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FINAL REPORT

Evaluation of a School-Based Intervention Programme – NADA Austria's Anti-Doping School Programme

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Executive Summary

The International Standard for Education (ISE) mandates WADA Code Signatories to plan, deliver, and evaluate anti-doping education. Evaluation studies of anti-doping interventions, especially in a school setting are scarce, even though increasing in number lately. The National Anti-Doping Agency (NADA) Austria has developed a school-based anti-doping intervention for adolescents aged 14-19. The content of the program cover knowledge about doping, values, morals, as well as self-efficacy and behavioural control in a sport setting. The program itself is implemented in Austrian schools with a sport focus and delivered by speakers of NADA Austria. The aim of this project was to evaluate the possible effects of this program on different outcomes including knowledge about NADA Austria's offerings, trust in and satisfaction with the work of national and international sport organizations responsible for doping prevention, situational temptation to doping, variables that are expected to influence the latter as well as behaviour to avoid unintentional doping.

In total, 27 schools that have implemented the program and 17 schools that were still schools with a sport focus but served as control schools. They have not implemented the program were surveyed over the time span of four years. Unfortunately, due to the COVID-19 crisis, the attrition rate of the participants was significantly higher than expected and thus data collection could not have been implemented as planned by the study protocol Instead of five time points in measure we could only follow up three and most of the control schools withdraw their participation towards the end of the study, thus decreasing the total sample size to a number that rendered data analysis at all time points impossible. Results still allow some conclusions to draw and additional stakeholder interviews rather addressing managerial points and challenges amended the data to provide recommendations not only in terms of the effectiveness of NADA Austria's school program but also in terms of managerial implications for future studies that are composed of a corporation of science and practice.

In sum, NADA Austria's school program has a significant effect on all knowledge-related outcomes, that are important protective factors especially in view of unintentional doping. No effects were detected for the other assessed outcomes. Situational temptation was exceptionally low and did not significantly change over the study period. Descriptively, a slight increase was detected, that can be considered as proof of a natural maturing of the athletes as individuals and sportspersons. NADA

Austria's intervention also did not seem to have a significant effect on self-efficacy, perceived behavioral control and attitudes. However, as these outcomes are related to content that NADA Austria is delivering in schoolyear three mostly, the results need to be interpreted carefully. Due to COVID-19 and the closing down of the schools, it is highly likely that this content was not delivered as expected.

From a managerial point of view, three important foci emerged: communication, setting school and science. In detail, joint meetings with all those involved are particularly noteworthy and recommendable especially at the beginning of the project. As such, needs of all sides can clearly be communicated to prevent mismatches caused by lacking communication and provide solutions for real problems caused by competing needs. The "school setting" is a specific one and has fundamentally special features. It is therefore advisable to consider this challenge but also to use it as a resource, for example by making interventions part of the lesson. Fundamentally, basic didactic training is important for speakers, and it becomes even more important when they are part of the classroom and teaching. Science must consider all the boundary conditions that school entail already at the design stage of the project, more specifically while developing the study design and testing protocol. In the best case, this should happen together with the schools (that will provide time slots for education delivery), the sport organization (or any other provider of the educational content) and the research team, who needs to clearly communicate why keeping up the compliance and following the testing protocol is crucial for valid and reliable results. Lastly, a-priori risk assessments and possible solutions to it should be discussed together and noted to ensure a quick and flexible response to potential incidents threatening the study protocol and implementation.

Top Three Outcomes

1) To us the main important outcome was the managerial learnings from working with practice. We believe that these learning are transferable to similar set ups in which science, sport organizations and a third stakeholder (i.e., schools, but also for example sports clubs, national federations, etc.) are working together. This cooperation can be successful only if there is a clear and transparent communication, especially in terms of needs and fixed frameworks, to adapt the planning.

2) The second main outcome, also from a managerial perspective, is the importance of commitment from all involved stakeholders. To be successful, science is dependent on a certain quality of data, and this asks for commitment of the study participants who, for example, fill in the survey. This is associated with their motivation that can and must be facilitated by all involved parties. So, giving the scientific study behind a certain importance to all and showing this to students and rather outside stakeholders, significantly helps. Consider each other as partners on eye-level who all have an important job to do.

3) Third, considering the results from the evaluation, we could see significant improvements in knowledge related areas that are important with respect to the avoidance of unintentional doping. As for the psychological variables, the evidence of this study was not clear but mainly due to technical challenges caused by COVID-19 and the associated high attrition. Thus, given also other evidence in the field, we suggest to always combine knowledge and values-based elements and if possible, also psychological interventions as proven effective in other studies.

1 Introduction

Sport is supposed to convey values like solidarity, tolerance and fair play. Especially for children and adolescents, sport might be a means to develop their individual personality (Commission, 2007). However, a downside of competitive sport is doping, which can be seen as violating the spirit of sport and the core values of sport (Kayser, Mauron, & Miah, 2007; Kayser & Smith, 2008; Savulescu, Foddy, & Clayton, 2004). What is more, some substances and methods have severe health-affecting side effects (Achar, Rostamian, & Narayan, 2010).

Due to the known, and yet unknown, negative health-affecting side effects and the violation of the core values of sport, doping behaviour should be prevented. Next to strategies that focus on deterrence, research regarding value-based prevention has emerged and strategies have been developed, targeting two groups: On the one hand, athletes should be prevented from intentionally doping to improve their performance. On the other hand, those that unintentionally use prohibited substances or methods due to unawareness or inattentiveness should be protected. Even though motives are different, the consequences for both groups are similar (e.g., ban from sport). To counteract the development of a so-called “doping mentality” – a term that has received much attention in previous research (for example see Melzer, Elbe, and Brand (2010)) - doping prevention should start at an early point in the sporting careers. Prevalence figures of international studies estimate prevalence numbers in adolescents to be between 3-5%, being higher for male adolescents and increasing with age and higher sportive level of the athletes (Laure, 2000; Laure & Binsinger, 2007; Nicholls et al., 2017).

Given that morality and attitudes can form during childhood and adolescence (Commission, 2007), it is important that children and adolescents are exposed to anti-doping messages during these years. To support this, the National Anti-Doping Agency (NADA) Austria has started an Anti-Doping School Programme for adolescent athletes in 2013. Besides information-based doping prevention, this programme also includes elements of a value-based approach such as fair play, morality, self-perception and norms – elements that might add to a positive development of the adolescents’ personality. However, up to now this school-based prevention measure, targeting the future elite athletes of Austria, has not been systematically evaluated. Thus, this project aimed to systematically evaluate this school programme regarding its effectiveness

with focus on doping susceptibility as well as different variables linked to personality development.

2 Background

2.1 Risk factors of doping

Over the last decades, research into doping increasingly focused on investigating the risk factors that lead athletes to doping. In this context, knowledge (or the lack of it) about prohibited substances and methods was shown to be a significant predictor of doping attitude and behaviour (Laure & Binsinger, 2007; Peters, Schulz, Oberhoffer, & Michna, 2009; Wanjek, Rosendahl, Strauss, & Gabriel, 2007). Consequently, there was a demand for athletes to improve their knowledge about the risks of doping (Peters et al., 2009; Wanjek et al., 2007). Additional factors that might predict doping were found in two meta-analyses (Blank, Kopp, Niedermeier, Schnitzer, & Schobersberger, 2016; Ntoumanis, Ng, Barkoukis, & Backhouse, 2014). Situational factors were shown as the strongest positive predictors for doping attitude, while sportspersonship – in the sense of fair play – as the strongest negative predictor (Blank et al., 2016). In addition, the use of nutritional supplements, perceived social norms and positive attitude towards doping was the strongest positive predictor of doping intention and behaviour (Ntoumanis et al., 2014). Another study investigating protective factors of doping could show that moral, a social identity beyond sport and resilience towards peer pressure as being protective from doping (Erickson, McKenna, & Backhouse, 2015).

However, most of these studies focused on doping being an intentional behaviour, not taking into account that athletes can also commit a doping fraud unintentionally for example due to negligence. In this context, studies showed that nutritional supplements can be contaminated with prohibited substances such as anabolic steroids or stimulants (Chan et al., 2015; Chan, Tang, Yung, Gucciardi, & Hagger, 2019; Martinez-Sanz et al., 2017). A study with adolescent athletes investigating their awareness of these risks showed that only 40.7% refused to eat a food product that was given to them, and only 16.1% read the ingredients list before eating (Chan et al., 2015). As an increasing number of athletes uses nutritional supplements, it is crucial that they have sufficient knowledge about the dangers of doping, so that unintentional doping can be prevented.

In summary, it seems that perceived social norms, moral, self-image and attitudes towards doping play a significant role in the decision to dope. In addition,

awareness about doping and the risks of nutritional supplements could help protect athletes against doping. Moreover, it seems that a certain amount of trust in the work of anti-doping organisations is important in the decision to engage in doping. In this context, Mulder, van Dijk, and De Cremer (2009) showed that trust in authorities plays an important role in regard to whether people comply to the rules or not. In the context of doping, Overbye (2017) could show that only 40% of the investigated athletes found the possibility to be selected for a doping control a deterrent. Reason for this might be a low level of trust in the testing system, which was for example found among athletes who experienced errors during prior doping controls (Overbye, 2016). Thus, preventive measures should not only include the above-mentioned risks and protective factors, but also try to increase trust in the anti-doping work.

2.2 Preventive approaches in schools

Adolescence describes a time of biological, intellectual and social changes. While adolescents tend to revolt against authorities and their social surroundings, they also seek recognition and acceptance by their peers (Oerter & Dreher, 2008). During this time, it is possible to positively influence the development of their morality with specific interventions, as it was found that the adolescent age is an important stage for the development of moral behaviour (Kohlberg & Hersh, 2009). In this socialisation process, the school might play an important role as it is the setting where students gain their first social experiences outside the family. Recognizing the potential importance of the school setting for doping prevention, different research groups used this setting to present intervention programs that were built on evidence in regard to risk factors for doping behaviour. The “Adolescent Training and Learning to Avoid Steroids Program” (ATLAS) for example tackled intentions to use steroids of American school students (Goldberg et al., 1996; Goldberg et al., 2000). The program was developed in 1994 in the USA for male adolescent to show them alternatives for alcohol and illegal substances with the aim to prevent them from doping. Next to theoretical lessons, it also included practical training sessions like strength training. Results of the evaluation showed that the intention to use anabolic steroids as well as the actual use decreased in the intervention group. Additionally, attitudes towards doping and norms were positively influenced due to the program, and knowledge about food supplements, steroids and other illegal substances was increased (Goldberg et al., 1996; Goldberg et al., 2000). Also in Greece and Germany, specific prevention approaches were developed for the school setting, with the aim to promote an anti-doping culture

amongst adolescents (Barkoukis, Kartali, Lazuras, & Tsorbatzoudis, 2016) and to strengthen the pupils character in order to be more resilient against doping (Wippert & Fliesser, 2016).

Also, the World Anti-Doping Agency (WADA) built on this research and developed and implemented the e-learning programme ALPHA ("Athlete Learning Program about Health and Anti-Doping") in 2014, representing a "holistic, values-based approach and offers a pragmatic and positive alternative to the traditional approach to the prevention of doping". In 2021, a new and e-learning platform was launched, namely the Anti-Doping Education and Learning Platform (ADEL), which is the new version of the current Anti-Doping e-Learning platform (ADeL) that was introduced in 2018 (WADA, 2021).

2.3 Doping prevention in Austria - NADA Austria and its preventive approaches

In 2008, NADA Austria was founded. Since then, they initiated several preventive approaches to fulfil one of their main aims – doping prevention through information and awareness. Next to the MedApp and an e-learning course about anti-doping, the mobile game "Born to Run" and the anti-doping campaign "Bleib sauber" ("Stay clean") were especially developed for the school setting. In 2021, a new learning platform (aktiv.nada.at) was created as the central instrument of NADA Austria's preventive work, including an e-learning course, videos, articles, games and important documents in relation to anti-doping (NADA-Austria, 2021).

