Accepted for publication in *Performance Enhancement and Health* published by Elsevier: https://doi.org/10.1016/j.peh.2021.100200

The status quo before the International Standard for Education: Elite adolescent athletes' perceptions of anti-doping education

Katharina Gatterer[1], Bernhard Streicher[2], Andrea Petróczi[3], Marie Overbye[4], Wolfgang Schobersberger[1,5], Matthias Gumpenberger[1], Kathrin Weber[1], Karsten Königstein[6], Cornelia Blank[1]

[1]Institute of Sports Medicine, Alpine Medicine & Health Tourism, Private University for Health Sciences, Medical Informatics and Technology, Eduard-Wallnöfer Zentrum 1, 6060 Hall in Tyrol, Austria; katharina.gatterer@umit.at; wolfgang.schobersberger@tirol-kliniken.at; matthias.gumpenberger@umit.at; kathrin.weber@umit.at; cornelia.blank@umit.at

[2]Institute of Psychology, Private University for Health Sciences, Medical Informatics and Technology, Eduard-Wallnöfer Zentrum 1, 6060 Hall in Tyrol, Austria; bernhard.streicher@umit.at

[3]School of Life Sciences, Pharmacy and Chemistry, Kingston University, Penrhyn Road, Kingston upon Thames KT1 2EE, London, UK; A.Petroczi@kingston.ac.uk

[4]Faculty of Health Sciences and Sport, University of Stirling, Stirling FK9 4LA, UK; marie.overbye@stir.ac.uk

[5]Tirol-Kliniken, Anichstraße 35, 6020 Innsbruck, Austria

[6]Department of Sport, Exercise and Health, Division Sports and Exercise Medicine, University of Basel, Birsstraße 320B, 4052 Basel, Switzerland; k.koenigstein@unibas.ch

Corresponding author:

Dr. Cornelia Blank, https://orcid.org/0000-0002-5913-0251
Associate Professor
Department of Psychology and Medical Sciences
Institute of Sports Medicine, Alpine Medicine & Health Tourism, UMIT
Eduard-Wallnöfer-Zentrum 1, 6060 Hall in Tirol, Austria
Phone: +43 (0) 50 8648 3840
Fax: +43 (0) 50 8648 67 3840
cornelia.blank@umit.at

Declaration of Interest: AP chairs the World Anti-Doping Agency's Working Group on Doping Prevalence, and consults on WADA's anti-education and outreach activities.

Word count: 5048

ABSTRACT

Education is a fundamental pillar of anti-doping. With the International Standard for Education (ISE) coming into effect in 2021, understanding the status quo of anti-doping education is paramount. This study aimed to evaluate young elite athletes' perceptions of the anti-doping education they receive. A total of 2,232 athletes, participating at any of four Youth Olympic events between 2018 and 2020 (representing 49 sport disciplines and 124 countries) were surveyed using an online questionnaire, including questions about the anti-doping education received, athletes' views about its usefulness and trust in its content. Additionally, anti-doping education programmes of the countries' National Anti-Doping Organisations (NADOs) were assessed in terms of scope and extent, and categorised as 'comprehensive', 'selective', 'limited' or 'information-only'. Perceived usefulness and trust were compared between these groups. Three-quarters (73.3%) of the athletes received anti-doping education, its usefulness and trust were rated as 'good' (>4 out of 5). Based on NADO's anti-doping education, athletes in the 'information-only' category had significantly lower values for usefulness and trust, while those in the 'selective' category had the highest values. Results confirm the importance of a multifaceted education, recommending the implementation of at least one educational approach above information provision were perceived to be more useful and trusted, and could facilitate Code compliance via developing skills as well as knowledge for informed decision making.

Keywords anti-doping education; usefulness; trust; perception; elite adolescent athletes; ISE

1. Introduction

Anti-doping education has grown in importance, reflected in the publication of the International Standard of Education (ISE) (WADA, 2020), being in effect from January 2021. Therein, WADA emphasises that all Code signatories should develop and deliver education for all athletes and their support personnel (ASP), including the following four components: “a) awareness raising (highlighting topics and issues related to clean sport), b) information provision (providing accurate, up-to-date content related to clean sport), c) values-based education (delivering activities focusing on developing personal values and principles, and ethical decision-making) and d) anti-doping education (anti-doping information building competencies in clean sport behaviours and informed decision-making)” (WADA, 2020, p 10). For the purpose of this study, and based on this definition and the World Anti-Doping Code (WADC) (WADA, 2015), we differentiate between information programmes and education programmes. Information programmes should create awareness and provided athletes and their support personnel with basic anti-doping information, so that they know about their roles and responsibilities, and that unintentional doping can be prevented. Education programmes go beyond this knowledge transfer, as they should be values-based and build competencies in ethical behaviour and informed decision-making, to promote and enable clean sport behaviour.

The timing of the anti-doping education is an important factor as well (WADA, 2021). Anti-doping education early in the stage of athletes’ professional careers, before they are selected for a doping control, may prevent these from doping – intentional or not – and inform them of their rights and responsibilities under the WADC – such as knowing the doping control process (WADA, 2021). In addition to anti-doping education being delivered at the beginning of an athletic career, researchers argue that adolescence is

a significant stage for shaping moral behaviour, values and attitudes, and developing critical thinking, social competencies and self-concept (Backhouse, McKenna, & Patterson, 2009; Flammer & Alsaker, 2002; Oerter & Dreher, 2008; Steinberg, 2016). Next to information about rights and responsibilities, these domains were shown to be important in preventing negative doping behaviour and willingness to dope (Ntoumanis, Ng, Barkoukis, & Backhouse, 2014). Targeted education at a young age, not necessarily associated with the stages of athletic careers, as these might be different depending on the sport, might positively influence these areas and should be delivered early as possible (Gatterer et al., 2020; Lentillon-Kaestner, Hagger, & Hardcastle, 2012; Peters, Schulz, Oberhoffer, & Michna, 2009) – an approach supported by athletes themselves (Efverström, Bäckström, Ahmadi, & Hoff, 2016; Hallward & Duncan, 2018). It was shown that for example attitudes and doping susceptibility of adolescent elite athletes can be improved by targeted intervention methods, independently of the mode of delivery (e.g. online, face-to-face) (Nicholls et al., 2020).

