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Health Psychological Constructs as Predictors of Doping Susceptibility in Adolescent Athletes

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Abstract

Background: Doping is a highly relevant problem in sport, even in adolescent athletes. Knowledge of the psychological factors that influence doping susceptibility in young elite athletes remains sparse.
Objectives: This study investigated the predictive potential of different health-psychological constructs and well-being on doping susceptibility. The main hypotheses to be tested were positive associations of fear of failure, external locus of control, and ego-oriented goal orientation as well as negative associations of confidence of success, task orientation, internal locus of control, and performance motivation with doping susceptibility. Low levels of well-being are furthermore expected to be associated with doping susceptibility.
Methods: Within this cross-sectional study, 1,265 Austrian junior athletes aged between 14 and 19 years responded to a paper-pencil questionnaire.
Results: Performance motivation was a negative, while depressive mood, self-esteem, fear of failure and ego-oriented goal orientation were positive predictors of doping susceptibility. In addition, participants who were offered performance enhancing substances in the past were particularly susceptible to doping.
Conclusions: The study corroborates the predictive value of classical psychological constructs in doping research, initially analyzed in view of adult athletes, also for adolescents' doping susceptibility.

Keywords: Doping Susceptibility, Well-Being, Fear of Failure, Confidence of Success, Performance Motivation, Goal Orientation, Locus of Control

1. Background

Doping is generally considered antithetical to the spirit of sport and is believed to confer unfair advantages. As it was shown that mere deterrence strategies are ineffective on their own (1), additional education-based prevention approaches (i.e. Goldberg's ATLAS program (2)) were increasingly applied to prevent negative behaviour before it occurs. Nevertheless, a recent meta-analysis of available data indicates that the hypothesized link between knowledge, attitudes, and behaviour is less strong than expected (3). As a consequence, the complexity of the doping phenomenon was acknowledged and scientists suggest that only a firm understanding of factors involved in doping as well as their relationships will potentially result valid prosocial interventions for doping (4).

Considerable efforts to identify predictors of doping behaviour and doping susceptibility have been undertaken. Frequently, these predictors were derived from theoretical frameworks originating from health psychology (5). For example, Jalleh et al. (6) found a positive association between doping-related attitudes - operationalized as outcome expectancies - and doping behaviour, for which attitudes explained 13% of the variance. Morality, reference group opinion and perceived legitimacy accounted for 81% of the variance in doping attitudes. A study by Donahue et al. (7), which was conducted within the framework of the self-determination theory (8), highlighted the importance of intrinsic motivation and sportspersonship, i.e. respectful behaviour towards competitors and referees (9) for doping prevention. Finally, Petroczi (10) could demonstrate the impact of achievement goal orientation on doping-related attitudes, but not on doping behaviour.

Even though representing promising results in view of doping prevention intervention points, it must be acknowledged that empirical testing of these theoretical constructs was mostly done for adult elite athletes (3). This opens a gap in research as doping was shown to already be a problem in younger athletes (11-13). Subsequently, scientists have suggested including the target group of adolescent athletes in preventive approaches. In detail, Vitzthum et al. (14) proposed that doping prevention should already

begin in adolescent ages, before the beginning of puberty.

2. Objectives

Therefore, the current study aims to evaluate the association between doping susceptibility and various health psychological constructs, including fear of failure, confidence of success, performance motivation, goal orientation, and locus of control, attitudes in sport, and demographic characteristics with focus on adolescent athletes. To go beyond the available information, the second aim is to investigate possible associations between doping susceptibility and facets of well-being, which have to the best of our knowledge not been investigated until today. Doping susceptibility was chosen as outcome variable, following the suggestions of previous research to use indirect questions, and to consider susceptibility to performance enhancing substance (PES) use as a proxy for doping behaviour (6, 15-17), where doping susceptibility is closely associated with attitudes towards doping. We a priori hypothesize positive associations of fear of failure, external locus of control and ego-oriented goal orientation and negative associations of confidence of success, task orientation, internal locus of control and performance motivation with doping susceptibility. Low levels of subjective well-being are furthermore expected to be associated with increased doping susceptibility.

3. Methods

3.1. Participants

Based on an invitation sent out with the support of the Austrian ministry of sport and the NADA Austria, 12 of 27 recognized elite sport schools drawn from six Austrian counties (Tyrol, Salzburg, Vienna, Styria, Lower Austria, and Vorarlberg) agreed to participate. Questionnaires were distributed to all junior athletes aged between 14 and 19 years visiting these 12 schools. Respondents were asked to fill in the forms in the presence of at least one member of the study team. All students of these schools agreed to participate leading to a response rate of 100%. The study was approved by the ethics committees of the Medical Universities of Innsbruck, Graz, and Vienna and the county of Lower Austria (Innsbruck: AN3854, 284/4.1., Graz: 23-206 ex 10/11, Vienna: 1096/2010, St. Polten: GS4-EK-4/121-2011). All participants provided written informed consent.