In 2013, NADA Austria developed its own anti-doping school programme for sport schools. The programme was started to help adolescents to develop into independent and confident young people who choose a clean and healthy sport over doping and substance abuse. Additionally, the awareness of unintentional doping should be raised and developed (NADA-Austria, 2013). It is based on evidence-based psychological and knowledge related aspects that were identified as risk- and protective factors regarding doping (Blank et al., 2016; Ntoumanis et al., 2014). The intervention consists of a continuous, age-appropriate educational program including three sessions of 45 minutes every schoolyear beginning with the 4th grade (age 14) and running until the end of 8th grade (age 18 years). The different aspects that are included (and expected to improve) are:

a) Knowledge and trust: The students' knowledge about the anti-doping work of NADA Austria should be improved as NADA Austria should become more tangible. Additionally, trust in their anti-doping work should be increased.

b) Fair play, rules and values of sport: The importance of rules and fair play in sport should be strengthened to ensure the athletes develop into fair sportspersons that understand doping as any other sports rule they should comply with.
c) Self-control and -efficacy: The self-perception of the students should be further developed so that they develop to be athletes who believe they can make decisions autonomously and self-determined.
d) Values, moral and social norms in society: Values, moral and social norms in society as well as in the sporting context should be conveyed.
e) Knowledge about rights and responsibilities: The adolescents' awareness about the procedure of doping controls and the rights and responsibilities under the World Anti-Doping Code 2015 should be raised and improved.
f) Knowledge about effects and unintended side-effects of doping: Students should gain knowledge about the meaning and definition of doping and its possible effects and unintended side-effects. Furthermore, benefits and risks of food supplements and possible alternatives should be pointed out.
g) Sensitivity towards unintentional doping: Students should develop skills to be more sensible towards unintentional doping not only in obvious sport-related situations but also in daily routines.

3 Aims of the project

NADA Austria's school programme was developed and implemented to intervene with various psychological and knowledge related aspects that were previously identified as risk- and protective factors regarding doping (refer to the literature review). Up to now, the school programme has not been evaluated regarding its efficiency. Thus, the project aims to systematically evaluate the effects of the intervention programme on students' situational temptation to doping as well as several evidence-based risk factors of doping intentions and behaviour. Moreover, the students' trust in and satisfaction with the work of NADA Austria as well as other national and international sport organisations should be investigated. In detail, the following four overall research areas will be addressed including the outlined research questions and -hypotheses.

3.1 Knowledge, Trust, and Satisfaction

The first area addresses the knowledge about NADA Austria as well as the perceived trust in and satisfaction with their work but also with the work of other national and international sport organizations. In detail, the following research question serves as

outline: *Does the school-based intervention affect the level of knowledge about NADA Austria and perceived trust in and satisfaction with the anti-doping work of national and international sport organizations including the efficiency and efficacy of doping controls?*

We aim to test the hypotheses that, compared to the control group, Austrian Junior Athletes (aged 14-18), after attended the NADA school-based intervention program, have an increased level of:

a) knowledge about NADA Austria and its work,
b) trust in the anti-doping work of national and international sport organizations,
c) satisfaction with the anti-doping work of national and international sport organizations,
d) Perception of the efficacy of national testing systems, and
e) Perception of the efficacy of international testing systems.

3.2 Situational Temptation

The second area addresses the variable of situational temptation, a strong predictor for doping intention and -behaviour. In detail, the following research question serves as outline: *Does the school-based intervention affect situational temptation to dope of junior athletes*. We aim to test the hypotheses that, compared to the control group, Austrian Junior Athletes (aged 14-18), after attended the NADA school-based intervention program, are less tempted to dope in specific pressure situations after the four-year school-based intervention.

As the literature states that doping prevalence rates were higher in older athletes and those competing at a higher sporting level, we further hypothesize that the situational temptation of Austrian Junior Athletes (aged 14-18) of the control group will significantly increase over time.

3.3 Knowledge, Moral, Fairness, Behavioural Control, Self-Efficacy, Attitudes, and Norms

The third area addresses variables that are said to influence doping susceptibility and behaviour. As such, the following research question serves as outline: *Does the school-based intervention affect variables that are expected to influence doping susceptibility and behaviour?*

Taking the variables of interest from the literature as outlined above, we aim to test the hypotheses that, compared to the control group, Austrian Junior Athletes (aged

14-18), after having attended the NADA school-based intervention program, have an increased level of:

a) perceived knowledge regarding doping in general, prohibited substances and methods and their rights and responsibilities written in the WADC,
b) test knowledge regarding the prohibited list, side effects of doping and their rights and responsibilities written in the WADC,
c) moral decision making,
d) sportspersonship
e) perceived behavioural control,
f) self-efficacy,
g) attitudes, and
h) norms.

Based on an expected biological development of the students over the four-year project period, we further hypothesize that, Austrian Junior Athletes (aged 14-18) of the control group also have increased mean values in:

a) moral decision making,
b) sportspersonship,
c) perceived behavioural control,
d) self-efficacy,
e) attitudes, and
f) norms.

3.4 Unintentional Doping

The fourth area addresses the sensitivity towards unintentional doping. The following research question serves as outline: *Does the school-based intervention affect the sensibility towards unintentional doping?*

We aim to test the hypotheses that, compared to the control group, Austrian Junior Athletes (aged 14-18), after having attended the NADA school-based intervention program will be more sensible towards unintentional doping, and

4 Methods

4.1 Design

The quasi-experimental research study was implemented for a total period of four years, starting with 01.01.2018. It was a two-armed study and included Austrian sport schools attending the NADA school programme and Austrian sport schools not

participating in the NADA school-programme (control group). The allocation to the intervention and control school was not at random. Intervention schools were all indicated by NADA Austria as those schools with a sport focus who participated in their program. Control schools were selected out of the remaining schools with sport focus who did not yet participate in the NADA school program. Thus, the sampling approach was a purposeful one.

4.2 Intervention

In Austria, there are several prevention activities initiated by the NADA Austria. To fulfil one of their main aims – doping prevention through information and creating awareness (NADA-Austria, 2015) – preventive measures such as the MedApp (NADA-Austria, 2017c), an e-learning course about anti-doping work, the mobile game “Born to Run” (NADA-Austria, 2017b) as well as the anti-doping campaign “Bleib sauber” (“Stay clean”) (NADA-Austria, 2017a) were developed especially for the school setting. Given the success of earlier school-based active intervention programs the NADA Austria developed its own “Anti-Doping School Program for Sport Schools” in 2013 (NADA-Austria, 2013). Sport Schools in Austria include school setting designed for junior elite athletes, providing them with more time to finish their school career and allowing them to focus on their sporting careers. The program was started to help adolescents to develop into independent and confident young people who choose a clean and healthy sport over doping and substance abuse. Additionally, the awareness of unintentional doping should be raised and developed (NADA-Austria, 2013). Even though developed before, it can be considered aligned to evidence-based psychological and knowledge related aspects that were identified as risk- and protective factors regarding doping (Ntoumanis et al., 2014; Blank et al., 2016).

As part of the current study, each class of the intervention schools had 2 lessons (à 50 minutes) on anti-doping per schoolyear. The programme consisted of four progressive, age-appropriate and interactive modules presented by NADA instructors. Next to overall information on the work of NADA Austria, students were educated in contents like fairness, values in sport and society, morality, and self-image. With this programme, NADA Austria tried to intervene with various evidence-based psychological and knowledge related aspects that were identified as risk- and protective factors regarding doping. We hypothesized that students from the intervention schools will display improvements in all aspects compared to students from the control schools. In addition, and because some aspects might change due to

age-related development (e.g., moral, norms), we further hypothesized that the intervention leads to improvement in those aspects independently of the age-related development. In detail, the different aspects that were expected to improve, and thus were part of the intervention are outlined in table 1.

Table 1: Details on NADA School Program

Area	Content	Schoolyear
Knowledge of and trust in the work of NADA Austria	The students' knowledge about the anti-doping work of NADA Austria should be improved as NADA Austria should become more tangible. Additionally, trust in their anti-doping work should be increased. By this, also trust and satisfaction in and with the work of further national and international sport organizations was expected to increase	1, 4
Fair play, rules and values of sport	The importance of rules and fair play in sport should be strengthened to ensure the athletes develop into fair sportspersons that understand doping as any other sports rule they should comply with.	(1), 2
Self-control and -efficacy	The self-perception of the students should be further developed so that they develop to be athletes who believe they can make decisions autonomously and self-determined. Modules one and two should further help them to use their knowledge in various situations.	3
Values, moral and social norms in society	Values, moral and social norms in society as well as in the sporting context should be conveyed.	3, 4
Knowledge about rights and responsibilities	The adolescents' awareness about the procedure of doping controls and the rights and responsibilities under the World Anti-Doping Code 2015 should be raised and improved.	4
Knowledge about effects and unintended side-effects of doping	Students should gain knowledge about the meaning and definition of doping and its possible effects and unintended side-effects. Furthermore, benefits and risks of food supplements and possible alternatives should be pointed out.	4
Sensitivity towards unintentional doping	Students should develop skills to be more sensible towards unintentional doping not only in obvious sport-related situations but also in daily routines.	1-4

4.3 Sample description and sample size

In total, 27 Austrian sport schools that agreed to take part in the NADA school-programme and 17 sports schools who did not participate (control schools) were invited to take part in the study. Given the fact that most sport schools with students with a high level of sport performance and affinity to school already participated in the school-program, the control schools, by nature, hosted students that, on average, were expected to have a lower sport performance level. Yet, as they were still schools with a sport focus, we expect them to serve as control schools sufficiently. The targeted study population for this project were students aged 14-18 years, attending the above-mentioned schools. Students started with the intervention programme in their first year (grade 5) with module one and were included in the study until the end of grade eight (four years later) or until their exit from school.

In total, we expected 320 students (160 in each group – intervention/control) participating at the survey including a dropout rate of 10% based on the experience of the NADA project in 2010. Power analysis with GPower for the most complex statistical calculation applicable (2x5 ANOVA with repeated measurements, within and between subjects, 2 groups, 5 time points of measurement and a small effect size (Cohen's d = 0.2) yielding a power of 0.95, required a total N of 188 students.

4.4 Survey Instrument

To assess if the content of the above-described intervention is successful, we evaluated the outcomes using a paper-and-pencil questionnaire. The first section of the questionnaire consisted of socio-demographic information including age, gender, sport, training quantity, competitions/year and competition level. In addition, previously used questionnaires in anti-doping science were used to investigate the various variables, which will be described in detail in the following:

4.4.1 Awareness and trust of and satisfaction with the anti-doping work on national and international sport organizations

Students were asked questions regarding NADA Austria and their work. The answers were mainly based on a nominal scale. Aligned to the European Social Survey (2012), we used self-made questions to assess the students' trust in national and international federations. The stem "With respect to each of the following, tell me to what extent do you trust them?" was used followed by six different national and international sport federations (WADA, NADA Austria, IOC, Austrian Olympic Committee, FIFA, my national sport federation). With respect to satisfaction with their work, the stem: "even

though you do not have a personal relation to the following organizations: If you think of their performance (in general and related to doping prevention) how satisfied are you?" was used followed by the same six national and international sport federations (WADA, NADA Austria, IOC, Austrian Olympic Committee, FIFA, my national sport federation). Questions were answered on a 5-point Likert scale (0: do not trust at all; 4: completely trust and 0: not satisfied at all; 4: completely satisfied). For the analysis, a score for each of the questions was derived using the mean value over all six items. Cronbach's alpha for trust at baseline, after schoolyear one and two was = .80, =.84, =.77, and for satisfaction=.82, =.80, =.74.

To assess the trust in the efficacy and efficiency of national and international competition and out-of-competition testing programs, students were asked eight questions in total. Regarding the efficacy, the stem: "to what extent do you trust in the efficacy of the current doping control program in the following situations? (e.g., doped athletes will be detected as such by testing and laboratory analyses)" was used and followed by four different situations: national and international out-of-competition control and national and international in-competition control. Regarding the efficiency, the stem "To what extent do you trust that the athletes will be selected efficiently? (in the sense of the "right" athletes will be selected for doping controls)" followed by the same four situations as above. Questions were answered using a 5-Point Likert Scale (0: do not trust at all; 4: completely trust). For data analysis, the two questions (with their four items respectively) were summarized to a mean score of trust for testing efficacy and efficiency. Cronbach's alpha for efficacy at baseline, after schoolyear one and two was =.84, =.84, =.80, and for efficiency =.87, =.87, =.89. Higher values indicate higher trust in and higher satisfaction with the outcome.

4.4.2 Situational temptation

Based on previous research of (Barkoukis, Lazuras, & Tsorbatzoudis, 2014; Lazuras, Barkoukis, Rodafinos, & Tzorbatzoudis, 2010), six items were used to assess situational temptation, in terms of the level of agreement to whether the students would be tempted to take prohibited substances and/or methods in certain situations. Example questions are "…if I feel disadvantage"; "…if I prepare for an important competition/game". Questions were answered on a 5-point Likert scale (0:do not agree at all; 4: completely agree). For data analysis, the average score out of the six items was built. Cronbach's alpha at baseline, after schoolyear one and two was =.92, =.94,

=.95. Higher values indicate a higher degree of feeling tempted to dope in specific situations of pressure.