Regarding the implementation of educational approaches, limited research exists. Woolf's (2020) critical evaluation of anti-doping education in historical context indicates that despite effort made, the anti-doping knowledge of athletes remains poor, which he puts down to lack of pedagogic principles, specifically to an alignment between learning outcomes, the education activities, and the assessment of learning outcomes. A recent study showed that NADOs mostly focus on knowledge transmission (i.e. information programmes), and education programmes are often lacking (Gatterer et al., 2020). In addition, International Federations (IFs) spent less money on anti-doping education in 2015 than 2009 (Mountjoy, Miller, Vallini, Foster, & Carr, 2017). This may also be reflected in international elite athletes' criticism of National Federations (NFs)

by reporting a lack of responsibility and non-commitment of NFs to anti-doping education (Efverström et al., 2016).

Furthermore, in general, athletes' perception of the education, which is the way that they perceived the education with respect to different aspects such as distribution, access, content, and provider, is important for its success (Hallward & Duncan, 2018). For exempla, a study of international elite athletes suggested that their perception of an unequal distribution of access and opportunity for anti-doping education among countries can affect athletes' perception of the legitimacy of the anti-doping system (Efverström et al., 2016). Other studies found that athletes would appreciate more educational opportunities (De Hon, Eijs, & Havenga, 2011; Qvarfordt, Ahmadi, Bäckström, & Hoff, 2019; Somerville & Lewis, 2005). Another important domain in this regard might be the athletes' trust in the provider and the content of the education they receive. Dreiskämper and colleagues adapted the trust model (Mayer, Davis, & Schoorman, 1995) to the sports context and showed that lack of trust in a sports federation can influence athletes' anti-doping behaviour (Dreiskämper, Pöppel, & Strauß, 2016; Dreiskämper, Pöppel, Westmattelmann, Schewe, & Strauss, 2016). As shown by Qvarfordt and colleagues, the trust in the organisations might be affected by a lack of delivery of WADC-required information and education, leading to the inability of athletes to properly follow all anti-doping regulations (Qvarfordt et al., 2019). Also, age might be an important factor in assessing the level of trust as it was reported that trust in specific anti-doping measures decreases with age (Overbye, 2016; Overbye & Wagner, 2014). Thus, the (lack of) delivery of continuous education throughout the entire athletic career potentially affects the level of trust in the organisation and a lack of trust in the organisation (not) providing this education may impact Code compliance. The conceptual map of the connections between education provider, content, athletes'

perception and expected outcome, which underpins the current study, is depicted in Fig. 1. , . Thus, any lack of trust in the organisation might be reflected in a lack of trust in the education itself associated with the anti-doping behaviour athletes potentially display as a result. In sum, education is an important pillar of doping prevention, but we hypothesize that it is not enough to simply provide any kind of education, but that it needs to be perceived as useful and trusted (with respect to the content). In addition, it needs to be equally accessible and reach all athletes to positively affect anti-doping behaviour.

1.1. Aims of the current study

Summarizing the existing literature, anti-doping education from an early age is an important pillar in doping prevention. It should encompass awareness-raising, information provision, values-based education and anti-doping education (WADA, 2015, 2020). Positive perceptions of athletes regarding the education they receive in terms of it being perceived useful and trusted is also preferable (Dreiskämper, Pöppel, & Strauß, 2016; Efverström et al., 2016; Hallward & Duncan, 2018). To date, no study has investigated these points in a multi-national sample of elite adolescent athletes. Thus, in the context of WADA's new ISE, this study aimed to explore the athletes' perceptions of their anti-doping education's usefulness and trust in its content.

2. Material and Methods

The current study followed a quantitative cross-sectional approach, utilising online data collection.

2.1. Participants

Participants were elite adolescent athletes from summer and winter sports, aged 13–18 years, competing in any of the following major youth events: the 2018 Summer

Youth Olympic Games (YOG), 2020 Winter YOG and both editions of the European Youth Olympic Festivals (EYOF) in 2019 (winter and summer).

2.2. Instrument

The online questionnaire captured socio-demographic information (age, gender, sport, country), and whether the athletes had experience with doping controls and anti-doping education. Athletes with anti-doping education were asked about the provider (NADO, IF/NF, sports club, and/or school; multiple responses possible) and content of the education. In detail, content included a) information about prohibited substances/methods, b) information about anti-doping organisations and their responsibilities, c) contents of the WADC 2015, d) role plays (i.e. dilemma situations), e) online programmes/apps, f) discussions. Respondents could indicate whether or not they received the contents and multiple answers were possible. For data analysis, this variable was merged into two mutually exclusive groups of those who received information only and those who received information and elements of anti-doping education based on Gatterer et al. (2020). In the initial version of the questionnaire, distributed to athletes in Buenos Aires and Sarajevo, there were six items each about their perception of the education's usefulness and trust asked with respect to each content indicated (a – f). The two items were rated on a 5-point Likert scale and read as follows: "Do you think the anti-doping education you received was useful to you so that you know what you need to do as an elite athlete?" and "Do you trust the information of the anti-doping education you received?". However, based on the athletes' feedback about the length of the questionnaire and after assessing the data of this subsample, the questionnaire was changed for the upcoming two Games in Baku and Lausanne. As there was a very low variance in means in the usefulness and trust ratings between the different categories, the adapted questionnaire only

contained one single item for each, usefulness and trust, referring to all contents. Please refer to the supplemental material for the questionnaire (changes in the questionnaire between the Games are highlighted) and the results of the initial questionnaire indicating ratings of trust and usefulness specified by content.

To ensure content validity, the questionnaire was developed with support from seven renowned experts in anti-doping, specialising in the fields of social, health and sport psychology, sports medicine, sport sciences, sport management, and public health. This was done with a first expert meetings during which all members met, discussed the research question and what the instrument should provide on information. Based on the constructs that were decided to include, the first and last author of the paper drafted the items that were then revised by all experts. A developmental psychologist and expert in learning disorders was consulted to ensure appropriate language for the young target group. Moreover, the German online version was pre-tested with Austrian elite junior athletes (aged 14–18 years) in June 2018 to confirm comprehensibility. The questionnaire was amended as necessary (e.g. unclear wording). After finalization, the German version was translated into 22[1] languages by a professional translating office or native-speaking researchers (including independent back-translation) (van de Vijver & Hambleton, 1996) to avoid language bias. The questionnaire was discussed and revised in the second meeting that took place after the first two Youth Olympic events. The revision of the questionnaire was informed based on the data of these two events and slight adaptations to the questionnaire were made.