3.2. Procedure

After the agreement of the individual sport schools and sport training centers, the research team scheduled an appointment with the head of school. According to the time-slot provided by the head of school, three or more members of the research team visited the respective school. During a 45-minute school-lesson, the questionnaires were presented to the students. Prior to this session, the content of the study was explained by the teacher of the class. Open questions were clarified with the research team in advance. Students who did not wish to participate in the survey did not have to fill in the questionnaire, yet all of the students took part in the study. The entire data acquisition was finished within 8 months of time.

3.3. Measures

Next to socio-demographic questions, the questionnaire consisted of three additional sections to evaluate doping susceptibility and the different psychological constructs. One of the socio-demographic items addressed whether or not the respondents have had contact to doping in terms of someone offering them doping substances (i.e. previous PES-offer). For analysis purposes, the socio-demographic sports engaged in item was grouped into high-risk and low-risk sports. The classification was previously used in anti-doping research (18) and aims at sports which are believed to be more vulnerable to doping practices as based on doping prevalence numbers. High-risk sports included the following: running, swimming, bodybuilding, cross-country skiing, biathlon, biking, athletics, and triathlon.

3.4. Doping Susceptibility

Based on the challenges in the reliable assessment of actual doping behaviour via self-report, doping susceptibility was chosen as outcome variable, following the suggestions of previous research to use indirect questions, and to consider doping susceptibility as a proxy for doping behaviour (6, 15, 17). In accordance with previous research, doping susceptibility was quantified by presenting athletes with four hypothetical situations, in the context of which they were asked whether they would be willing to take prohibited substances (17, 19, 20). The scenarios included the following: a, Your strongest opponent has doped and you know about it, would you take a prohibited substance to increase your chances of winning?; b, If you could earn 1 million Euros in a competition, would you take prohibited substances to increase your chances of winning; c, If you had information about the fact that your opponents dope, would you also take prohibited substances to increase your chances of winning?; d, If there was no risk of getting caught doping, would you take prohibited substances to increase your chances of winning?; this study's Cronbach's-$\alpha = 0.82$). Items were rated using a five-point Likert scale ranging between 0 (absolutely not) and 4 (absolutely sure).

3.5. Berne Questionnaire of Well-Being in Adolescents

To assess well-being, the BFW was used. In its original form, this instrument consists of 39 items distributed among six subscales assessing aspects of subjective well-being in adolescents (21). For the purposes of the present study, the following four scales were used: 1, positive attitude towards life (PAL), e.g. my future looks good (this study's Cronbach's-α = 0.72); 2, depressive mood (DM), e.g. There is nothing that really gives me joy (this study's Cronbach's-α = 0.61); 3, self-esteem (SE), e.g. I am able to complete tasks as well as most of other people (this study's Cronbach's-α = 0.67); and 4, Anxiety (A), e.g. During the past few weeks, I worried about my health (this study's Cronbach's-α = 0.75). Items were rated using a six-point Likert scale ranging between either 0 (totally incorrect) and 5 (totally correct) or, for anxiety, 0 (no worries at all) and 5 (a lot of worries).

3.6. Questionnaire for Evaluating Mental Competencies and Attitudes in Sport

To assess the different health psychological scale as well as more general attitudes towards sport, not specifically framed towards doping, the FEMKES was used. This questionnaire quantifies various behaviours, experiences and attitudes related to sport (22). Of its 19 subscales, eight were planned to be used herein: 1, Confidence of Success (CiS), e.g. During a competition, I am very sure that I will reach my goals (this study's Cronbach's-α = 0.72); 2, fear of failure (FoF), e.g. During a competition I often think things could go wrong (this study's Cronbach's-α = 0.67); 3, performance motivation (PM), e.g. Difficult sporting challenges particularly attract me (this study's Cronbach's-α = 0.71); 4, Goal Orientation - Ego-Orientation (GOE), e.g. I feel be most successful in sport when others' performances are inferior to mine (this study's Cronbach's-α = 0.72); 5, Goal Orientation - Task-Orientation (GOT), e.g. I feel most successful in sport when my performance feels good to me (Cronbach's-α = 0.38); 6, goal orientation - social recognition (GOS), e.g. I feel most successful in sport when I make people who are important to me happy (this study's Cronbach's-α = 0.66); 7, locus of control - external control (LOCE), e.g. I believe that successful sporting careers frequently depend on other people (this study's Cronbach's-α = 0.68); and 8, locus of control - internal control (LOCI), e.g. If I achieve something in sport, it is due to my personal efforts (this study's Cronbach's-α = 0.55). Based on the very low reliability indices of scale 5 and 8, these were excluded from further analyses. Items were rated using a six-point Likert scale ranging between 0 (does not apply at all) and 5 (applies completely).