4.4.3 Perceived and test knowledge about doping, its effects and unintended side-effects, the rules, and responsibilities under the WADC

Perceived knowledge about doping in general, substances/methods and the WADC was assessed using the stem “On a scale from 0 (very bad) to 4 (very good), how well are you informed about…” followed by three items addressing doping in general, substances/methods of the current prohibited list, and rules and responsibilities of the WADC. The variable was further analysed item-based and a mean score of all three items was built to gain a picture of overall perceived knowledge. Cronbach’s alpha at baseline, after schoolyear one and two was =.77, =.80, =.84. Higher values indicate a better perceived knowledge.

Test knowledge about illegal substances and methods, their (side-) effects as well as the rights and responsibilities of an athlete based on the WADC, were assessed using a “right/wrong/don’t know” format. Answers were recorded in correct and wrong answers. Correct answers yielded one point, wrong and don’t know answers yielded zero points. For further analysis, a sum score of the three areas (i.e., prohibited list, 10 items, maximum of 10 points; side effects, 13 items, maximum of 13 points; WADC, six items, maximum of six points) as well as an overall score (29 items, maximum of 29 points) was calculated. Higher values indicate a better test knowledge.

4.4.4 Moral decision making

To examine pupil’s morality, two subscales of the “Attitudes to Moral Decision-making in Youth Sport Questionnaire” (AMDYSQ) were used to examine anti-social attitudes (acceptance of cheating and of gamesmanship; three items respectively, e.g., It is OK to cheat if nobody knows”) (Lee, Whitehead, Ntoumanis, & Hatzigeorgiadis, 2008). Questions were answered on a 5-point Likert scale (0: do not agree at all; 4: fully agree). This scale was not yet validated in German. To be used in this study, items were translated back and forth from a professional bilingual interpreter. For further analysis a mean score for each of the subscales was computed. Cronbach’s alpha at baseline, after schoolyear one and two was =.83, =.87, =.92 and =.77, =.78, =.86 respectively. Higher values indicate a less positive attitude to moral decision making.

4.4.5 Fairness

To evaluate the program’s effect on fairness, the “Multidimensional Sportspersonship Orientation Scale” (MSOS) by Vallerand, Brière, Blanchard, and Provencher (1997)

was used. The questionnaire examined five subscales of fairness: respect for social conventions, respect for the rules and the officials, respect for one's full commitment toward sport participation, respect and concern for the opponent, and negative approach toward the practice of sport (e.g., I respect the referee even though he/she is not good). Questions were answered on a 5-point Likert scale. This scale was not yet validated in German. To be used in this study, items were translated back and forth from a professional bilingual interpreter. For further analysis a mean score for each of the subscales was computed. Cronbach's alpha for respect for social conventions at baseline, after schoolyear one and two was =.72, =.75, =.79. Cronbach's alpha for respect for the rules and the officials at baseline, after schoolyear one and two was = .74, =.76, =.74. Cronbach's alpha for respect for one's full commitment toward sport participation at baseline, after schoolyear one and two was =.75, =.78, =.55. Cronbach's alpha for respect and concern for the opponent at baseline, after schoolyear one and two was =.70, =.79, =.81. Cronbachs-alpha for negative approach toward the practice of sport at baseline, after schoolyear one and two was =.42, =.50, =.05. Higher values mean a better sportspersonship orientation for respect for social conventions, respect for the rules and the officials, respect for one's full commitment toward sport participation, and respect and concern for the opponent but a worse sportspersonship orientation for the negative approach toward the practice of sport

4.4.6 Self-efficacy

The "Allgemeine Selbstwirksamkeit Kurzskala" (ASKU; general self-efficacy scale) was used to assess subjective expectations of competency. ASKU measures the subjective belief to be able to cope with critical situations by oneself. The short version consists of three items (e.g., I can solve most problems by myself") and was introduced and validated by Beierlein, Kovaleva, Kemper, and Rammstedt (2012). Questions were answered on a 5-point Likert scale (0: do not agree at all; 5: fully agree). For further analysis a mean score was computed. Cronbach's alpha at baseline, after schoolyear one and two was =.80, =.79, =.88. Higher values mean a better self-efficacy.

4.4.7 Perceived behavioural control

Next to self-efficacy, the concept of perceived behavioural control was assessed. This concept was previously applied to the doping context using three items to identify the perceived self-control to dope or not to dope (Lazuras et al., 2010). Questions were answered on a 5-point Likert scale (0: do not agree at all; 5: fully agree). For further analysis a mean score was computed. Cronbach's alpha at baseline, after schoolyear

one and two was =.28, =.35, =.24. As these values were not acceptable, item of perceived behavioural control is analysed on an item-base.

4.4.8 Attitudes

To assess attitudes, the questions were presented using the stem “The use of prohibited substances/methods to enhance my performance would be” and followed by four semantic differentials based on a Likert-scale (e.g., 0: good; 4: bad). This approach was used previously in doping research (Lazuras et al., 2010). For further analysis a mean score was computed. Higher values mean a better, anti-doping, attitude. Cronbach’s alpha at baseline, after schoolyear one and two was =.76, =.69, =.67.

4.4.9 Norms

Descriptive norms were evaluated using two open questions about perceived prevalence of doping within the specific sport and in Austria in general. This procedure was adjusted to Austria as based on previous research from Barkoukis et al. (2014). Further analyses used these items on an item-based approach and no score was built. To evaluate social norms, students were asked whether they believe that significant others in their surroundings would support doping (based on previous study by Goulet, Valois, Buist, and Côté (2010)). Questions were answered on a 5-point Likert scale (0: do not agree at all; 5: fully agree). For further analysis a mean score was computed. Higher values indicate a higher agreement of important others with doping behaviour. Cronbach’s alpha at baseline, after schoolyear one and two was =.89, =.96, =.92.

4.4.10 Sensitivity towards unintentional doping

To receive an impression about students’ sensitivity towards unintentional doping, we used the behavioural adherence to unintentional doping scale that was used by Chan et al. (2015). The scale includes seven items to assess the behavioural adherence to avoid unintentional doping. Three items measure the frequency (e.g., “On a scale from 0 (never) to 6 (always), how often do you check if your nutritional supplements or medication contains prohibited substances?”), and four items measure the effort (e.g., ., “On a scale from 0 (not at all) to 6 (very much), do you think you take an effort to prevent the unintentional use of prohibited substances/methods?”) of avoidance behaviour. Questions were answered on a 7-point Likert scale. For further analysis a mean score for the two areas was computed. Cronbach’s alpha at baseline, after

schoolyear one and two was =.82, =. 90, =.91. Higher values indicate a higher unintentional doping avoidance behaviour.

4.4.11 Initially planned but not used

Knowledge about legal consequences

It was initially planned to investigate knowledge about the legal consequences of doping using a case study developed by (Blank et al., 2021) and including a doping case and possible consequences. In addition, the perception of the appropriateness of each of these consequences would have been assessed. Based on the results of the baseline measure, we did not further include this task. The original task was developed and tested with adults and the wording and task seems to be too complex for adolescent students in the given time frame of a school hour considering the overall length of the survey.

Sensitivity towards unintentional doping

We also initially planned to include a third measure for sensitivity towards unintentional doping based on previous research of Chan et al., (2015). As part of the final survey after schoolyear four at the end of the project, the so-called Lollipop-Dilemma was planned to be applied to assess students' susceptibility to unintentional doping. They would have been offered a lollipop including a list of its ingredients. The investigator would have observed whether the students refuse to take the lollipop (not taking), they take it but do not eat it (not eating) and whether they read the list of ingredients (reading). This dilemma has proven to be efficient in earlier research (Chan et al., 2015). The lollipop dilemma would have been only presented at the last measurement at the end of grade 8. Due to ethical reasons, it would have been resolved directly after the data aggregation and results would have been only compared between the intervention and control schools. Due to the COVID-19 situation, we were not allowed to enter the schools, thus, would not have had a reliable observer to do the experiment. Thus, the lollipop dilemma was also omitted from the study. The German version of the questionnaire is available from the principal investigator on request.

4.5 Procedure

Recruitment was done in cooperation with NADA Austria and the state school boards of the respective Austrian states the schools were located. As all students were at least 14 years of age, they were mature minors under Austrian law (§21 ABGB) and therefore allowed to sign the written informed consent on their own. However, parents of the students were informed about the study as well. Questionnaires and written

informed consent forms were collected by the research team at the end of each data collection session. To ensure the questionnaires can be assigned to the different time points of measurement respectively, the students were asked to provide a personal code every time they fill in a questionnaire. The code consists of the first two letters of their mother's and father's name as well as the first two digits of their birth date.

Initially, it was planned that students receive the questionnaire within a school lesson at five points in time (Baseline before their first intervention session in grade 5, at the end of grade 5, 6, 7 and 8). The COVID-19 crisis led to restrictions in schools (e.g., home schooling, pupils in quarantine, no "outsiders" allowed in the building, etc.). Thus, we could not complete all five data collections as previously planned in the project proposal. The first data collection was done between 09/2018 - 06/2019, and COVID-19 hit in the middle of the preparation for data collection 2, leading to fewer students being investigated. Data collections three and four had to be omitted due to the restrictions and the last and final data collection was done in 2022, but with a significantly lower number of students, especially in the control schools. Therefore, we were only able to distribute the survey at three time points: Baseline, before the first schoolyear and intervention, after schoolyear one, and after schoolyear four.

4.6 Data analysis

The data was analysed descriptively and presented with proportions and the mean value and standard deviations respectively. Due to the COVID-19 circumstances, the subsequent statistical analyses changed compared to the initial study protocol. Owing to the high attrition rate, that was mostly caused by the COVID-pandemic that led schools, especially control schools, to withdraw from the study obligation during the study, and the resulting unbalanced sample sizes after schoolyear one and four, the subsequent analyses were as follows: Beyond being analyzed descriptively at the three time points of measure, all metric variables were assessed for a) the effect of the school intervention for the first schoolyear only using a 2x2 ANOVA with repeated measurement before and after schoolyear 1 with the group (control vs. intervention) as interaction effect, and b) for the development of the variables over time in the intervention group only using an ANOVA with repeated measurement at three time points of measurement (before and after schoolyear one and after schoolyear four). Even though no control group is existent, the last analysis might still provide insight in possible effects or no effects of the intervention. The significance level is set on $p < 0.05$.

5 Results Survey Study

5.1 Sample description

Of the 27 invited intervention schools, 17 agreed to participate in the study with a total sample of N=319 students. Of the 17 invited control schools, nine agreed to participate with a total sample of N=256. Due to the indicated challenges, the COVID-19 pandemic cause, the attrition rate was significantly higher than expected and participating schools decreased throughout the study period (after schoolyear one: $N_{intervention}$=246, $N_{control}$=37; after schoolyear four: $N_{intervention}$=62, $N_{control}$=2).

Table 2a and Table 2b summarize the socio-demographic characteristics of the sample at each time point of measurement (three of initially planned five).