As part of another, associated project, a short survey was sent to all NADOs whose athletes participated at any of the four events. NADOs were asked to provide details

[1] Chinese, Croatian, Czech, Danish, Dutch, English, Finnish, French, Greek, Hindi, Hungarian, Italian, Japanese, Norwegian, Polish, Portuguese (European and Brazilian), Russian, Slovenian, Spanish, Swedish, Turkish

on their anti-doping education programmes. The exact procedure of this part of the overall project is presented elsewhere, for details, please refer to Gatterer et al (2020).

2.3. Procedure

To connect with the athletes, several gatekeepers were used. In detail, the study purpose and procedure were described to the Chefs de Mission (CdM) of all participating nations before the Games via email. Athletes participating at the Games were approached in the Youth Olympic Village (YOV) by the study team in the communal spaces. Information cards with the QR code and link for the questionnaire were distributed among athletes, their ASP and the CdM. Close cooperation with National Olympic Committee (NOC) staff facilitated contact with the nations' delegations. The study was also presented to medical staff of the delegations during the Games. Participation was anonymous and voluntary. Informed consent was provided by athletes prior to completing the questionnaire. Athletes completed the questionnaire on site at the sport events on Tablets or Computers, or on their own mobile devices using a QR code.

2.4. Data Analysis

Data were analysed descriptively and are presented as frequencies, means and standard deviation. Education providers were classified as NADO-only, federation-only, sports club-only, school-only or multiple. Items with respect to the content of the received anti-doping education were summarized into 'information programmes' (i.e. programmes that create awareness and provide information about for example their roles and responsibilities) and 'education programmes' (i.e. beyond information and with focus on values-based and social skills education). The categorisation was made based on the suggestion in the WADC (WADA, 2015) and on Backhouse et al. (2014), also used by Gatterer et al. (2020), but merged into two categories (information (1 from

Gatterer et al. (2020)) and education (2-5 from Gatterer et al (2020)). Respondents were further categorized into athletes who a) received only education, b) received only information, and c) received both.

Overall means for trust and usefulness with respect to the specific content of the first subsample (Buenos Aires and Sarajevo) were combined to one mean for overall trust and overall usefulness of education received and used for further analyses as the individual items (i.e. trust/usefulness per content-item) did not show a great variance. Cohen's d was indicated to quantify effect sizes.

Associations of perceived usefulness and trust with age were assessed using Spearman correlation. Sport disciplines were divided into a) individual and team sports and b) low and high doping risk ('high risk' = performance measured in weight, speed or distance) (Pitsch & Emrich, 2011). Differences of usefulness and trust between these were analysed using independent sample t-tests. Cohen's d was indicated to quantify effect sizes. Based on the scope of the respective NADOs' anti-doping education, represented countries were classified into four categories: 'comprehensive', 'selective', 'limited' or 'information-only' (Table 1). Inclusion criteria were based on four education approaches (affective-focused, social skills, life skills, ethics- and values-based) (Gatterer et al., 2020). Mean usefulness and trust scores were compared between categories by univariate ANOVA with post-hoc test; type of sport, gender and age were co-variates.

Participants were divided into two groups based on if they received information only, or information and education. Differences between ratings of usefulness and trust were investigated with independent samples t-test. Cohen's d was indicated to quantify effect sizes. Differences between the classified providers (as outlined above) in

perceived usefulness and trust were analysed by univariate ANOVA with post-hoc test. The significance level was set at $p < .05$.

3. Results

In total, 9,503 athletes from 124 different countries participated at the events; 2,252 (23.5%) with complete data sets were analysed (mean age 16.25±1.03 years; 49.7% females). All Olympic Youth sport disciplines ($N = 49$) were represented.

Of the participants, 73.3% ($n = 1,636$) indicated receiving anti-doping education. In total, 26.7% ($n = 596$) did not receive any anti-doping education, yet, of these, 15.8% ($n = 94$) had been selected at least once for doping control during their career. About one-third (35.8%, $n = 586$) of the athletes reported that they received anti-doping education from multiple sources. When only one provider was indicated, NADOs were cited most often as the main education provider (30.2%, $n = 494$), followed by NFs/IFs (22.3%; $n = 365$), schools (4.7%; $n = 77$) and sports clubs (3.7%; $n = 61$). Most athletes with anti-doping education received both information and education programmes (63.4%; $n = 1,038$); 35.2% ($n = 576$) received only information programmes and 1.3% ($n = 22$) did not specify. For details on education content, refer to Table 2.

Generally, athletes rated the education as useful (4.32±0.83 out of 5) and trusted in its content (4.51±0.74). There was a significant positive correlation between usefulness and trust ($r = .496$; $p < .001$), but not between age and usefulness ($r = -.010$; $p = .690$) or age and trust ($r = -.039$; $p = .137$). Female athletes showed significantly higher usefulness values (4.37±0.79 vs 4.28±0.83; Cohen's $d = .103$; $p = .047$). No significant gender difference was found for trust (female: 4.56±0.66 vs male: 4.49±0.76: Cohen's $d = .100$; $p = .056$). Significant differences were found between education types in usefulness (information: 4.18±0.92 vs education: 4.39±0.75; Cohen's $d = .250$; $p < .001$) and trust (information: 4.41±0.84 vs education: 4.57±0.67; Cohen's $d = .212$; $p <$

.001) (Fig. 2a and 2b), and between providers in usefulness (p < .001) and trust (p < .001) (Fig. 2c and 2d). No difference was found between individual/team sports in usefulness (4.34±0.80 vs 4.27±0.89; Cohen's d = .085; p = .183) or trust (4.54±0.70 vs 4.46±0.81; Cohen's d = .107; p = .092), nor between low-/high-risk sports in usefulness (4.31±0.84 vs 4.34±0.81; Cohen's d = .027; p = .610) or trust (4.48±0.80 vs 4.55±0.67; Cohen's d = .099; p = .063).

