 72.4%) were in the 21-23 years category, followed by those older than 23 years (37; 21.3%), and the least were those younger than 20 years (11; 6.3%). In terms of degree programmes, 69 (39.7%) were pursuing Bachelor of Science (Exercise and Sport Science), 55 (31.6%) were in B.Ed (Physical Education) and 50 (28.7%) in Bachelor of Science (Recreation and Sport Management). Most of the students (117; 67.2%) were in their fourth year of study, 27(15.5%) in third year, 18 (10.3%) in first year, and 12(6.9%) in the second year of study. Seventy-one (40.8%) of the respondents were participating in sport competitions at the inter-university level, while 103(59.2%) did not. Of those who participated in sports, 35 (47.29%) were in ballgames, 27 (36.84%) were in racket and batting games, 8(10.81%) were in swimming and 4(5.4%) were in athletics. Ninety-eight (56%) had been taught a subject, unit or topic on doping during their studies while 76(43.7%) had not, while 45(25.9%) had attended other courses or sessions on doping.

The results on the participants’ sources of information on doping are presented in Table 1, while changes in KAB about doping are presented in Table 2.

Table 1 shows that the sources of information on doping among the students were mainly the internet (78.7%), lectures (73.6%), social media (71.3%), television (69.5%) and newspapers (60.3%). The least sources of information on doping were parents (21.3%), seminars (31%), radio (41.4%), college (48.3%), and friends (56.9%). Descriptive

Table 1. Sources of information/knowledge of doping (n=174)

S/no	Source	Yes		Somewhat		No	
		n	%	n	%	n	%
1	Internet	137	78.7	19	10.9	18	10.3
2	Social Media	124	71.3	25	14.4	25	14.4
3	Lectures	128	73.6	18	10.3	28	16.1
4	Television	121	69.5	20	11.5	33	19.0
5	Newspapers	105	60.3	31	17.8	38	21.8
6	Friends	99	56.9	29	16.7	46	26.4
7	College	84	48.3	33	19.0	57	32.8
8	Radio	72	41.4	30	17.2	72	41.4
9	Magazines	66	37.9	29	16.7	79	45.4
10	Seminars	103	59.2	17	9.8	103	59.2
11	Parents	37	21.3	21	12.1	116	66.7

data on the participants' KAB at pre-test and post-test as well as results on Wilcoxon Signed Ranks Tests are presented in Table 2.

Results in Table 2 show that there were apparent positive changes in scores of general and specific knowledge on substances which enhance performance (except on stimulants), as well as attitudes and beliefs about doping. Kruskal Wallis test analyses showed that students enrolled in the Exercise and Sport Science programme had lower pre-test scores than those pursuing the Physical Education programme in the knowledge of anabolic steroid ($p=.003$) and stimulants ($p=.018$) as doping agents. The results of Wilcoxon Signed Ranks Test comparing the pre-test and post-test scores showed significant difference only concerning general knowledge on substances that can enhance sport performance ($Z= -6.084$; $p<.001$) and attitude towards doping ($Z= -4.050$; $p<.001$). The post-session test had higher positive mean rank scores (72.41 vs 42.75 and 72.64 vs 61.79, respectively). This indicates that the session was successful in imparting general knowledge and bridging scores on attitudes towards doping, but had less impact on knowledge of specific PES and beliefs about doping.

The study was also set out to establish whether the impact of the session will be influenced by students' gender, age category, athletic status, level of study, and/or and study programme. This was achieved by comparing the changes in scores between pre-test and post-test sessions across the various demographic clusters using Mann Whitney U test and Kruskal-Wallis test, as well as through regression analyses. The results showed no significant differences ($p>.05$) across gender and degree programme, but differences in changes of scores on attitude towards doping were evident across

the students' athletic status ($p=.035$), age category ($p=.002$) and level of study ($p=.050$). Student-athletes recorded significantly lower mean rank score than non-athletes students (77.85 vs. 94.16; $p=.035$). Dunn's post hoc pairwise comparison showed that students older than 23 years had significantly lower mean rank score than those aged 21-23 years (65.39 vs 95.72; $p=.004$). Results of regression analyses exploring the influence of the students' gender, age category, athletic status, level of study, and/or study programme on KAB changes following the anti-doping education session are presented in Table 3 below.