Table 2a: Socio-demographic information at each time point of measurement (metric variables)

		Baseline			Schoolyear 1			Schoolyear 4		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
Intervention	Age	316	14.57	0.7	246	15.04	0.7	62	17.98	0.5
	Training h/week	308	12.09	4.5	242	13.37	4.7	62	14.07	6.0
Control	Age	256	15.04	0.7	37	15.57	0.7	2	17.5	0.7
	Training h/week	356	10.45	4.9	36	10.29	3.6	2	19.5	4.9

$N_{Intervention}$ Baseline=319; $N_{control}$ Baseline=256; $N_{Intervention}$ Schoolyear 1=247; $N_{control}$ Schoolyear 1=37; $N_{Intervention}$ Schoolyear 2=67; $N_{control}$ Schoolyear 2=2

Table 2b: Socio-demographic information at each time point of measurement (nominal variables)

			Baseline		Schoolyear 1		Schoolyear 4	
			n	%	n	%	n	%
Intervention	Gender	Male	226	28.5	174	70.4	33	53.2
		Female	91	70.8	72	29.1	29	46.8
	Competition Level	None	3	0.9	3	1.2	5	8.1
		Regional	31	9.7	11	4.5	10	16.1
		National	67	21.0	53	21.5	7	11.3
		International	212	66.5	178	72.1	40	64.5
	# competition /season	None	3	0.9	5	2.0	6	9.7
		1-3	12	3.8	5	2.0	6	9.7
		4-6	19	6.0	15	6.1	3	4.8
		7-9	14	4.4	18	7.3	5	8.1
		>=10	268	84.0	204	82.6	42	67.7
	Training/Week	1	1	0.3	-	-	-	-
		2	5	1.6	3	1.2	3	4.8
		3	10	3.1	3	1.2	8	12.9
		4	30	9.4	13	5.3	3	4.8
		5	65	20.4	30	12.1	5	8.1
		>5	204	63.9	198	80.2	43	69.4
	RTP member	No	63	19.7	99	40.2	42	67.7
		Yes	20	6.3	12	4.9	7	11.3
		Don’t know	230	72.1	135	54.9	13	21.0
	If yes, which	Basis	2	10.0	-	-	2	28.6
		Top	5	25.0	7	58.3	2	28.6
		Don’t know	13	65.0	5	41.7	3	42.9
	Doping control	No	302	94.7	237	96.0	52	83.9
		Yes	9	2.8	10	4.0	6	9.7
	If yes, which	IC	2	22.2	6	0.6	3	50.0
		OOC	5	55.6	3	0.3	-	-
		Both	1	11.1	1	0.1	3	50.0
Control	Gender	Male	149	41.8	21	56.8	-	-
		Female	107	58.2	16	43.2	2	100.0
	Competition Level	None	22	8.6	1	2.7	-	-
		Regional	67	26.2	5	13.5	-	-
		National	75	29.3	11	29.7	-	-
		International	91	35.5	20	54.1	2	100.0
	# competition/ season	None	21	8.2	1	2.7	-	-
		1-3	41	16.0	1	2.7	1	50.0
		4-6	23	0.9	5	13.5	-	-
		7-9	17	6.6	1	2.7	-	-
		>=10	148	57.8	28	75.7	1	50.0
	Training/Week	1	6	2.3	-	-	-	-
		2	17	6.6	2	5.4	-	-
		3	51	19.9	5	13.5	-	-
		4	39	15.2	4	10.8	-	-
		5	47	18.4	8	21.6	-	-
		>5	95	37.1	18	48.6	2	100.0
	RTP member	No	94	36.7	19	51.4	2	100.0
		Yes	7	2.7	-	-	-	-
		Don’t know	152	59.4	17	45.9	-	-
	If yes, which	Basis	3	42.9	-	-	-	-
		Top	2	28.6	-	-	-	-
		Don’t know	2	28.6	-	-	-	-

Doping control	No	237	92.6	37	100.0	2	100.0
	Yes	19	7.4	-	-	-	-
If yes, which	IC	12	63.2	-	-	-	-
	OOC	2	10.5	-	-	-	-
	Both	5	26.3	-	-	-	-

$N_{Intervention}$ Baseline=319; $N_{control}$ Baseline=256; $N_{Intervention}$ Schoolyear 1=247; $N_{control}$ Schoolyear 1=37; $N_{Intervention}$ Schoolyear 2=67; $N_{control}$ Schoolyear 2=2; Missing values cause % of <100%; RTP: Registered Testing Pool; IC: In-competition; OOC: Out-of-Competition;

Even though intended, the control and intervention group differed in several socio-demographic variables at baseline. Also, the students of the control groups were active at a high level of training and competition, yet this level was significantly lower compared to the intervention group. The distribution of gender also differed, indicating an over-representation of female students in the control group. Finally, more students of the intervention group were members of a RTP and previously selected for doping control.

5.2 Knowledge, Trust in, and satisfaction with the anti-doping work of, national and international anti-doping organizations/ sport federations

The number of students of the intervention group who have attended an anti-doping event of NADA Austria increased from 11.7% (at baseline), to 76.2% (after schoolyear one) to 88.7% (after schoolyear four). In the control group, these numbers increased from 14.2% to 10.8% to 100% (n=2). The proportion of students who have attended an anti-doping seminar after schoolyear one was significantly higher in the intervention group ((Chi-Square=62.8, p<.001).

Results about the perceived knowledge of NADA Austria and its support offerings are descriptively outlined, separately for intervention and control group, in Table 3. Significant differences at baseline are marked. Results of the 2x2 repeated measure ANOVA are outlined in table 4.

Table 3: Information about NADA Austria (’s)

		Baseline			Schoolyear 1			Schoolyear 4		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
Intervention	in general†	307	2.27	1.0	245	3.05	0.8	62	3.32	0.9
	handbook high performance sport‡	308	1.71	1.0	246	2.26	1.3	61	2.77	1.3
	Dopipedia‡	307	1.39	0.9	246	2.01	1.2	60	2.47	1.3
	MedApp‡	308	1.44	1.0	246	2.73	1.5	60	3.32	1.5
	Anti-Doping License‡	307	2.08	1.2	246	2.92	1.4	61	3.51	1.3
Control	in general†	252	1.87	0.9	36	2.33	0.7	1	3.0	-
	handbook high performance sport‡	251	1.50	0.9	37	1.70	0.8	2	2.5	0.7
	Dopipedia‡	251	1.38	0.8	37	1.51	0.9	2	3.0	0.0
	MedApp‡	251	1.38	0.9	37	1.62	1.2	2	4.5	0.7
	Anti-Doping License‡	253	2.01	1.2	37	2.24	1.0	2	4.5	0.7

$N_{Intervention}$ Baseline=319; $N_{control}$ Baseline=256; $N_{Intervention}$ Schoolyear 1=247; $N_{control}$ Schoolyear 1=37; $N_{Intervention}$ Schoolyear 2=67; $N_{control}$ Schoolyear 2=2;

† 5-Point Likert scale (very badly informed; very well informed); ‡ 5-Point Likert scale (never heard of; heard of very often);

Table 4: Effect of the NADA School Program on Information about NADA Austria (’s)

	Intervention					Control					Significance (eta^2)	
		Baseline		Schoolyear 1			Baseline		Schoolyear 1			
	n	Mean	SD	Mean	SD	n	Mean	SD	Mean	SD	Time	Interaction
in general†	239	2.26	1.0	3.05	0.8	36	1.86	0.8	2.33	0.7	<.001 (.02)	.07 (.01)
handbook high performance sport‡	241	1.73	1.0	2.25	1.3	37	1.46	0.7	1.70	0.8	.001 (.04)	.22 (.002)
Dopipedia‡	241	1.40	0.9	2.02	1.2	37	1.27	0.6	2.51	0.9	<.001 (.06)	.08 (.01)
MedApp‡	241	1.49	1.0	2.75	1.5	37	1.27	0.9	1.62	1.2	<.001 (.13)	<.001 (.04)
Anti-Doping License‡	240	2.11	1.2	2.91	1.4	37	2.11	1.2	2.24	1.0	<.001 (.06	.008 (.03)

† 5-Point Likert scale (very badly informed; very well informed); ‡ 5-Point Likert scale (never heard of; heard of very often)

The results of the repeated 2x2 ANOVA indicates a significant time effect for all variables and a significant interaction effect for the MedApp and the Anti-Doping License. For both, the intervention group has a significantly higher increase in perceived information on these topics compared to the control group.

The results of the repeated measure ANOVA for the intervention group only at three time points (baseline, schoolyear one and four) indicates a significant time effect for all variables at $p<.001$ ($n_{in\ general}=54$, $eta^2=.42$; $n_{handbook}=53$, $eta^2=.35$; $n_{Dopipedia}=53$, $eta^2=.45$; $n_{MedApp}=54$, $eta^2=.64$; $n_{License}=52$, $eta^2=.36$).

The descriptive results of the changes in trust in, and satisfaction with the anti-doping work of, national and international anti-doping organizations/ sport federations, efficacy and efficiency of doping control systems is displayed in table 5.

Table 6 and 7 summarize the results of the 2x2 repeated measure ANOVA and the repeated measure ANOVA at three time points for the intervention group respectively. No time and no interaction effects were found before and after schoolyear one and comparing intervention and control group. No significant time effects were found for the intervention group except for the efficacy of the international doping controls. For the combination of international controls, in- and out-of-competition, the perceived efficacy significantly drops throughout the four years, with a marked decrease between after schoolyear one and after schoolyear four ($p=.048$, $eta^2=.09$).

The efficacy and efficiency related questions were a score built based on two items referring to in-competition and out-of-competition controls. As the literature states that athletes keep referring to an unfair international control system in the sense that their national system is stricter compared to the international system, we analyzed these items on an item-per-item base as well but only for the intervention group at three time points. The results of this analysis are displayed in table 11 and indicate a significant time effect with decreasing perceived efficacy for international in-competition controls ($p=.035$, $eta2=.09$).

Table 5: Trust in, and satisfaction with, anti-doping organizations, efficacy, and efficiency with the doping control systems

		Baseline			Schoolyear 1			Schoolyear 4		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
Intervention	Trust Sport Organizations†	138	2.82	0.7	146	2.82	0.8	50	2.72	0.7
	Satisfaction Work Sport Organization‡	115	2.64	0.8	124	2.80	0.7	44	2.82	0.6
	Efficacy national control†	243	2.75	1.0	207	2.77	0.9	59	2.63	0.9
	Efficacy intl. control†	241	3.01	0.9	211	2.94	0.9	55	2.71	1.0
	Efficiency national control†	220	2.48	1.1	190	2.52	1.0	57	2.44	1.0
	Efficiency int. control†	222	2.65	1.1	192	2.59	1.0	56	2.57	1.0
Control	Trust Sport Organizations†	126	2.69	0.8	12	2.53	0.8	-	-	-
	Satisfaction Work Sport Organization‡	86	2.58	0.7	9	2.67	1.0	1	3.00	-
	Efficacy national control†	198	2.40	1.0	25	2.44	0.8	2	2.25	0.4
	Efficacy intl. control†	195	2.73	1.0	26	2.81	0.8	2	2.50	0.7
	Efficiency national control†	184	2.17	0.9	26	2.23	0.9	2	2.50	2.12
	Efficiency int. control†	181	2.44	1.0	27	2.59	0.8	2	1.75	1.1

†5-Point Likert scale (0: do not trust at all; 6: completely trust); ‡5-Point Likert scale (0: not at all, 6: completely)

Table 6: Effect of the NADA school program on trust in, and satisfaction with, anti-doping organizations, efficacy, and efficiency with the doping control systems,

	Intervention					Control					
		Baseline		Schoolyear 1			Baseline		Schoolyear 1		Significance (eta^2)	
	n	Mean	SD	Mean	SD	n	Mean	SD	Mean	SD	Time	Interaction
Trust Sport Organizations†	76	2.83	0.8	2.89	0.7	8	2.81	0.7	2.60	0.7	.78 (.001)	.46 (.006)
Satisfaction Work Sport Organization‡	57	2.75	0.7	2.78	0.7	3	2.89	0.7	3.22	0.5	.42 (.01)	.50 (.008)
Efficacy national control†	170	2.78	1.0	2.81	0.9	21	2.38	1.2	2.38	0.8	.90 (<.001)	.90 (<.001)
Efficacy intl. control†	171	3.06	0.8	2.99	0.9	21	2.76	1.1	2.81	0.7	.89 (<.001)	.59 (.002)
Efficiency national control†	147	2.54	1.0	2.55	1.0	22	2.25	1.1	2.20	0.8	.67 (.001)	.94 (<.001)
Efficiency int. control†	148	2.69	1.1	2.55	1.0	21	2.33	1.1	2.50	0.8	.93 (<.001)	.25 (.008)

†5-Point Likert scale (0: do not trust at all; 6: completely trust); ‡5-Point Likert scale (0: not at all, 6: completely)

Table 7: Development of trust in, and satisfaction with, anti-doping organizations, efficacy, and efficiency with the doping control systems

		Baseline		Schoolyear 1		Schoolyear 4			
	n	Mean	SD	Mean	SD	Mean	SD	p	eta^2
Trust Sport Organizations†	18	3.00	0.6	3.08	0.5	2.69	0.7	.08	.14
Satisfaction Work Sport Organization‡	11	3.05	0.6	2.80	0.6	2.61	0.4	.17	.16
Efficacy national control†	34	2.78	1.0	3.03	0.8	2.62	1.0	.17	.05
Efficacy intl. control†	33	3.09	0.8	3.02	0.8	2.67	0.9	.046	.09
Efficiency national control†	26	2.50	1.0	2.63	0.9	2.56	0.9	.89	.005
Efficiency int. control†	28	2.59	1.0	2.68	1.0	2.61	1.0	.93	.003
Efficacy national OOC control†	37	2.57	1.1	2.84	1.0	2.38	1.1	.15	.05
Efficacy national IC control†	39	2.95	1.1	3.18	0.8	2.79	1.0	.15	.05
Efficacy intl. OOC control†	34	2.82	1.0	2.91	1.0	2.91	1.0	.90	.003
Efficacy intl. IC control†	37	3.32	0.8	3.22	0.9	2.86	1.0	.035	.09
Efficiency national OOC control†	26	2.38	1.1	2.50	1.1	2.46	1.0	.93	.003
Efficiency national IC control†	30	2.67	1.1	2.77	0.9	2.63	0.9	.96	.005
Efficiency intl. OOC control†	29	2.45	1.1	2.62	1.0	2.48	1.0	.80	.008
Efficiency intl IC. control†	30	2.73	0.9	2.73	1.0	2.63	1.0	.89	.004

†5-Point Likert scale (0: do not trust at all; 6: completely trust); ‡5-Point Likert scale (0: not at all, 6: completely

5.3 Situational Temptation

Mean values of situational temptation in the intervention group increased from baseline M=0.36±0.7 (n=288 of N=319) to M=0.37±0.75 (n=238 of N=247) after schoolyear one to M=0.54±0.9 (n=61 of N=67) after schoolyear four. The control group's baseline mean of M=0.68±0.9 (n=200 of N=256) decreased to M=0.49±1.0 (n=36 of N=37) after schoolyear one to M=0.08±0.1 (n=2 of N=2) after schoolyear four.