As outlined earlier, we draw on previously collected data assessing the provided education by NADOs (refer to Gatterer et al., 2020) to associate these with our results. Based on their educational programmes, 48 of these NADOs (represented by 45.9% of the investigated athletes) were allocated to the 'information-only' group, 13 to 'limited' (represented by 13.8% athletes), 8 to 'selective' (represented by 13.8% athletes) and 9 to 'comprehensive' (represented by 19.4% athletes). No information was available from 46 NADOs (represented by 7.0% athletes) as no information was received by those NADOs as part of the study by Gatterer et al., (2020). Regarding NADO, athletes in the 'limited' category reported significantly higher values compared to the 'information-only' category for both usefulness (4.46±0.74 vs. 4.28±0.84; p=.034) and trust (4.69±0.63 vs. 4.45±0.74; . p<.001), even after controlling for age, sport type and gender. For details, please refer to Table 3. As gender showed a significant effect, data was analysed separately. Females from countries allocated to the 'limited' category showed significantly higher trust values compared to all other categories (p<.01), and male athletes from this category indicated significantly higher trust values compared to those from the 'information only' category (p=.013). For details, please refer to Table 4.

4. Discussion

This study investigated the perceived usefulness and trust of the anti-doping education elite adolescent athletes receive. About three-quarters (73.3%) of the youth elite athletes surveyed received some type of anti-doping education in form of information and/or education programmes. The majority (63.4%) received information and education programmes including for example information about prohibited substances/methods and role-plays. Perceived usefulness and trust ratings were generally high for anti-doping education (>4 out of 5). Athletes from countries with NADOs in the 'limited' education category (providing information and at least one educational approach) had significantly higher values compared to the other categories.

4.1. The status quo of anti-doping education

Although WADA requires that all athletes, especially youth athletes, receive anti-doping education (WADA 2021), and that their first experience with anti-doping should be educative and not through doping control (WADA, 2021), about one-quarter (26.7%) of the youth elite athletes in our study reported to have never received any anti-doping education. Of these, 15.8% had been tested at least once during their career. This might undermine the anti-doping system: without sufficient knowledge about their responsibilities during doping control, young athletes may be less equipped for compliance with the WADA rules and more vulnerable to mistakes during the doping control process (made by either the athletes and/or the doping control team) because they lack awareness of the control process including their rights and responsibilities and are less prepared once selected. Education before doping control exposure would be helpful for all athletes, many of whom are stressed by the process of doping testing (Elbe & Overbye, 2013; Elbe, Schlegel, & Brand, 2012) , but it seems particularly important for athletes attending major sport competitions and who are therefore likely

to be tested. Unexpectedly, among athletes in the 'selective' category (providing information and at least two educational approaches), 28% had no anti-doping education. This finding suggests that although information and education programmes for youths are available in these countries, they seem not to reach all young elite athletes participating at Olympic youth events. Explanations might relate to implementation issues and/or the respondents might not accurately report or remember their education. Nonetheless, this suggests that NADO and other organisations responsible for anti-doping should regularly monitor the reach of their programmes.

In addition to providing the necessary information and raising awareness, the new ISE require Code signatories to deliver values-based anti-doping education focusing on personal values and principles, and building competences to make informed decisions (WADA, 2021). Of the athletes receiving anti-doping education, more than half (63.4%) reported to have received both information and education programmes. This finding implies a mismatch between provider and perceptions on consumer side of anti-doping education. It might be hypothesized that young athletes cannot reliably differentiate between 'information' and 'education' as Gatterer et al. (2020) concluded that most of the content that providers deliver is information- and not education-based. This discrepancy might be explained by the fact that some athletes might not have fully understood our answer options (e.g., considering the description of the doping control process as 'role-play' and thus indicating it as 'education' rather than 'information') and thus they thought they received content that they, in fact, did not. Another explanation might be that these athletes received the educational content from providers other than the NADOs. Another key finding was that approximately one-third (35.2%) of athletes surveyed only received information, which was shown to be insufficient to equip

athletes to resist doping (Backhouse et al., 2009; Gatterer et al., 2020; Hanson, 2009). Thus, comprehensive anti-doping education programmes raising awareness as well as targeting anti-doping knowledge and decision-making skills should be the main focus of NADOs and other organisations with responsibility for anti-doping.

4.2. Youth elite athletes' perceptions of education's usefulness and trust

Generally, the athletes had a favourable opinion about the received education, reflected in high usefulness (>4 out of 5). Those receiving both information and education programmes reported significantly higher values than those receiving only information programmes, a result that supports previous research asserting that anti-doping education should use a multifaceted approach (Backhouse et al., 2009; Gatterer et al., 2020; Hanson, 2009). Interestingly, anti-doping education programmes provided in schools were rated significantly less useful compared to other providers. This is interesting as research shows that the school setting is excellent for interventions, with easy access to children and adolescents of all ages (Demetriou & Höner, 2012). One explanation could be that the programmes' content or deliverer, rather than the setting, may have been responsible for the lower usefulness ratings. In detail, programmes delivered at schools might be broader and less standardized and might thus be less adapt for some young elite athletes, which might impact the perceived usefulness. This argument finds support by considering another setting, the sports clubs that also received significantly lower usefulness and trust ratings compared to when NADO or the federation was the provider. The latter have a more consistent and standardized program design, simply due to their responsibilities outlined by the WADC and now also the new ISE. Thus, providing anti-doping education is one of their key roles, especially for NADOs (WADA, 2021), a fact that leads to this education being likely more standardized across NADOs, thus resulting

in similar experiences by the athletes. This explanation might be supported by the markedly lower variance in answers with respect to education received by NADOs (refer to Fig. 2b). Even though the ratings of trust and usefulness are overall high, these findings indicate room for improvement for education in sports clubs and schools, which also have a responsibility for anti-doping education (WADA, 2020) and have unique access to athletes at the local level. A suggested consequence is to consider a further standardization of school- and sports clubs-based education initiatives. A good example for such a standardization, next to the new ISE, is the current WADA initiative "Sport Values in Every Classroom" that target students 8-12 years in a school-based setting.

Another important point in recognition of the study by Dreiskämper, Pöppel, & Strauß (2016) and their underlying model of trust (Mayer et al., 1995) is the importance of trust in anti-doping and athletes' compliance with the rules set out by the anti-doping organisations. Trust also impacts on legitimacy perception (Woolway et al., 2020), which in turn influences how athletes feel about anti-doping and its demands. Even for athletes who are fully committed to clean sport, the constant vigilance to ensure compliance with all the rules and requirements is demanding and could be quite stressful (Petróczi et al., 2021). Anti-doping education via trusted and useful information supports athletes in this process. As such, it mainly prevents inadvertent anti-doping rule violations, and protects vulnerable athletes from falling for doping under pressure rather than prevent deliberate use of doping for competitive advantage.