Regression analyses results (Table 3) showed a significant influence on attitude towards doping change (Model *Adjusted R Square* =.109; $p<.001$) by year of study ($Beta = .241$; $p=.001$), degree programme ($Beta = -.213$; $p=.007$), and athlete status ($Beta = -.166$; $p=.030$). The other independent variables explored did not show a significant influence on KAB changes.

DISCUSSION

The purpose of this study was to assess KAB about doping among university students in sports-related degree programmes before and after one-day session organized by ADAK. This was apt as the students will play pivotal roles in anti-doping crusade based on anticipatory socialization and professional work as athletes' support personnel after graduation. Secondly it was necessary to evaluate the efficacy of the ADAK session in changing the students' KAB. Over 50% of the students had been taught a topic/unit on doping in their degree programmes. This finding compares with the results of a previous study, which indicated that 75% of the

Table 2. Pomp score means, standard deviations and median on knowledge, attitudes and beliefs at pre-test and post-test scores, and wilcoxon signed ranks test results ($n=174$)

Variable	Pre-test			Post-test			Wilcoxon Signed Ranks Test	
	Mean	SD	Median	Mean	SD	Median	Z	Asymp. Sig. (2-tailed)
General Knowledge on PES	66.97	13.52	67.860	74.43	15.36	78.570	-6.084	0.000
Knowledge on Anabolic steroids	31.61	8.85	31.110	31.34	10.29	28.890	-1.064	0.287
Knowledge on Stimulants	31.47	10.97	33.330	30.93	12.33	28.570	-0.716	0.474
Attitudes towards doping	70.24	12.97	70.000	73.71	12.88	73.750	-4.050	0.000
Beliefs about doping	59.91	13.83	60.710	61.19	14.16	60.710	-1.254	0.210

Table 3. Regression Coefficients on influence of independent variables on attitude towards doping change following anti-doping education session (Model *Adjusted R Square*=0.109; $p<.001$)

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	7.521	5.707		1.318	0.189	-3.746	18.788
Year of study	2.918	0.881	0.241	3.313	0.001	1.179	4.656
Gender	-2.105	1.907	-0.087	-1.104	0.271	-5.869	1.659
Age	-2.195	1.816	-0.092	-1.209	0.228	-5.780	1.390
Degree programme	-3.313	1.216	-0.213	-2.725	0.007	-5.713	-0.913
Athlete status	-4.080	1.859	-0.166	-2.195	0.030	-7.749	-0.410

students had been taught a topic related to doping (Rintaugu & Mwangi, 2020). Therefore, the university PE curriculum appears to be cognizant of the importance of creating awareness on doping in sports. Secondly, the same previous study had found that 43% of the students had attended courses or seminars on doping, while the current study indicated that 25.9% of the students had attended similar courses. Consequently, it is expected that the participants possessed the necessary knowledge, the right attitudes and beliefs (KABs) regarding doping. Additionally, it seems that doping is a cross-cutting subject within various degree programs offered at different universities. Notably, doping is addressed in courses such as sports nutrition, training methods, and biochemistry-related units. The results of the present study showed that 59.2% of the students had not participated in external sports competitions. This is worrying as students in these departments are supposed to be strong pillars of sports representation in their universities.

The three main sources of information on doping among the students were the internet, lecturers and social media. These sources are comparable to those reported in Kamenju (2014), where the main source of information on doping among athletes in teacher training colleges was the broadcast media. It is important to note that not all information posted on the internet is credible. Therefore, it is important that the students get information from credible and reliable online sources. As much as the students derived information on doping from different sources, Rintaugu and Mwangi (2020) had reported that the main sources of information on doping among a similar cohort were lecturers/members of faculty. Consequently, members of the faculty are advised to direct students to credible online resources such as WADA and ADAK websites for reference materials.

Results of the current study indicated that during the pre-test, the students had above average general knowledge on illicit drugs that could enhance sport performance, but scored poorly on anabolic steroids and stimulants. However, the students had negative attitudes towards doping and desirable perceptions on doping. These findings are mirrored in Pavlovic and Pupils' (2013) study, where university students in Sarajevo had insufficient knowledge and negative attitudes towards doping. Similarly, studies by Takahashi et al. (2013) and Sanchez et al. (2013) have reported that sport science students in Japan and Spain had negative attitudes towards doping.