The repeated measure 2x2 ANOVA to assess the development of situational temptation before and after schoolyear one (research question one) was performed with $n_{control}$=34 and $n_{intervention}$=232. Results indicate a significant time effect (p=.04; eta^2=0.16) but no significant interaction effect (p=.22; eta^2=0.006). Mean values of the control group increased from M=0.23±0.6 to M=0.47±1.0 and of the intervention group from M=0.32±0.7 to M=0.38±0.8.

The results of the repeated measure ANOVA for the intervention group only at three time points indicates (n=51) no significant time effect (p=.64, eta^2=.009) for situational temptation ($M_{baseline}$= 0.42±0.7; $M_{schoolyear1}$=0.38±0.6; $M_{schoolyear4}$=0.48±0.9).

5.4 Variables expected to influence situational temptation

Table 8 outlines the development of perceived knowledge, test-knowledge morality, fairness, self-efficacy, perceived behavioral control, attitudes, descriptive and social norms at the respective time points of measurement and separated for the groups descriptively. Results of the 2x2 repeated measure ANOVA are outlined in table 9.

Table 8: Perceived and test knowledge, morality, sportspersonship, self-efficacy, perceived behavioral control, attitudes, descriptive and social norms

		Baseline			Schoolyear 1			Schoolyear 4		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
	Intervention									
Subjective Knowledge	Subjective Knowledge Doping†	310	1.79	1.1	245	2.25	0.9	62	2.47	1.0
	Subjective Knowledge PL†	311	1.16	1.2	245	1.84	1.1	62	2.24	1.1
	Subjective Knowledge WADC†	311	1.07	1.2	245	1.76	1.2	62	2.02	1.2
	Subjective Knowledge score†	305	1.35	1.0	243	1.95	0.9	62	2.24	0.9
Test Knowledge	Test Knowledge PL‡	292	4.69	1.7	236	5.51	1.6	60	7.72	1.7
	Test Knowledge Side Effects‡	297	6.55	1.7	230	6.90	1.7	58	9.69	2.7
	Test Knowledge WADC‡	299	2.74	1.3	242	2.96	1.1	59	3.97	1.8
	Test Knowledge all‡	269	14.1	3.1	220	15.4	2.9	54	21.2	4.8
Moral Decision Making	Acceptance of cheating#	311	0.23	0.8	243	0.45	0.8	61	0.71	1.0
	Acceptance of gamesmanship#	306	1.18	1.1	240	1.30	1.1	60	1.26	1.3
Fairness	Respect for social convention#	298	3.01	0.7	231	3.11	0.7	58	3.20	0.7
	Respect for rules and officials#	272	3.09	0.6	233	3.65	0.5	58	2.96	0.7
	Respect for one's full commitment#	304	3.74	0.4	232	3.65	0.5	58	3.43	0.6
	Respect for the opponent#	283	2.15	1.0	233	2.20	1.0	59	2.44	1.0
	Negative approach towards practice of sport#	292	1.61	0.7	234	1.73	0.7	58	1.98	0.8
	Self-Efficacy#	311	3.15	0.7	240	3.21	0.7	62	3.10	0.7
	PBC 1%	308	0.65	1.1	244	0.54	1.0	61	0.69	1.2
	PBC 2%	301	0.84	1.3	244	0.66	1.2	62	0.60	1.1
	PBC 3%	309	2.94	1.5	245	2.96	1.5	60	2.78	1.6
	Attitudes§	274	4.09	0.9	235	4.18	0.9	62	4.24	0.8
Descriptive Norms	Prevalence specific sport$	315	11.26	17.1	243	10.00	17.6	62	9.18	14.7
	Prevalence Austria$	313	18.2	18.8	240	18.0	18.3	62	12.5	14.7
	Social norms#	311	0.17	0.5	242	0.24	0.7	62	0.23	0.7
	Control									
Subjective Knowledge	Subjective Knowledge Doping†	253	1.72	1.0	36	1.69	0.9	2	3.0	1.4
	Subjective Knowledge PL†	252	0.97	1.1	36	1.19	1.0	2	3.0	1.4
	Subjective Knowledge WADC†	251	1.04	1.1	37	1.35	1.2	2	2.5	2.1

	Subjective Knowledge score†	249	1.25	0.9	36	1.43	0.9	2	2.83	1.65
Test Knowledge	Test Knowledge PL‡	243	4.81	1.8	36	4.61	1.8	2	7.00	1.4
	Test Knowledge Side Effects‡	236	6.46	1.7	34	6.76	1.7	2	8.50	3.5
	Test Knowledge WADC‡	247	2.47	1.0	35	2.89	1.2	2	5.00	0.0
	Test Knowledge all‡	218	13.74	3.1	32	14.22	3.7	2	20.5	4.9
Moral Decision Making	Acceptance of cheating#	248	0.61	0.8	35	0.78	1.2	2	0.17	0.2
	Acceptance of gamesmanship#	244	1.53	1.2	35	1.57	1.3	2	0.17	0.2
Fairness	Respect for social convention#	243	2.91	0.8	32	3.07	0.7	2	3.9	0.1
	Respect for rules and officials#	186	3.10	0.5	32	2.94	0.7	2	3.7	0.4
	Respect for one's full commitment#	249	3.43	0.6	35	3.42	0.7	2	2.9	1.3
	Respect for the opponent#	241	2.23	0.8	30	2.35	0.7	2	2.6	1.4
	Negative approach towards practice of sport#	242	1.77	0.7	30	1.56	0.6	2	1.1	0.4
	Self-Efficacy#	250	2.85	0.8	36	3.00	0.6	2	2.17	2.1
	PBC 1%	254	0.71	1.1	37	0.62	1.2	2	0.00	0.0
	PBC 2%	255	0.78	1.2	37	0.81	1.2	2	0.00	0.0
	PBC 3%	255	2.75	1.5	37	3.00	1.2	2	3.00	1.4
	Attitudes§	237	3.85	1.0	36	4.10	0.9	2	4.75	0.4
Descriptive Norms	Prevalence specific sport$	249	11.69	17.8	32	6.22	10.7	2	11.0	12.7
	Prevalence Austria$	248	21.27	19.0	34	14.20	13.6	2	10.0	14.1
	Social norms#	255	0.26	0.6	37	0.48	1.1	2	0.00	0.0

$N_{Intervention}$ Baseline=319; $N_{control}$ Baseline=256; $N_{Intervention}$ Schoolyear 1=247; $N_{control}$ Schoolyear 1=37; $N_{Intervention}$ Schoolyear 2=67; $N_{control}$ Schoolyear 2=2;

% Items of Perceived behavioral control: PBC 1: Taking prohibited substances depends on the situation, PBC 2 Taking prohibited substances depends on other persons, PBC 3 I can decide alone if I take prohibited substances/methods

† 5-Point Likert scale (0: very badly informed; 4: very well informed); ‡ True-false format transferred to a score (1 point for each correct answer) with a maximum of 10 points for knowledge on the prohibited list (PL), 13 points for knowledge on side effects, and 6 points for knowledge on the World Anti-Doping Code (WADC), resulting in a total of 29 points for overall test knowledge; # 5-Point Likert scale (0: completely disagree; 4: completely agree); § 5-Point Likert scale (1: pro-doping attitude anchor; 5: anti-doping attitude anchor), higher values mirroring anti-doping attitudes;

$estimated prevalence out of 100%

Table 9: Effect of the NADA School Program on variable expected to influence situational temptation compared to the control

	Intervention					Control					
	Baseline			Schoolyear 1		Baseline			Schoolyear 1		Significance (eta^2)	
	n	Mean	SD	Mean	SD	n	Mean	SD	Mean	SD	Time	Interaction
Subjective Knowledge Doping[†]	242	1.80	1.1	2.26	0.9	35	1.43	1.0	1.71	1.1	<.001 (.05)	.39 (.003)
Subjective Knowledge PL[†]	242	1.18	1.2	1.86	1.1	35	0.74	0.8	1.23	1.0	<.001 (.08)	.42 (.002)
Subjective Knowledge WADC[†]	242	1.08	1.2	1.76	1.2	35	1.09	1.1	1.43	1.14	<.001 (.07)	.14 (.008)
Subjective Knowledge score[†]	237	1.36	1.0	1.97	0.9	34	1.11	0.9	1.49	0.9	<.001 (0.11)	.20 (.006)
Test Knowledge PL[‡]	221	4.72	1.7	5.52	1.6	33	4.30	1.6	4.67	1.9	.002 (.04)	.25 (.005)
Test Knowledge Side Effects[‡]	225	6.42	1.6	6.92	1.7	32	6.09	1.2	6.84	1.5	.001 (.05)	.49 (.002)
Test Knowledge WADC[‡]	235	2.75	1.3	2.97	1.1	33	2.55	1.1	2.85	1.3	.048 (.02)	.78 (<.001)
Test Knowledge all[‡]	192	13.9	3.0	15.3	2.9	27	12.8	2.6	14.2	3.8	<.001 (.09)	.95 (<.001)
Acceptance of cheating[#]	241	0.41	0.8	0.44	0.8	33	0.55	0.9	0.78	1.2	.07 (.01)	.20 (.006)
Acceptance of gamesmanship[#]	238	1.07	1.0	1.30	1.1	33	1.39	1.3	1.58	1.3	.012 (.02)	.76 (<.001)
Respect for social convention[#]	217	3.01	0.7	3.11	0.8	31	2.99	0.8	3.11	0.8	.21 (.006)	.74 (<.001)
Respect for rules and officials[#]	210	3.09	0.7	3.05	0.7	29	2.83	0.8	2.96	0.7	.49 (.002)	.15 (.009)
Respect for one's full commitment[#]	227	3.76	0.4	3.64	0.5	34	3.53	0.5	3.41	0.5	.01 (.03)	.88 (<.001)
Respect for the opponent[#]	213	2.19	1.0	2.19	1.0	26	2.25	0.7	2.38	0.8	.44 (.003)	.50 (.002)
Negative approach towards practice of sport[#]	221	1.58	0.7	1.72	0.7	28	1.63	0.6	1.61	0.6	.39 (.003)	.29 (.004)
Self-Efficacy[#]	237	3.20	0.6	3.21	0.7	34	2.93	0.6	3.00	0.7	.45 (.002)	.63 (.001)
PBC 1[%]	243	0.62	1.1	0.54	1.0	36	0.64	1.1	0.64	1.2	.73 (<.001)	.73 (<.001)
PBC 2[%]	232	0.82	1.3	0.67	1.2	37	0.78	1.1	0.81	1.2	.66 (.001)	.52 (.002)
PBC 3[%]	242	2.96	1.5	2.98	1.5	37	2.97	1.3	3.00	1.2	.87 (<.001)	.99 (<.001)
Attitudes[§]	207	4.15	0.9	4.19	0.9	33	3.73	1.2	4.14	0.8	.025 (.02)	.06 (.01)
Prevalence specific sport[$]	244	11.9	18.1	11.0	17.6	30	5.25	8.2	6.57	10.9	.91 (<.001)	.53 (.001)
Prevalence Austria[$]	239	18.0	18.7	17.9	18.3	31	14.5	12.2	12.7	11.4	.60 (.001)	.65 (.001)
Social norms[#]	239	0.15	0.5	0.22	0.7	37	0.22	0.6	0.48	1.1	.006 (.03)	.12 (.009)

[%] Items of Perceived behavioral control: PBC 1: Taking prohibited substances depends on the situation, PBC 2 Taking prohibited substances depends on other persons, PBC 3 I can decide alone if I take prohibited substances/methods

[†] 5-Point Likert scale (0: very badly informed; 4: very well informed); [‡] True-false format transferred to a score (1 point for each correct answer) with a maximum of 10 points for knowledge on the prohibited list (PL), 13 points for knowledge on side effects, and 6 points for knowledge on the World Anti-Doping Code (WADC), resulting in a total of 29 points for overall test knowledge; [#] 5-Point Likert scale (0: completely disagree; 4: completely agree); [§] 5-Point Likert scale (1: pro-doping attitude anchor; 5: anti-doping attitude anchor), higher values mirroring anti-doping attitudes; [$]estimated prevalence out of 100%

Results of the repeated 2x2 ANOVA outline a significant positive (i.e., improvement) time effect for all knowledge-related variables, one of the moral-related variables (acceptance of gamesmanship) and attitudes. For respect for one's full commitment to sport (related to fairness) and social norms, significant negative time effects (i.e., lower values) were found. For none of the variables, we could find a significant interaction effect.