As for usefulness, the level of trust in this cohort was overall very satisfying (>4 out of 5). The high levels of trust might be related to their young age, as studies showed that trust in specific parts of the anti-doping system were higher among younger athletes but decreased with age and with personal experience with concrete anti-doping

measures/procedures (Overbye, 2016; Overbye & Wagner,2014). Athletes trust in the anti-doping system may change during the career of the athletes and can be influenced by experiences with the system, for example, negative experiences or experiences of flaws canlead to a decrease in trust in the anti-doping system (Overbye, 2016). There was one outlier with respect to sports clubs whose content was perceived significantly less trustful. Again, this could be due to a greater variance in responses. Summarizing, the level of trust and usefulness in this age group and level of sport seems to be very high and a future challenge but goal should be to encounter the evidence age effect (at least on trust) and keep this trust and usefulness levels as high in order to foster clean sport behaviour.

Finally, significant differences in usefulness and trust among educational categories (‘information-only’, ‘limited’, ‘selective’ and ‘comprehensive’) based on NADOs’ programmes were seen. Unsurprisingly, athletes from countries with anti-doping education categorised as ‘information-only’ had the lowest usefulness and trust ratings. Although not all athletes receive anti-doping education only through their NADOs, these programmes are likely to be indicative of other initiatives in the country, as NADOs often cooperate with schools, sports clubs and other stakeholders (iNADO, 2019). Thus, these results may reflect young athletes’ general perceptions of anti-doping education in their country. Between the categories ‘information-only’ and ‘limited’, trust and usefulness ratings differed significantly. This reinforces the notion that athletes merely knowing all the rules (knowledge they would gain through information programmes) is not sufficient; education needs to be provided as well as it was shown that the combination might help athletes comply with all anti-doping rules and remain clean (Mountjoy et al., 2017). Additionally, the provision of both, information and education might also increase the levels of trust and usefulness, a fact that seems

to be important in rule-compliance as well (Dreiskämper et al., 2016). This is in line with the significantly higher usefulness and trust ratings of athletes who received information and education programmes compared to those receiving only information programmes.

Interestingly, there were no differences among ‘limited’, ‘selective’ and ‘comprehensive’. One explanation might be a ceiling effect as the trust- and usefulness ratings are overall very high already. Another reason might be that this indicates that while athletes want education allowing them to better adhere to the rules in the complex sports landscape, they do not perceive they need any more to fulfil their roles as a professional athlete with respect to anti-doping and their focus is on training and enhancing their athletic performance. Also, other studies showed that athletes sometimes perceive anti-doping education as a distraction, especially when they feel that it is not personally relevant to them due to the actual or perceived low prevalence of doping in their sport (Hallward & Duncan, 2018).

In sum, our findings suggest that a good ‘limited’ program might be preferred as athletes prioritize their time to other things and selective and comprehensive education including more sessions might not be compatible with these priorities – and not perceived to be needed. NADOs (and other anti-doping organisations) currently offering only information programmes however need to revise their programmes (also in accordance with the new ISE) to step up to ‘limited’ programs by adding at least one element from educational approaches appropriate to their target audience. This might increase athletes’ usefulness and trust ratings. Further studies are needed to investigate the effect of such changes in anti-doping education.

4.3. Limitations

Although the questionnaire was available in 23 different languages, some languages might not have been covered. Not being able to complete the questionnaire in one's mother tongue might have led to a language bias for a small number of athletes due to possibly misunderstanding the questions, and to some athletes not being investigated as they did not understand our request. Additionally, we collected data in communal spaces where athletes could spend their free time; athletes not visiting those sites might have been missed. To address this, we provided cards with the QR code and links to the questionnaire to the NOCs to be distributed among their athletes. Also, due to the sensitivity of the topic and social desirability, athletes might not have answered honestly. We tried to minimize this possibility by ensuring them of their anonymity. The fact that there was an option to select multiple responses with respect to the content of education received led to the fact that we could not match the received content to the specific provider. This might slightly dilute the conclusion that there is a gap between the evidence that NADOs of specific countries mostly offer information-based education and athletes of these countries self-report that they also receive values-based education as the latter could also stem from an IF for example. However, we still believe that the results are accurate as based on the scarce evidence there is, also IF's mostly cover awareness raising (outreach programs) and information-based education similar to the one of NADOs (as for example reported in Hurst et al. (2020).

5. Conclusion

This study demonstrated that most adolescent athletes competing at major international youth sports events received anti-doping education in form of information and/or education programmes and perceived it as useful and trust its content. The number of different educational approaches (e.g., social skills, life skills) seems to make no difference to perceived usefulness and trust in anti-doping education as it

were quite high to start with. However, athletes from countries whose NADOs only offer information programmes rated the programmes' usefulness and trust the lowest. With the ISE being in effect since January 2021, many organisations with responsibility for anti-doping education may need revise their programmes to ensure that both information and education is included, and that all young athletes receive it before attending their first international event. We recommend more support to help stakeholders implement education programmes, as a lack of resources and expertise can hinder this process.

Acknowledgements The authors would like to thank the athletes for participating in the study, and the NADOs for sharing data on their anti-doping education programmes.

Funding This work was supported by the International Olympic Committee (IOC) Social Science Research Grant.

Ethics approval Research Committee for Scientific and Ethical Questions (RCSEQ), UMIT - Private University for Health Sciences, Medical Informatics and Technology, RCSEQ 2444/18**.**

6. Reference List

Backhouse, S., McKenna, J., & Patterson, L. (2009). *Prevention through education: a review of current international social science literature*. Montreal: World Anti-Doping Agency.

Blank, C., Leichtfried, V., Fürhapter, C., Müller, D., & Schobersberger, W. (2014). Doping in Sports: West-Austrian Sport Teachers' and Coaches' Knowledge, Attitude and Behavior. *Deutsche Zeitschrift für Sportmedizin, 65*(10), 289-293. https://doi.org/10.5960/dzsm.2014.133.

Boardley, I. D., Smith, A. L., Ntoumanis, N., Gucciardi, D. F., & Harris, T. S. (2019). Perceptions of coach doping confrontation efficacy and athlete susceptibility to intentional and inadvertent doping. *Scandinavian Journal of Medicine & Science in Sports, 29*(10), 1647-1654. https://doi.org/10.1111/sms.13489.