3.7. Statistics

To describe the study population, means (M) $\pm$ standard deviations (SD) were obtained. Unpaired t-tests were used to compare doping susceptibility and questionnaire scale scores between male and female respondents, high vs. low risk sports, and those who had and had not previously been offered PES. Where significant differences between male and female respondents arose, data were analyzed separately for both genders. ANOVAs were performed to assess differences in doping susceptibility with respect to the following independent variables: school (sport high-school, commercial academy, commercial school, national training centre, and regional training centre), competitions/year (0, 1 - 3, 4 - 5, 6 - 10, > 10) and parents' highest level of education. Post-hoc testing was performed where appropriate and p values were adjusted using Bonferroni correction. Effect sizes will be provided according to Cohen (23) for comparisons of different groups.

Pearson correlations were computed to quantify bivariate associations between doping susceptibility and age, questionnaire scale scores and whether athletes were training with a team (i.e. at least one professional trainer). Gender was partialled-out in this analysis. In addition, a stepwise linear regression analysis was computed with doping susceptibility as dependent variable, entering socio-demographic and situational variables in a first step (bivariate correlation with doping susceptibility at least < 0.2) and FEMKES and BWF variables in a second and third step. To provide an index of multicollinearity, the variance inflation factor (VIF) was obtained. The significance level was set at $P < 0.05$ in all analyses.

4. Results

4.1. Sample Characteristics

The total sample consisted of 1,265 junior athletes with a mean age of 16.24 $\pm$ 1.5 years. Approximately two-thirds (66.9%) of the sample were male; 61.3% attended a Sport-gymnasium (sports high school), 15.2% attended a national intensive training centre, 12.5% attended a commercial high school, and 2.2% attended a regional intensive training centre. Athletes trained 5.33 $\pm$ 1.3 times per week; the majority of them adhered to a training schedule (72.2%) and used a professional trainer on a regular basis (81.2%). Soccer (35%), skiing (8.4%), tennis (8.1%), and swimming (6%) were the most frequently practiced sports. Of the total sample, 42.1% performed a sport considered as vulnerable to doping.

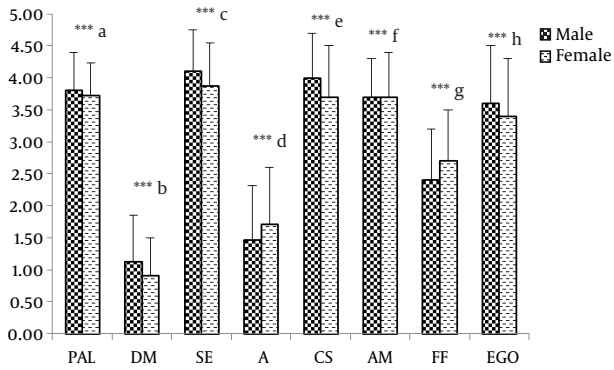
4.2. Doping Susceptibility

The mean doping susceptibility score of the total sample was 0.77 ± 0.86; susceptibility was not associated with age (r = 0.01, P = 0.63). Differences in doping susceptibility and specific socio-demographic variables are presented in Table 1. Results of an univariate analysis of variance displayed a difference in doping susceptibility and the number of competitions entered per year was (P = 0.02, η^2 = 0.010) as well as the type of school (P < 0.001, η^2 = 0.037) Findings of the Bonferroni-corrected post-hoc analysis are outlined in Table 1.

4.3. FEMKES and BWF

Significant gender-specific mean values of the FEMKES and BWF scales are presented in Figure 1. After gender was partialled-out, age exhibited a slightly negative association with five of the FEMKES scales, namely CoS, FoF, PM, GOS, and LOCE (-0.10 < r < -0.060; all P < 0.004). Female athletes who had previously been offered a PES scored higher for GOE (3.81 ± 0.9 vs. 3.22 ± 0.9, P = 0.007, dCohen = 0.656). In terms of the BWF scales, age was unrelated to these scores (-0.061 < r < 0.036, all n.s.). Differences in the BWF scores and whether respondents had been previously offered PES are displayed in Figure 2 Cohens'd ranged between 0.23 and 0.41. After controlling for gender, the PAL scale became non-significant.