Analyzing the intervention group only, the repeated measure ANOVA at three time points indicates a significant improvement, with large effects, for all knowledge-related variables.

The results for moral and sportspersonship indicate a significant time effect for acceptance of gamesmanship (a facet of moral) and respect for one's full commitment (facet of sportspersonship). Whereas the acceptance of gamesmanship is increasing, the respect for one's full commitment is decreasing.

Analyzing the intervention group only, the repeated measure ANOVA at three time points indicates a significant change over time for all variables with large effect sizes except respect for the opponent. For acceptance of cheating, respect for social conventions, respect for one's full commitment to sport values improve (or remain the same for acceptance of cheating) during the first schoolyear but markedly drop (i.e., get worse) after schoolyear four. Acceptance of gamesmanship, respect for rules and officially, the negative approach towards the practice of sport worsens throughout the four schoolyears as indicated by the decreasing (increasing for negative approach towards the practice of sport and acceptance of gamesmanship) mean values.

Self-efficacy perceived behavioral control attitudes and descriptive norms did not change over time. Social norms, related to significant others accepting doping behavior was overall low but significantly increased over time, especially between after year one and year four. For details, refer to table 10.

Table 10: Development of variables expected to influence situational temptation of the intervention group over time

		Baseline		Schoolyear 1		Schoolyear 4			
	n	Mean	SD	Mean	SD	Mean	SD	p	eta^2
Subjective Knowledge Doping†	53	1.49	0.9	2.11	0.8	2.51	1.0	<.001	.29
Subjective Knowledge PL†	52	1.06	1.1	1.60	1.1	2.15	1.1	<.001	.26
Subjective Knowledge WADC†	54	0.74	1.0	1.46	1.2	1.98	1.1	<.001	.31
Subjective Knowledge score†	52	1.10	0.8	1.74	0.9	2.21	0.9	<.001	.41
Test Knowledge PL‡	47	4.48	1.4	5.51	1.3	7.60	1.8	<.001	.55
Test Knowledge Side Effects‡	50	6.12	1.4	6.94	1.8	9.60	2.9	<.001	.43
Test Knowledge WADC‡	50	3.00	1.1	3.22	1.1	3.78	1.8	.022	.08
Test Knowledge all‡	41	13.5	2.4	15.6	2.4	20.8	5.3	<.001	.53
Acceptance of cheating$^{\#}$	52	0.39	0.9	0.39	0.6	0.72	1.1	.017	.08
Acceptance of gamesmanship$^{\#}$	51	0.86	1.1	1.12	1.2	1.23	1.2	.038	.07
Respect for social convention$^{\#}$	46	3.16	0.6	3.50	0.5	3.18	0.7	.003	.14
Respect for rules and officials$^{\#}$	46	3.28	0.7	3.21	0.6	2.98	0.8	.010	.11
Respect for one's full commitment$^{\#}$	46	3.68	0.4	3.71	0.3	3.40	0.6	.001	.17
Respect for the opponent$^{\#}$	47	2.30	0.9	2.39	1.0	2.46	1.1	.40	.02
Negative approach towards practice of sport$^{\#}$	49	1.49	0.7	1.74	0.7	2.04	0.8	.001	.15
Self-Efficacy$^{\#}$	48	3.10	0.6	3.24	0.6	3.10	0.8	.25	.03
PBC 1$^{\%}$	51	0.47	1.0	0.33	0.8	0.75	1.3	.11	.04
PBC 2$^{\%}$	51	0.92	1.4	0.45	1.1	0.57	1.1	.08	.05
PBC 3$^{\%}$	51	2.94	1.6	3.00	1.5	2.84	1.6	.85	.003
Attitudes§	48	4.19	1.0	4.21	0.8	4.21	0.8	.99	<.001
Prevalence specific sport$^{\$}$	54	7.87	15.5	9.31	14.3	9.02	15.6	.85	.003
Prevalence Austria$^{\$}$	53	14.0	15.7	15.9	15.9	13.1	15.4	.51	.01
Social norms$^{\#}$	53	0.09	0.5	0.07	0.2	0.26	0.6	.05	.06

$^{\%}$ Items of Perceived behavioral control: PBC 1: Taking prohibited substances depends on the situation, PBC 2 Taking prohibited substances depends on other persons, PBC 3 I can decide alone if I take prohibited substances/methods

† 5-Point Likert scale (0: very badly informed; 4: very well informed); ‡ True-false format transferred to a score (1 point for each correct answer) with a maximum of 10 points for knowledge on the prohibited list (PL), 13 points for knowledge on side effects, and 6 points for knowledge on the World Anti-Doping Code (WADC), resulting in a total of 29 points for overall test knowledge; $^{\#}$ 5-Point Likert scale (0: completely disagree; 4: completely agree); § 5-Point Likert scale (1: pro-doping attitude anchor; 5: anti-doping attitude anchor), higher values mirroring anti-doping attitudes; $^{\$}$estimated prevalence out of 100%

5.5 Sensitivity towards unintentional doping

Mean values of the behaviour to avoid unintentional doping in the intervention group increased from baseline M=2.21±1.7 (n=187 of N=319), to M=2.85±1.7 (n=159 of N=247) after schoolyear one and decreased to M=2.77±1.5 (n=52 of N=67) after schoolyear four. For the control group, mean values decreased from baseline M=1.73±1.3 (n=142 of N=256) to M=1.69±1.2 (n=21 of N=37) after schoolyear one and increased to M=3.86±2.0 (n=2 of N=2) after schoolyear four.

The results of the 2x2 repeated measure ANOVA indicate no significant effects over time and between the groups (p_{time}=.15, eta^2=.02; $p_{interaction}$=.60, eta^2=.002). The mean of the intervention group (n=104) changed from M=2.47±1.8 to M=2.96±1.6. The mean for the control group (n=14) changed from M=1.74±1.0 to M=1.94±1.1.

The results of the repeated measure ANOVA at three time points for the intervention group only, indicated no significant time effect (n=23; M_{base}=2.14±1.3; $M_{schoolyear1}$=2.85±1.8, $M_{schoolyear4}$=2.76±1.4; p=.13; eta^2=.09).

6 Discussion of Survey Results

The main aim of the presented research was to evaluate a school-based anti-doping intervention with respect to its potential effects on situational temptation to doping, knowledge, awareness, and psychological variables that are expected to impact on doping behavior (e.g., moral, fairness, norms). A secondary aim was to assess whether the effects are stronger in the intervention schools as compared to control schools that followed a normal school curriculum tailored to a school with sport focus. Therewith, it would fit neatly in recent efforts for evaluation of doping prevention measures (for summaries refer to for example Daher, El Khoury, and Dwyer (2021) or Bates et al. (2017) that are an answer to the call for more research into this area.

Unfortunately, mostly due to the COVID-19 pandemic, we could not follow the study protocol and data evaluation as planned. Thus, results might be biased, and interpretation of the data be done with caution. If at all, the discussion and interpretation of the data can only be regarded as indications for possible effects but not as robust evidence. As such, and with the effort to keep as many information as possible, the following section will discuss the results mostly on a descriptive level, indicating developments of mean values of outcomes throughout the whole student samples of intervention and control. Consequently, these results only indicate mean changes in the cohort but not on an individual level and cannot necessarily be generalized. Results of the inductive statistics for schoolyear one, considering intervention and control group, and for the entire time (three time points in measure) for the intervention group only will be discussed if feasible.

6.1 Knowledge, trust, and satisfaction

In general, education is positively associated with trust and social capital (Huang, Maassen van den Brinka, & Groot, 2009). Therefore, one significant aim for NADA Austria in developing the school-based program was to not only increase the knowledge about what they do and offer but with it, the trust in and satisfaction with their work. As anti-doping is a global issue, it was further hoped that this increase of trust and satisfaction swaps towards further national and international sport organizations entrusted with anti-doping.

Results of the evaluation study indeed outlined an increase in the level of knowledge of the anti-doping offerings of NADA Austria in the control and experimental group. For the

MedApp and the Anti-Doping License we could see a stronger increase in knowledge for the experimental group during schoolyear one. However, trust and satisfaction with the work of anti-doping organizations, showed a moderate level but remained constant. Concluding, it seems that the aim to improve on trust and satisfaction by educative measures could not be reached for this sample of students. This is unfortunate as trust, trustworthiness, and legitimacy were acknowledged as important factors in anti-doping in terms of the compliance to the rules (Shelley, Thrower, & Petroczi, 2021; Woolway, Lazuras, Barkoukis, & Petroczi, 2020) showed that athletes need to trust the system to become advocators. Additionally, considering the subsample of the intervention group of students of whom we have survey results at three time points in measure, we could see a significant decrease in perceived trust in the efficacy of the international testing system. This is worrying and might support the evidence that perceived fairness of the doping control system undermines trust (Petróczi et al., 2021) – being a possible explanation for the low levels of trust. Yet, this interpretation must be taken with caution as this subsample only consisted of 37 students, thus might be affected by a selection bias.

6.2 Situational temptation

Situational temptation was chosen as proxy to doping behavior. As assessing true doping behavior is a major challenge, past researchers often replace it with an outcome that is expected to be a direct proxy of it. Others could be doping susceptibility, likelihood or for example doping intentions (Hurst, Ring, & Kavussanu, 2020; Jalilian, Allahverdipour, Moeini, & Moghimbeigi, 2011; Maria Kavussanu et al., 2022; M. Kavussanu et al., 2021). Overall, the scores of situational temptations show a very low mean (below one) for both, experimental and control group, whereas the mean for the intervention group slightly increased (indicating an increased temptation) and the one of the control group, slightly decreased. Interestingly, considering the dependent subsamples of schoolyear one, a significant time effect indicating an increase in situational temptation with a large effect size was found. In this subsample the baseline value of the control group was much lower than in the overall sample of the control group, thus also here, the values increased towards after schoolyear one, explaining the significant time effect. This might be an indicator that the attrition on the control group, that was not related to a complete drop-out of the school due to Corona only, might not be by chance. It seems that those athletes who have a generally

higher temptation did not further comply to the study protocol – however, this is just an assumption. Under the line though, we cannot say that the school-based intervention has a relevant effect on situational temptation. This is in contrast to other publications evaluating the effects of anti-doping education. Goldberg et al. (1996) found improved drug refusal skills as well as lower intentions to use anabolic steroids in another study of 2000 after an educative intervention. More recently, higher intentions not to use anabolic steroids (Jalilian et al., 2011), lower doping likelihood (Maria Kavussanu et al., 2022; M. Kavussanu et al., 2021), lower doping susceptibility (Nicholls et al., 2020), and decreased willingness to take prohibited substances (Ntoumanis et al., 2021) were found. However, none of these used the exact same preventive initiative and Ntoumanis et al., (2021) did an intervention to change coach communication that then affected the willingness to dope of their athletes.