De Hon, O., Eijs, I., & Havenga, A. (2011). Dutch Elite Athletes and Anti-Doping Policies. *British Journal of Sports Medicine, 45*, 310-384. https://doi.org/10.1136/bjsm.2011.084038.

Demetriou, Y., & Höner, O. (2012). Physical activity interventions in the school setting: A systematic review. *Psychology of Sport and Exercise, 13*(2), 186-196. https://doi.org/10.1016/j.psychsport.2011.11.006.

Dreiskämper, D., Pöppel, K., & Strauß, B. (2016). Vertrauen ist gut … Entwicklung und Validierung eines Inventars zur Messung von Vertrauenswürdigkeit im Sport. *Zeitschrift für Sportpsychologie, 23*(1), 1-12. https://doi.org/10.1026/1612-5010/a000156.

Dreiskämper, D., Pöppel, K., Westmattelmann, D., Schewe, G., & Strauss, B. (2016). Trust Processes in Sport in the Context of Doping. In B. Blöbaum (Ed.), *Trust and Communication in a Digitized World. Models and concepts of trust research* (pp. 125-141). Basel: Springer International Publishing.

Efverström, A., Bäckström, Å., Ahmadi, N., & Hoff, D. (2016). Contexts and conditions for a level playing field: Elite athletes' perspectives on anti-doping in practice. *Performance Enhancement & Health, 5*(2), 77-85. https://doi.org/10.1016/j.peh.2016.08.001.

Elbe, A.-M., & Overbye, M. (2013). Urine doping controls: the athletes' perspective. *International Journal of Sport Policy and Politics, 6*(2), 227-240. https://doi.org/10.1080/19406940.2013.801361.

Elbe, A.-M., Schlegel, M. M., & Brand, R. (2012). Psychogenic urine retention during doping controls: Consequences for elite athletes. *Performance Enhancement & Health, 1*(2), 66-74. https://doi.org/10.1016/j.peh.2012.01.001.

Flammer, A., & Alsaker, F. D. (2002). *Entwicklungspsychologie der Adoleszenz*. Bern: Huber.

Gatterer, K., Gumpenberger, M., Overbye, M., Streicher, B., Schobersberger, W., & Blank, C. (2020). An evaluation of prevention initiatives by 53 national anti-doping organizations: Achievements and limitations. *Journal of Sport and Health Science, 9*(3), 228-239. https://doi.org/10.1016/j.jshs.2019.12.002.

Hallward, L., & Duncan, L. R. (2018). A Qualitative Exploration of Athletes' Past Experiences With Doping Prevention Education. *Journal of Applied Sport Psychology, 31*(2), 187-202. https://doi.org/10.1080/10413200.2018.1448017.

Hanson, J. M. (2009). Equipping athletes to make informed decisions about performance-enhancing drug use: a constructivist perspective from educational psychology. *Sport in Society, 12*(3), 394-410. https://doi.org/10.1080/17430430802673734.

Hurst, P., Ring, C., & Kavussanu, M. (2020). An evaluation of UK athletics' clean sport programme in preventing doping in junior elite athletes. *Performance Enhancement & Health*, *7*(3-4), 100155.

iNADO. (2019). *This is iNADO*. Retrieved from http://www.inado.org/about/this-is-inado.html. Accessed October 15, 2020

Kondric, M., Sekulic, D., & Mandic, G. F. (2010). Substance use and misuse among Slovenian table tennis players. *Substance Use & Misuse, 45*, 543-553.

Kondric, M., Sekulic, D., Petroczi, A., Ostojic, L., Rodek, J., & Ostojic, Z. (2011). Is there a danger for myopia in anti-doping education? Comparative analysis of substance use and misuse in Olympic racket sports calls for a broader approach. *Substance Abuse Treatment, Prevention, and Policy, 6*, 27.

Laure, P., Thouvenin, F., & Lecerf, T. (2001). Attitudes of coaches towards doping. *The Journal of Sports Medicine and Physical Fitness, 41*, 132-136.

Lentillon-Kaestner, V., Hagger, M. S., & Hardcastle, S. (2012). Health and doping in elite-level cycling. *Scandinavian Journal of Medicine & Science in Sports, 22*(5), 596-606. https://doi.org/10.1111/j.1600-0838.2010.01281.x.

Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integrative model of organizational trust. *The Academy of Management Review, 20*(3), 709-734.

Mountjoy, M., Miller, S., Vallini, M., Foster, J., & Carr, J. (2017). International Sports Federation's fight to protect the clean athlete: are we doing enough in the fight against doping? *British Journal of Sports Medicine, 51*(17), 1241-1242. https://doi.org/10.1136/bjsports-2017-097870.

Nicholls, A.R., Morley, D., Thompson, M.,A., Huang, C., Grant, A., Rothwell, M., Cope, E., & Ntoumanis, N. (2020). The effect of the iPlayClean education programme on doping attitudes and susceptibility to use banned substances among high-level adolescent athletes from the UK: A cluster-randomised controlled trial. *International Journal of Drug Policy*, 82, 102820.

Ntoumanis, N., Ng, J.Y., Barkoukis, V., Backhouse, S. (2014). Personal and psychosocial predictors of doping use in physical activity settings: a meta-analysis. *Sports Medicine,* 44,1603–24.

Oerter, R., & Dreher, E. (2008). Jugendalter. In R. Oerter & L. Montada (Eds.), *Entwicklungspsychologie*. Weinheim: PVU Beltz.

Overbye, M. (2016). Doping control in sport: An investigation of how elite athletes perceive and trust the functioning of the doping testing system in their sport. *Sport Management Review, 19*(1), 6-22. https://doi.org/10.1016/j.smr.2015.10.002.

Overbye, M., & Wagner, U. (2014). Experiences, attitudes and trust: an inquiry into elite athletes' perception of the whereabouts reporting system. *International Journal of Sport Policy and Politics, 6*(3), 407-428. https://doi.org/10.1080/19406940.2013.791712.

Patterson, L. B., Backhouse, S., & Duffy, P. J. (2016). Anti-doping education for coaches: Qualitative insights from national and international sporting and anti-doping organisations. *Sport Management Review, 19*(1), 35-47. https://doi.org/10.1016/j.smr.2015.12.002.

Peters, C., Schulz, T., Oberhoffer, R., & Michna, H. (2009). Doping und Dopingprävention: Kenntnisse, Einstellungen und Erwartungen von Athleten und Trainern. *Deutsche Zeitschrift für Sportmedizin, 60*(3), 73-78.