During the post-test, there were significant changes in students' general knowledge of PES and attitudes towards doping. These results corroborate those of Barkoukis et al. (2015) where the intervention programme among adolescents changed their attitudes and beliefs about doping. Similarly, Codella et al. (2019) reported that an anti-doping seminar among high school students improved their knowledge of doping. The lack of significant changes in the students' specific knowledge of stimulants and anabolic steroids, and beliefs about doping in the current study is worrying. It can be speculated that the short nature of the session (one day) may not have profoundly impacted the students' specific knowledge on PES. This is supported by Elliot et al.'s (2008)

observation that knowledge enhancement was not significant with respect to the methods of doping and their consequences for health. This may be because some materials require more time to be assimilated. The study sought to establish whether the students' knowledge on illicit substances that could enhance sports performance, stimulants, anabolic steroids, attitudes towards doping and beliefs about doping is differentiated based on the selected demographic variables of gender, year of study, degree programme and athletic status (athlete/non-athlete), both at pre- and post-test sessions. Results of Mann Whitney U Test and Kruskal Wallis Test indicated no significant differences in knowledge, attitudes and beliefs about doping, both at pre- and post-testing periods, based on the gender and athletic status of the students. The lack of differences in KAB based on the participants' gender has been reported in previous studies (Pavlovic et al., 2015; Rintaugu & Mwangi, 2020). Other studies have reported marked difference with males having more positive attitudes towards doping than females (Lucidi et al., 2008; Peretti-Watel et al., 2004).

Knowledge, attitudes, and beliefs about doping did not significantly differ between students who had or had no previous experience participating in competitive sport. Conventionally, it is expected that students who have participated in sports competitions would possess greater knowledge about doping, along with negative attitudes and desirable beliefs towards it. However, Rintaugu and Mwangi (2020) reported that university students who had not participated in sports had higher average scores on general knowledge of substances that can enhance sport performance and stimulants. This finding is intriguing, as it was anticipated that students with sports competition experience would be more knowledgeable (Aguilar-Navarro et al., 2022). Corluka et al. (2011) and Singhammer (2012) also observed that knowledge and attitudes towards doping normally change with age and playing experience. The current study findings clearly show that ADAK may need to heighten their awareness of anti-doping campaigns in sports training and competition settings. Furthermore, the same students, who were non-athletes, showed more desirable attitudes and perceptions about doping.

Comparison using Kruskal Wallis with Dunn's pairwise post hoc test showed that students in BSc (ESS) had significantly less knowledge of anabolic steroids and stimulants as doping agents than those enrolled in the B.Ed (PE) course. It is postulated that students enrolled for BSc (ESS) were exposed to more general content on doping topics but less specific knowledge on the effects and health consequences of anabolic steroids and stimulants. Conversely, Takahashi et al. (2013) reported that despite attending lectures about illicit drugs, students remained unaware of the chemical composition of the drugs they were using. This has practical implications in curriculum development and review to enhance competencies in this regard, more aptly because many Kenyan athletes who have failed doping tests were caught using anabolic steroids. Overall, there were no significant differences in attitudes and beliefs about doping between the three degree programmes. Rintaugu and Mwangi (2020) also

found no differences based on course of study on knowledge and perceptions about doping, but variations were observed in attitudes towards doping.

In terms of the level of study, comparison using Kruskal Wallis test showed no significant differences in general or specific knowledge of PES. However, the fourth-year students had significantly lower pre-test scores in attitude towards doping in sport (pro-doping attitude) compared to 1st and 3rd year students. However, caution must be taken because of the large difference in the number of participants - most were fourth years and there were very few from the other year groups. Previous studies have shown that fourth-year students scored higher on knowledge of substances that can enhance sports performance compared to first-year students (Rintaugu & Mwangi, 2020). In terms of attitude, the authors speculated that finalist students may have started questioning the effectiveness of anti-doping campaigns as they get more exposed to more knowledge on ergogenic aids. It has been observed that the varieties of ways athletes are using to improve their performances are increasingly difficult to distinguish from doping concepts (Muniz-Pardos et al., 2021; Mwangi et al., 2021; Pitsiladis et al., 2017). Therefore, it is not surprising that Vangrundebeek and Tolleheer (2010) found that sport science students were moving away from a zero-tolerance stance on doping, adopting a more lenient attitude. Finalist sports science students' attitude on doping may also be compromised by reports and the ever increasing knowledge and pursuits of ergogenic aids in sports.