Under the line, the slight increase in our study does not seem to be worrying as it can also be caused by a normal maturing of the students, as persons and as athletes. It is obvious that by the end of schoolyear four, the presented situations are less abstract compared to the first presentation before schoolyear one, because students experienced the world of professional sport to a greater extent. It can even be that they experienced exactly the outlined situations and can now relate better to them. As a consequence, it might be that they now did not answer these by their initial believes and values only anymore but blended with their personal (sporting) experience changing a ‘completely disagree’ answer to a ‘mostly disagree’ answer. Aligned to that even the increased values are still at an exceptionally low level with a maximum mean of 0.68 and a standard deviation of 0.9. This assumption can be backed up by other studies, in which the outcomes that are related to doping-behavior proxies, such as situational temptation, doping susceptibility or intention are also low but not to that extent (e.g., Kavussanu et al., 2021; Nicholls et al., 2020; Ntoumanis et al., 2021). Thus, it seems rather exceptional that these surveyed Austrian athletes had such low levels of situational temptation, also possibly due to socially desirable behavior.

6.3 Variables expected to influence doping susceptibility

Based on earlier research before the intervention program was developed (i.e., Ntoumanis et al., 2014; Blank et al., 2016), outcomes to be tackled included: Knowledge, moral decision-making, fairness, self-efficacy, attitudes, norms, and perceived behavior.

Results of our study indicate a positive significant effect of the intervention over time on all knowledge-related variables in both groups which is in support of earlier findings of for example Jalilian et al. (2011), Sagoe et al. (2016), Álvarez Medina et al. (2019), and Nicholls et al., (2020). This effect was also found in studies related to substance use, as for example nutritional supplements (Little, Perry, & Volpe, 2002).

Like situational temptation, values of moral decision making, in terms of the acceptance of cheating and gamesmanship, were positive and exceptionally low (maximal mean at 1.23). Interestingly though, they as well deteriorated over time in intervention and control group. Like for situational temptation though, these results must not be overestimated. Although they were for example significant for the subsample of schoolyear one, effect sizes were small and the relevance of the mean changes can be questioned, especially in view of the normal development from child to adolescent to young adult and to adult combined with the parallel development to become a (professional) sportsman/sportswoman. As such, like situational temptation, it does not seem that the NADA intervention had an impact on the development of moral decision-making. In contrast, Kavussanu et al. (2021) found a positive effect of their intervention on moral disengagement, anticipated guilt but not on moral identity. One reason is their intervention that was tailored to moral. Even though NADA Austria's program contains moral and values-based elements, it was not the sole outcome to be addressed. Additionally, Kavussanu et al., (2021) did not assess the exact same outcome as we did. Finally, due to COVID-19, NADA Austria could not deliver their program as planned. Values and moral were content for year three and four, and year two and three were hit by COVID, thus not done as planned. Reinforcing the content more than once might be an important issue on the way to success though. Thus, even though students might have had a proportion of moral content, it was not complete as planned. Yet, moral is an important outcome to be addressed by prevention as it was shown that it is strongly linked to doping likelihood or susceptibility (Boardley et al., 2018; Ntoumanis et al., 2014). Therefore, this content needs to be a significant part of education measures and content could be aligned to successful example (i.e., Kavussanu et al., 2021). Another interesting fact is the finding of Kavussanu et al. (2022) that a psychological intervention, compared to a pure educational intervention, shows greater effects on

anticipated guilt. Thus, it might also be useful to consider including psychological interventions aside the education sessions.

An interesting pattern for the fairness variables emerged as some of them improved after schoolyear one but deteriorated after schoolyear four. Again, for us, this seems an indicator that students become more engaged in competitive sport, feel the pressure, and more importantly, make their own experience in sport, that might lead for example to the fact that the mean score of having respect for rules and officials is threatened. However, what seems to be a fact is that the current NADA school program does not affect these values in a significant way in terms of improving it or stopping the, maybe, natural slight deterioration coming with age. It is difficult to compare these results to others, as, to the best of our knowledge, fairness or sportspersonship was not yet an outcome variable when evaluating (school) anti-doping interventions. Álvarez Medina et al. (2019) included the principles of fair play in their intervention but did not specifically assess its effect on fairness as outcome. However, like moral, fairness and sportspersonship is frequently assessed as influencing factor for doping behavior (Barkoukis, Lazuras, Tsorbatzoudis, & Rodafinos, 2011), doping intention (Guo, Liang, Baker, & Mao, 2021), and whistleblowing (Barkoukis et al., 2021) – all indicating a significant protective effect. Thus, tackling sportspersonship in a school-based intervention needs to be upheld but like moral, possibly with a different approach.

Descriptively, no notable changes were found for perceived behavioral control, self-efficacy, attitudes, descriptive and social norms (that was exceptionally low again with a deterioration tendency). However, self-efficacy and behavioral control was content that was covered mostly during year three and thus, massively affected by COVID-19. Interestingly though, for the subsample for schoolyear one, a significant time effect for attitudes was found. This can be explained by the baseline values for attitudes that was much lower for the control subsample compared to the intervention subsample and aligned throughout schoolyear one. Comparing these findings with previous research render these finding with respect to attitudes surprising as in most of (school) anti-doping interventions, positive effects of the intervention on attitudes (e.g., Álvarez Medina et al., 2019; Jalilian et al., 2011; Nicholls et al., 2020) was found. Kavussanu et al. (2022) assessed regulatory self-efficacy and could also not find significant effects of either an educational or psychological intervention on British and Greek athletes.

6.4 Sensitivity towards unintentional doping and perception of clean

Unintentional doping is a severe threat for athletes, especially younger athletes who might not be as sensibilized yet. A recent review outlined that a key evidence-based recommendation would be to enforce the engagement in specific behaviors such as seeking reliable information and checking ingredient lists (Chan et al., 2020). Interestingly, they further summarize that social-cognitive variables, such as attitudes, intentions, behavioral control, that are relevant in the context of doping behavior are as well relevant in the context of engaging in behavior to avoid unintentional doping (Chan et al., 2020).

Overall, the mean value of the behavior to avoid unintentional doping is moderate but development in the two groups is different. In the intervention group the mean score of the behavior to avoid unintentional doping raises during schoolyear one and remains rather constant until after schoolyear four. In the control group, not much happens during schoolyear one, but the value increases towards the end after schoolyear four. Again, as also the control schools are schools with a sport focus, this might happen due to a competitive sport socialization of the students, who, based on experience and possible other educative intervention acknowledge the importance of such behavior. In detail, also the control schools will offer sports theory in their curricula, in which anti-doping surely is a topic. In addition, also the athletes of these schools will interact with NADA Austria during outreach programs at sport competitions. Interestingly though, the mean value indicating this behavior at the end of the study is higher in the control group compared to the intervention group. Considering the subsamples of schoolyear one and all time points for the intervention only, no significant effects were detected. In sum, NADA Austria's school program does not seem to influence the change in behavior to avoid unintentional doping. To the best of our knowledge, no other evaluation study assessed this outcome so far. However, as with the above, efforts to address this behavior should be kept up. A promising approach was demonstrated by Chan et al., (2015) who showed that components of the self-determination theory, i.e., controlled motivation, effects the extent to which athletes apply a behavior to avoid unintentional doping. Thus, this might be a good start to integrate an intervention that addresses controlled motivation.

6.5 Limitations

As with all research, several limitations must be acknowledged. The biggest limitation associates to the high attrition rate of students. For one, because we lost complete schools who decided to withdraw during the study due to the COVID-19 situation. These missing data, however, could be considered as at random. The second, more worrying student attrition, associates to individual students that decided not to fill in further surveys, even though the school still took part. Considering the results, it can be expected that those cannot be considered as at random and thus present a true selection bias skewing the data. We acknowledged these already in the discussion section. A second limitation refers to socially desirable responding, especially for those outcomes that are sensitive (i.e., situational temptation, some of moral decision-making and fairness). This bias might have contributed to the very low mean values and consequently might have led to floor effects and overestimation of significant deterioration of these variables. A third limitation surely associates to the whole setting of the cooperation between science, NADA Austria and the schools, however, these will be presented, discussed and explored in more detail in the following chapter seven.

7 Bridging the Gap between Research and Practice

The initial project that was submitted for funding to WADA 'only' aimed at evaluating NADA Austria's school based anti-doping education. However, we extended the project throughout the lifespan of it to take a closer look at the challenges to actually bridge the gap between research and practice to enable the implementation of true practice-driven research projects. This decision was taken out of a) the fact that we, as research team, continuously faced challenges to implement the project from a scientific point of view. In detail, with respect to the task of collecting data with scientific rigor while keeping external sources of bias low. Second, this decision was taken out of b) the conversations that we had during data collection at the schools. These happened at random and were unintended, yet they offered fruitful insights in how the implementation of an external curricular activity is perceived and implemented and which challenges the schools face while agreeing to take part in such a project. Lastly, this decision was taken based on c) several talks with a representative from WADA who encouraged us to continue the effort in generating insights to help future (co-

created) research projects to not fall into the same traps. Thus, we considered the voices of all stakeholders, not only the student athletes, important and decided to invite these stakeholders to share their thoughts in systematic and planned interview conversations. The procedure and the results are described in the following.

7.1 Design, Method, Sample and Procedure

7.1.1 Design, Method, and Interview Guide

To gain a deeper understanding and to analyze strength and weaknesses of the used approach of implementing practice-oriented research including different stakeholders, a qualitative design was chosen to develop managerial implications for further similar research projects. We used qualitative, semi-structured interviews as well as observations. The semi-structured interview guide was held as open as possible to induce open discussion on the questions of how the school-program was perceived, what could be improved, what was unexpected. The problem-solution-centric interviews thus covered three main areas: a) challenges and opportunities of the school setting, b) feedback possibilities to be part of the development (initially and continuous) of the program and c): cooperation between science and practice. The first area aims to provide insights about the special characteristics of implementing doping prevention measures in the school setting. In detail, different perspectives on advantages, challenges but also possibilities on how to overcome these challenges will be addressed. In addition, thoughts of the stakeholder group who implemented the intervention and presented it to the students will be addressed with focus on mode of presentation, content distribution, opinion on the content. The second area on the possibility of feedback includes whether feedback towards NADA Austria on the program is technically possible and in what way. Secondly, the importance of feedback in general will be discussed. The third area encompassed the cooperation between science and practice and how the different needs were aligned – successfully or not. This mostly relates to the cooperation between NADA Austria and UMIT TIROL but also includes stakeholders at the school on their thoughts on the necessity and the way of bridging the gap between research and their everyday practice. In addition, observations made, and conversations lead by the research team during the data collection process in the school were noted.

7.1.2 Sample

To reach the aim of gaining insights in limitations and opportunities of practice-driven research projects, participants of the interviews were chosen on a purposeful sampling approach. We included different stakeholder groups that were school-related (i.e., teachers, officials), NADA-related distinguishing a) the development of the intervention (i.e., representatives of NADA Austria) and b) the implementation of the intervention (i.e., educators of NADA Austria who implemented the project in the schools). This selection allows to address the topic from different perspectives and experiences.

7.1.3 Procedure

The interviews were conducted in November 2022. Participants were informed about the intention and objectives of the interviews prior to their participation. They gave non-written informed consent that interviews would be recorded, and that the data will be used non-person related to produce information on managerial implications for future research projects. The interviews were conducted and recorded using Zoom. After processing the data, interview records and transcripts were deleted.

7.1.4 Data Analysis

The interviews were transcribed but not verbatim. Data was analyzed using a template analysis (Brooks, McCluskey, Turley, & King, 2015). The template was developed by the research team and consisted of the three above-outlined themes. In total, four additional sub-themes emerged whereas two relate to the first theme of the school setting and includes the integration in the curriculum and the education of the educators. The other two relate to the theme of cooperation between science and practice and address communication and commitment. No sub-themes were identified for the second theme of feedback. Notes from observations and conversations during the data collection were used to amend the findings of the interviews with the stakeholders.

7.2 Results and Discussion

7.2.1 Sample description

The interviews with teachers, school directors, sports coordinators (stakeholder group ‘school’), employees of Austria’s National Anti-Doping Agency (stakeholder group ‘intervention developer’) and their educators (stakeholder group ‘intervention provider’)

lasted between 17 and 64 minutes. For data protection reasons, no further details on socio-demographic information on the sample is provided to protect respondents' identity.

7.2.2 Challenges and opportunities of the school setting

One of the major themes that emerged from speaking with the school-related stakeholders was the embedding of the NADA program in the current school curriculum. In detail, the coordination with possible teaching units in the school setting was regarded sensible and even fundamental. Teachers and school administrations explained this idea several times and repeatedly mentioned during the interview that they consider this as a great advantage and help, because "*they are experts, we also do not know everything and pupils like to listen to someone, they do see every day*", participant 1 replied.