Petróczi, A., Heyes, A., Thrower, S. N., Martinelli, L. A., Backhouse, S. H., Boardley, I. D., & RESPECT Consortium. (2021). Understanding and building clean (er) sport together: Community-based participatory research with elite athletes and anti-doping organisations from five European countries. *Psychology of Sport and Exercise*, 101932. ttps://doi.org/10.1016/j.psychsport.2021.101932

Pitsch, W., & Emrich, E. (2011). The frequency of doping in elite sport: Results of a replication study. *International Review for the Sociology of Sport, 47*(5), 559-580. https://doi.org/10.1177/1012690211413969.

Qvarfordt, A., Ahmadi, N., Bäckström, Å., & Hoff, D. (2019). Limitations and duties: elite athletes' perceptions of compliance with anti-doping rules. *Sport in Society*, 1-20. https://doi.org/10.1080/17430437.2019.1681404.

Rodek, J., Idrizovic, K., Zenic, N., Perasovic, B., & Kondric, M. (2013). Differential analysis of the doping behaviour templated in three types of sports. *Collegium Antropologicum, 37*, 211-217.

Sekulic, D., Kostic, R., & Miletic, D. (2008). Substance use in dance sport. *Medical Problems of Performing Artists*, 66-71.

Somerville, S. J., & Lewis, M. (2005). Accidental breaches of the doping regulations in sport - is there a need to improve the education of sportspeople. *British Journal of Sports Medicine, 39*, 512-516.

Steinberg, L. (2016). Risk Taking in Adolescence. New Perspectives from Brain and Behavioral Science. *Current Directions in Psychological Science, 16*(2), 55-59. https://doi.org/10.1111/j.1467-8721.2007.00475.x.

van de Vijver, F. J. R., & Hambleton, R. K. (1996). Translating tests: some practical guidelines. *European Psychologist, 1*(2), 89-99.

WADA. (2015). *World Anti-Doping Code 2015*. Montreal: World Anti-Doping Agency.

WADA. (2020). *International Standard for Education*. Montreal: World Anti-Doping Agency.

Woolf, J. J. R. (2020) An examination of anti-doping education initiatives from an educational perspective: Insights and recommendations for improved educational design. *Performance Enhancement and Health*, 8(2-3), 100178. https://doi.org/10.1016/j.peh.2020.100178.

Woolway, T., Lazuras, L., Barkoukis, V., & Petróczi, A. (2020). "Doing what is right and doing it right": a mapping review of athletes' perception of anti-doping legitimacy. *International Journal of Drug Policy, 84*, 102865. https://doi.org/10.1016/j.drugpo.2020.102865

Zenic, N., Peric, M., Zubcevic, N. G., Ostojic, Z., & Ostojic, L. (2010). Comparative analysis of substance use in ballet, dance sport, and synchronized swimming: results of a longitudinal study. *Medical Problems of Performing Artists, 25*(2), 75-81.

Table 1. Inclusion criteria for the categorisation of countries according to their educational anti-doping programmes, based on Gatterer et al. (2020).

Category	Criteria
comprehensive	• programmes provide information to ensure Code compliance and values-based comprehensive education (at least two of the four approaches) • include programmes for adolescent athletes
selective	• programmes provide information to ensure Code compliance and at least two educational approaches
limited	• programmes provide information to ensure Code compliance and at least one educational approach
Information-only	• information provision only (e.g., information about prohibited substance/methods, control process, Whereabouts reporting etc.)

Note: educational approaches can include activities from affective-focused training (e.g., targeting feelings of value and self-worth), social skills training (e.g., assertiveness skills, resisting peer pressure), life skills training (e.g., decision-making process) or ethics- and values-based training (e.g., values and principles).

Table 2: Contents of education received

Contents	n	Yes (%)	No (%)
Information about prohibited substances/methods	1,610	91.2	8.8
Information about anti-doping organisations and their responsibilities	1,598	81.6	18.4
Contents of the WADC 2015	1,539	47.4	52.6
Role Play (i.e. dilemma situations)	1,573	48.2	51.8
Online Programmes/apps	1,553	59.5	40.5
Discussions	1,527	50	50
Others	1,242	7.4	92.6

WADC: World Anti-Doping Code

Table 3. Perceived usefulness and trust across educational categories for the anti-doping education.

	Have you ever received anti-doping education?†	Content of the received anti-doping education†			
Category (n athletes)‡	Yes % (*n*)	Information programmes % (*n*)	Information & education programmes % (*n*)	Usefulness MV±SD	Trust MV±SD
Comprehensive (434)	93.1 (404)	26.6 (107)	73.4 (296)	4.34±0.77	4.56±0.68
Selective (307)	72.0 (220)	36.4 (80)	63.6 (140)	4.31±0.76	4.54±0.70
Limited (309)	83.5 (258)	32.4 (82)	67.6 (171)	4.46±0.74*	4.69±0.63***
Information-only (1025)	62.9 (645)	37.1 (237)	62.9 (401)	4.28±0.84	4.45±0.74

Note: † some athletes did not indicate if they any received education, nor the content of the received anti-doping education. ‡ from 46 countries (*n* = 157 athletes), no information for categorising was available. Differences based Welch test and Tamhane-adjusted post hoc tests: * p<.05 compared to 'information-only'; *** p<.001 compared to 'information-only'.

Table 4. Gender differences in perceived usefulness and trust of the respective categories.

	Usefulness		Trust	
Category (n athletes) †	Female MV±SD	Male MV±SD	Female MV±SD	Male MV±SD
Comprehensive (434)	4.33±0.77	4.33±0.77	4.57±0.65	4.55±0.72
Selective (307)	4.33±0.82	4.28±0.65	4.55±.065	4.58±0.65
Limited (309)	4.55±0.70	4.35±0.77	4.77±0.46**	4.64±0.68*
Information-only (1025)	4.35±0.78	4.23±0.88	4.53±0.66	4.38±0.77

Note: † from 46 countries (*n* = 157 athletes), no information for categorising was available. Differences based on Welch test and Tamhane-adjusted post hoc tests: ** p<.01 compared to all other categories. * p=.013 compared to 'information-only'.