Comparison using Wilcoxon Signed Ranks Test showed no significant difference in most variables between pre-test and post-test. This means that the session had less significant impact on the students than what was expected. The session seems to have been more successful in imparting general knowledge and bridging scores in attitudes, but less successful in addressing issues related to specific doping substances and methods. Regression analyses showed that the impact of the session on attitude towards doping was influenced by year of study, degree programme and student's athlete status. Therefore, ADAK may need to develop session materials which are specific and customized for university students enrolled in different academic programmes, such as PE and sport science, as well as consider other demographic variables such as age and athletic status. This is not remote as the GOK's (2014) report recommended the need for inclusion of anti-doping education in the school curriculum.

Strengths

This study is novel in that it reflects on the efficacy of the anti-doping education programme aimed at changing the university students' KAB about doping. The session changed the students' general knowledge on performance-enhancing illicit substances and, therefore, it is an eye opener on the necessity to have more collaborative partnerships between universities offering sports-related courses and Anti-doping Organisations. The pre-test and post-test research design used in the study was able to highlight the efficacy of the session and identify areas requiring future attention.

Limitations

The session was essentially meant for the final year students as it was projected to be an annual event in subsequent years. The students in the other year groups (in their small numbers) who were invited for the inaugural session may have affected the results of the study. It is apparent that the session was a bit short (8 hours) and may have been rushed. Therefore, future sessions should allow more time for students to interact with facilitators and the training resources. The study did not cater for the possible effects of the mode of delivery but notes that the session entailed the utilization of lecture method as the mode of delivery. It could be interesting for ADAK to implement a hybrid mode of delivery, such as videos and practical activities. A blended mode of delivery can also be considered to engage expertise from diverse fields and backgrounds. There was no control group in this study, and the session was conducted on a one-shot basis. Other methodological designs, such as longitudinal approaches, should be employed to assess the long-term outcomes of anti-doping sessions. These constraints should be considered when interpreting the results of the study.

CONCLUSIONS

It is concluded that university students learn about doping through lectures and attending seminars/courses on doping. The students' sources of information on doping are varied, with the internet, lectures and social media being the main sources. There were significant changes in the students' general knowledge of substances that enhance sports performance and attitudes towards doping after one day anti-doping education session, but less effective in imparting on specific doping agents and methods. The efficacy of the session in changing the students' knowledge was not moderated by gender, age, athletic status and the programme of study. However, there were substantial influences in attitude changes by their athletic status, programme and level of study. The final year students have marginally significant pro-doping attitudes and this should be a major concern for stakeholders.

Recommendations

University students need to be guided to utilize reliable sources of information on doping. These include WADA and ADAK websites. There is a need to deliver more specific content to students on doping substances such as anabolic steroids and stimulants. More enriched intervention programmes using diverse approaches are needed for the students to internalize the anti-doping content, impact beliefs about doping, and elicit necessary behavioural change. It is necessary to customize content and delivery of anti-doping education programmes based on students' level and programme of study, as well as athletic status. It is also advisable that the units or courses be offered in the first year to empower the students to engage in further interactions in other practical avenues such as sports situations. Anti-doping agencies should introduce anti-doping education programmes customized for university students pursuing each sport-related

course. Future studies should assess the efficacy of longer intervention sessions and delivery modes. Lastly, it would be important to establish why the anti-doping education programme apparently had no impact on beliefs on doping and the tendency of final-year students toward pro-doping attitudes albeit marginally.

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DATA AVAILABILITY STATEMENT

Data for this work is available and will be shared upon reasonable request to the corresponding author.

AUTHOR CONTRIBUTIONS

Conceptualization: F. M. M., E. G. R., and M. S. Y. Project administration: F. M. M., E. G. R., and M. S. Y. Data curation: F. M. M., and E. G. R. Methodology: F. M. M., E. G. R., O. O. T., M. S. Y., E. K. T., N. F., X. T., and T. K. Formal analysis: F. M. M., E. G. R., and T. K. Validation: E. K. T., N. F., X. T., and T. K. Resources: F. M. M., E. G. R., O. O. T., M. S. Y., E. K. T., N. F., X. T., and T. K. Writing original draft: F. M. M., and E. G. R. Revising & editing manuscript drafts: F. M. M., E. G. R., O. O. T., M. S. Y., E. K. T., N. F., X. T., and T. K.

ETHICAL APPROVAL

Ethical approval was not required because the study is not invasive to humans or animals.

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