In Austria, the topic of anti-doping is not only dealt with during the NADA school program but also dealt with in physical education classes. "*I think it would be more interesting if it is part of our lessons. The kids have to listen and think of it, because than I can test it*" (Participant 2). Coordinating the two would be beneficial. In detail, it would increase the discussion of the topic, insofar as content is not only repeated, but also applied and made tangible for the students. However, this is only possible if the content that will be covered in both, the lessons and the lectures of NADA Austria is known to all involved parties. This does not mean that content cannot (and should) not be repeated, but that it could be built on, supplemented and deepened. If the cooperation was intensified and also intrinsically accepted by the schools, the solution of integrating the NADA lectures within physical education classes would be a promising option. Allowing NADA Austria's educators to hold their lectures during the physical education classes (hours), would on the one hand provide a more intense dispute with the topic that is attended by the teacher as well. Thus, he/she can easily pick up some of the content in future lectures if applicable to deepen the discussion and thus, understanding. On the other hand, as physical education generally has more time scheduled, it would also offer the sport organization more time in the schools, respectively in the classes.

A second theme, that rather emerged from the educators relates to their own didactical education. The educators increasingly pointed out that they visit the schools as experts on the subject. "*Sometimes, especially when the teacher isn´t in class the whole time, I cannot do any disciplinary actions, it isn´t allowed, and most of time I wouldn't know*

how" (Participant 3). It was stressed that they should not, and could not, take any disciplinary action in this capacity. They simply do not feel prepared and educated enough to set disciplinary measures for a group of adolescents they do not really know. Thus, there is, for some cases, a lacking competence counteract the emergence of unrest and disturbances in advance. Didactic support would give the speakers more ease in dealing with the students, so that they too can counteract situations in which the students become inattentive, for example.

*"Of course, using the PowerPoint, it is predetermined, but I often use examples or ask the kids, so they are more involved, and it is more interesting. So this is my form of "open lessons" (*Participant 3*).*

Education the educators also relates to the mode of content transmission – in detail, the teaching forms of frontal and open teaching. To apply the more suitable approach, depending on the situation, the educators themselves need to have a minimal competence about these and know about their advantages and disadvantages. Consequently, the educators would be able to present themselves more confidently and better identify themselves with both types of teaching if they were aware of which content can best be conveyed and how. Considering the needed resources to train the trainer, another, less resource-demanding option would be for a second speaker or an employee of the sports organization to accompany insecure and new speakers on the first appointments. At least, they should be available as a backup including an open feedback and exchange afterwards to discuss potential situations that were considered uncomfortable and how this could have been avoided. Conveying the content is important. Yet, equally important, it is to know how it can be best conveyed that added value is created for everyone involved. If all this is not feasible, at least, it should be ensured that the schoolteacher of the class is always present, to take countermeasures in case of unrest and disturbance.

7.2.3 The importance of feedback

"Communication is very important. And Feedback is part of it, this is how you can develop, and we are also measured against this and responsible for the students. But in school we don't have the time to speak with them [with the NADA speakers], sometimes we use the breaks for short discussion, but in general we do not give any feedback. But I think

we can, and we want, and if we had some problems and say this, the speakers were understanding" (Participant 4).

Schools in which the school program was carried out would like to be more involved in the processes surrounding the school program. It was emphasized that this would have a positive effect on cooperation, but above all, it can also influence the motivation of individuals. Feedback was mentioned as a possibility for this. Feedback on different areas was proposed to continue to improve interventions. For example, in the school setting, integrated teachers and/or sports coordinators should be given the opportunity to give feedback. They could fill out feedback forms, sports organizations could contact them personally, or a meeting could be held at regular but longer intervals (once a year or every 2 years). One school, for example, reported that they invite all experts to an "come together" twice a year. The schools take this as an opportunity to express them thank you and it also offers the opportunity for nice and open discussion on specific topics, providing a great way of providing feedback. They could fill out feedback forms, sports organizations could contact them personally, or a meeting could be held at regular but longer intervals (once a year or every 2 years). It is also possible to inform about changes and innovations. In addition, one could respond to questions, suggestions or requests or discuss them directly. It is also conceivable to integrate scientific support into these meetings, insofar as scientific cooperation exists or is being considered during this period.

7.2.4 Cooperation between science and practice

"*We know the Importance of the evaluation, and also research, and we are thankful. You can quickly say: "Yes, it fits!", but we need numbers, data, facts – Validity*"! (Participant 5).

As expected, the cooperation between science and practice is challenging because it seems that different languages are spoken. Two associated themes emerged – communication and commitment. In detail, the needs of science and the needs of practice are significantly different. For example, to guarantee rigor and reliable results, the pre-planned study design should not be changed if possible. However, from a practical point of view, changes in the setting happen and are even beneficial for the organization in terms of being beneficial for anti-doping. One example would be additional training that the research organization is not

aware of. If the effects of, in our example, NADA Austria's school-based intervention shall be evaluated, participating schools should not introduce additional anti-doping education, especially if that is not known to the research partner. This is a sever external bias that renders results unreliable. Another such example would be including former control schools into the intervention program during the run of the study. This might be beneficial for the organization as the number of schools educated by it increases, yet, again, it is not acceptable while being partner in a scientific study, because it also introduces bias. That does not mean, it cannot and may not happen, yet, at least, it needs a close communication with the research partner to find a solution that works for both parties.

Based on the experience of this project and the interviews, it seems crucial for success to have a very intense and continuous communication. It is important to not only discuss the programs and project internally but to cross-check on a regular basis to ensure the needs of both parties are met. Sometimes, both parties might develop new needs that might negatively interfere with the needs of the partner. That is why a constant communication system needs to be in place to inform the other party about needs, motivations, and reasons for action. In addition, it is necessary to determine periods of time that are important for science be able to meet deadlines and to commit to the study design. For example, measurement times: if these should always take place at a certain interval after an intervention, free times such as holidays should be considered, for example.

The second, associated, theme relates to the commitment of participating in scientific study. Participating in such a project is truly beneficial for any sport organization as the emerging results, that in the best case support the efforts of the sport organization and help them to improve on their work. Yet, it also brings obligations for the sport organization and the most important is commitment. This means, communicating that they are part of a scientific study and thus, reliant on support of any involved stakeholder. In detail, if the sports organizations in their communication with the school, as well as the educators, refer to an existing cooperation with science, a first visibility at the respective institutions is achieved. Thus, the schools recognize that a cooperation is taking place and consequently might give this more meaning. This preliminary information can simplify the (initial) contact. This prevents uncertainties and misunderstandings on the part of the schools. Therefore, the

importance and especially severity of the different needs and tasks of science should be known and understood by all those involved and vice versa.

8 Overall Conclusions and Managerial Implications

8.1 Future Direction of NADA Austria School Program

Overall, it can be concluded that the effects of the NADA Austria school program were strong with respect to perceived and actual knowledge of doping and of their own offerings. Yet, no significant effects were found for trust, moral decision-making, fairness, attitudes, self-efficacy, perceived behavioural control or behaviour to avoid unintentional doping. This might be explained by the challenges faced with COVID-19 leading to the fact that the school program could not have been delivered as planned, by the content and mode of delivery that might need be optimized, or by the scales that were used to measure the outcome. For example, it was shown that moral disengagement and moral emotions are two important concepts in terms of moral (Kavussanu et al., 2021) and we only assessed moral decision-making. Additionally, there are best practice examples of these content to be used in future prevention measures.

Another suggestion is to keep up the combination of knowledge and psychological variables to be addressed by the intervention. To improve, sessions and mode of delivery could be adapted based on other best practice examples (e.g., presented by Hurst et al., 2020, Barkoukis et al., 2016, Kavussanu et al., 2022, and Nicholls et al., 2020). Additionally, Nicholls et al., 2020 demonstrated the presenting the content face-to-face has better effects especially in terms of sustainability for some of the outcomes they assessed. Thus, visiting the schools and presenting the content face-to-face and not online should be upheld.

Second last, we could see almost no interaction effects pointing to the fact that control and intervention schools had similar developments. This does not necessarily mean that NADA's school program is not working but could also be explained by the possibility that the students at the control schools receive other prevention measures for example during sport theory at school or even by NADA Austria as part of their outreach program. Thus, for future evaluation, it is recommendable to include control questions in the control school questionnaire as for example if they visited other education sessions, by whom, how often, and with respect to what content.

Finally, keeping up the evaluation and working together with a university in doing so is strongly recommendable. Managerial implications on how to improve on that are provided in the next section and also based on this first experience in Austrian schools. Evaluation of doping prevention initiatives is not only an identified key aim of WADA and the ISE but was also mentioned by NADOs as a barrier of implementing anti-doping education. In detail, a representative from Asia stated that “Lacking proper method of education evaluation would be a setback to justify the effectiveness of doping prevention programs, which could hinder it from getting more attention and funding from the stakeholders,” and a representative from Europe cited the lack of ability to demonstrate impact (Gatterer et al., 2020:235). In line, a respondent of our stakeholder interviews of this research supported the importance of evaluation and reported: “*We know the importance of the evaluation, and also research, and we are thankful. You can quickly say: "Yes, it fits!", but we need numbers, data, facts – Validity"!* (Participant 5).

8.2 Learnings and Recommendations for the Management Practice-driven Anti-Doping Research

Concluding from the managerial point of view, three important foci emerged: communication, setting school and science. In the field of communication, the joint meetings with all those involved are particularly noteworthy and recommendable. This means for example that the sporting organization contacts the school and the study team at regular intervals. At best, there are joint meetings if that is possible on a regular basis. As such, needs of all sides can clearly be communicated to prevent mismatches caused by lacking communication and provide solutions for real problems caused by competing needs. The topic of feedback also flows into this focus area. Feedback should be requested to be able to further develop, to overcome weaknesses and to build and intensify strengths.

The “school setting” is a specific one and has fundamentally special features. School is linked to and dependent on many internal (timetables, teachers, number of students, equipment, etc.) and external conditions (curriculum, budget, location, etc.). It is therefore advisable to consider this challenge but also to use it as a resource, for example by making interventions part of the lesson. Fundamentally, basic didactic training is important for speakers, and it becomes even more important when they are part of the classroom and teaching.

The third recommended area is focused on science. All the boundary conditions that school entail must be considered already at the design stage of the project, more specifically while developing the study design and testing protocol. In the best case, this should happen together with the schools (that will provide time slots for education delivery), the sport organization (or any other provider of the educational content) and the research team, who needs to clearly communicate why keeping up the compliance and following the testing protocol is crucial for valid and reliable results. This does not mean, that changes can be dealt with – these naturally happen in a field setting. It only means that all involved parties, if they agreed to cooperate, are aware of the sincerity of the project and communicate it as such to all involved associated parties. This procedure also includes to ensure that no unnecessary changes to both, the intervention and the context and environment should happen while under scientific evaluation. Lastly, a-priori risk assessments and possible solutions to it should be discussed together and noted to ensure a quick and flexible response to potential incidents threatening the study protocol and implementation.

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10 Financial Documentation

The budget overview is outlined in Table 11. On the left side is the original documentation of our accountant department, thus, in German. On the right, I provided the English translation.

The overview includes all expenses until the end of October 2022. Thus, two months of personnel costs are still missing. After the closure of the cost-account, I will forward the final financial documentation.

Table 11: Financial Documentation

Zeilenbeschriftungen	Summe von Betrag	Type	Amount
Aktivpersonal	-28536,24	Personnel	-28536,24
Büro- Unterr.Material	-323,38	Office Material/Printing	-323,38
FL/Beratung	-23	Costs Schools	-23
Projekterlöse	33646,71	Project Revenue	33646,71
Sonst. Erlöse	0	Other revenue	0
Sonst.Aufwand Pers.	-4654,78	Other costs personnel (travel)	-4654,78
Sonst.Sachaufwand	-197,53	Mailings Costs	-197,53
Gesamtergebnis	**-88,22**	**Gesamtergebnis**	**-88,22**
Projekterlöse	**€ 33 646,71**	**Project Revenue**	**€ 33 646,71**
Aktivpersonal	**-€ 28 536,24**	**Personnel**	**-€ 28 536,24**
Büro- Unterr.Material	**-€ 323,38**	**Printing**	**-€ 323,38**
FL/Beratung	**-€ 23,00**	**Costs Schools**	**-€ 23,00**
Reisekosten	**-€ 4 654,78**	**Travel Costs**	**-€ 4 654,78**
Sonst.Sachaufwand	**-€ 197,53**	**Mailing Costs**	**-€ 197,53**