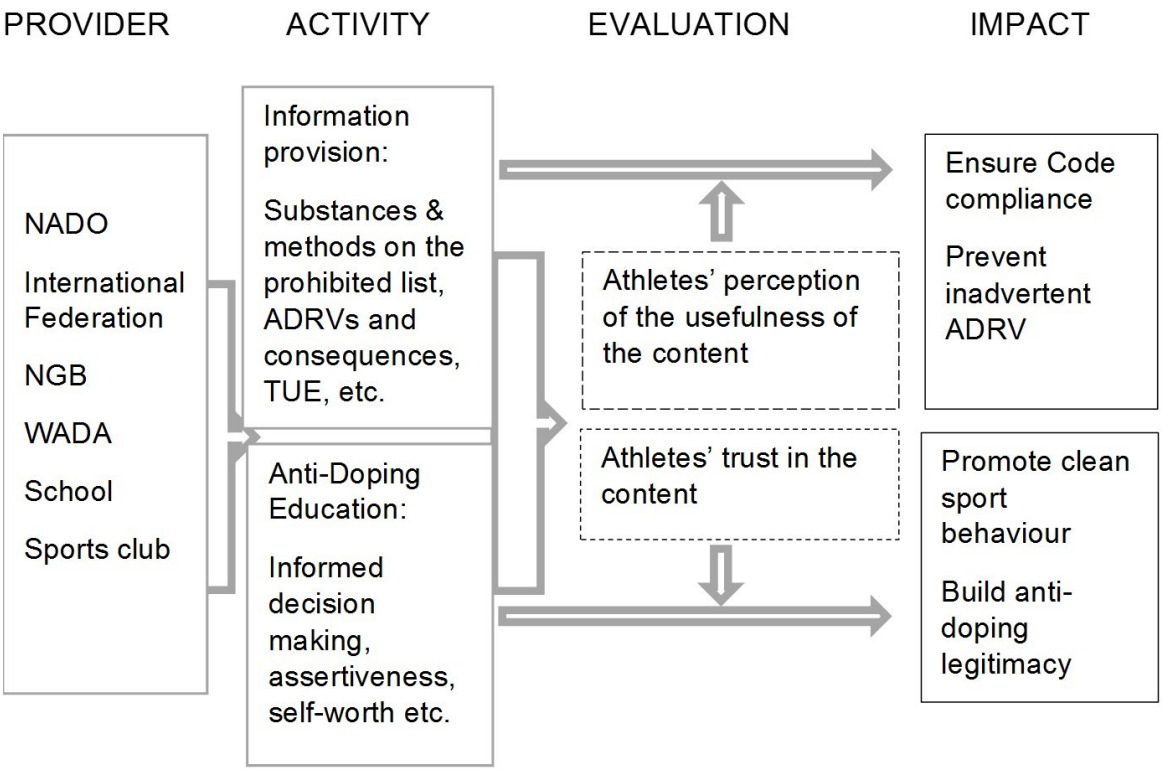

Fig. 1. Link between Provider, Activity, Evaluation and Impact of Anti-Doping Education.

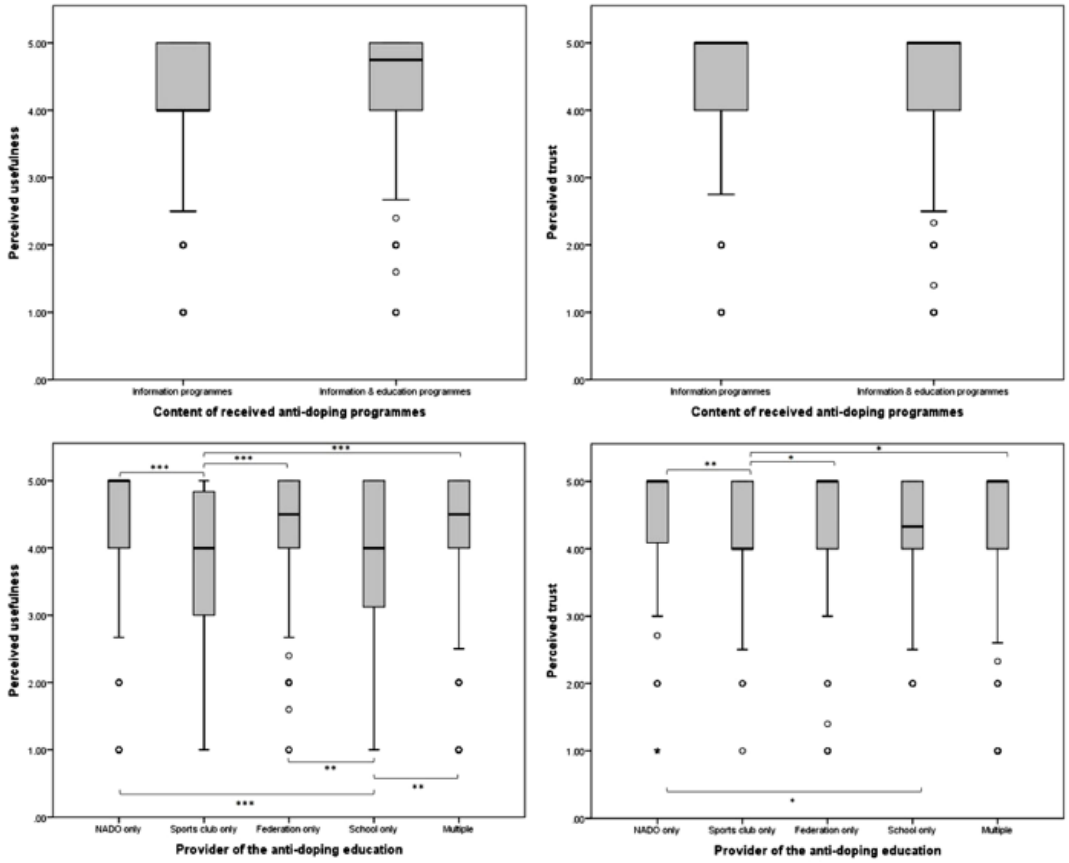

Fig 2a: Differences in perceived usefulness between education types. ***p<.001. Fig 2b: Differences in perceived trust between education types. ***p<.001. Fig 2c: Differences in perceived usefulness among education providers based on Welch test and Tamhane-adjusted post hoc tests. **p<.01; ***p<.001. Fig 2d: Differences in perceived among education providers based on Welch test and Tamhane-adjusted post hoc tests. *p<.05; **p<.01.