Figure 1. Gender-Specific Mean Values of FEMKES and BWF Scales

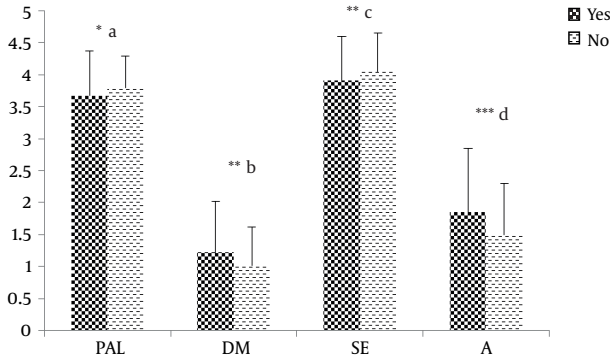


* P < 0.05, *** P < 0.001, [a] t(888.1) = -2.39, [b] t(933.2) = -5.48, [c] t(1202.0) = -5.72, [d] t(1201.0) = 4.58; [e] t(1246) = -9.54, [f] t(1243) = 6.07, [g] t(1234) = -3.96, [h] t(1211) = -3.32. PAL, positive attitude towards life; DM, depressive mood; se, self-esteem; a, anxiety; CS, confidence of success; am, achievement motivation; ego, ego-oriented goal orientation; FF, fear of failure.

4.4. BWF and FEMKES as Predictors of Doping Susceptibility

Preliminary correlation analyses with gender partialled-out revealed that, except LOCE (r = 0.05, P = 0.1), all BWF and FEMKES scales were associated with doping susceptibility (all P < 0.021, Table 2). Results of the stepwise linear regression analysis are outlined in Table 3. The total variance explained by was 23.7% with socio-demographic and situational (12%) and FEMKES variables (11.2%) explaining most of the variance. BWF variables only added 1.8%. Even though certain of the predictors were significantly associated with each other, particularly the FEMKES and BWF scales, relevant multicollinearity did not occur; VIF values were in the acceptable range (24).

Figure 2. Mean Values of BWF Scales in Relation to Previous PES Offers



* P < 0.05; *** P < 0.001; [a] t (193.3) = 2.26, [b] t (205.0) = -3.0, [c] t (1195) = 2.75, [d] t (202.9) = -4.32; PAL, positive attitude towards life; DM, depressive mood; SE, self-esteem; A, Anxiety.

5. Discussion

We investigated the predictive potential of different health-psychological factors and dimensions of well-being, with respect to doping susceptibility in junior athletes. Generally, health-psychological constructs, as already found in research of adult athletes, explained significant parts of the variance in adolescent athletes doping susceptibility. In detail, performance motivation was inversely, and fear of failure and ego-oriented goal orientation were positively, related to doping susceptibility. Well-being variables added only a little to the total variance in doping susceptibility with depressive mood and self-esteem being positive predictors of doping susceptibility.

The doping susceptibility of athletes was generally low but markedly higher in male vs. female athletes. Even though the latter finding contrasts with many previous studies' predictive models (17, 19, 25), it is consistent with a meta-analysis that demonstrated relatively low doping susceptibility scores in adult athletes and gender effects on doping intentions and behaviour in the same direction (3). In addition, our study demonstrates that adolescent

Table 1. Differences in Doping Susceptibility in Regard to Socio-Demographic Variables

	n	Mean	SD	P	Cohen's d
Gender				< 0.001	0.42
Male	846	0.89	0.91		
Female	412	0.54	0.69		
Sport classification				< 0.001	0.43
High-Risk[a]	533	0.98	0.94		
Low-Risk[b]	700	0.62	0.75		
PES-Offer				< 0.001	0.69
Yes	177	1.25	1.05		
No	1073	0.69	0.8		
School type				< 0.001[c]	0.55
Commercial academy	159	1.12	1.09		
Sport high-school	776	0.67	0.75		
Competitions per year				0.03[c]	0.26
5 - 10 competitions	136	0.6	0.78		
> 10 competitions	916	0.82	0.87		

Abbreviation: SD, standard deviation.
[a] At least one of the following: running, swimming, bodybuilding, cross-country skiing, biathlon, biking, athletics, and triathlon (18).
[b] All other sports.
[c] Bonferroni-corrected P-value.

Table 2. Correlations Between the Health Psychological and Well-Being Scales and Doping Susceptibility[a]

	Doping Susceptibility	Confidence of success	Fear of Failure	Performance Motivation	Ego Orientation	Social Recognition	Locus of Control – External	Positive Attitude Towards Life	Depressive Mood	Self-Esteem	Anxiety
Doping Susceptibility	1.00	- 0.17***	0.22***	- 0.26***	0.23***	0.07*	0.05	- 0.20***	0.22***	- 0.14***	0.20***
Confidence of Success		1.00	- 0.52***	0.65***	- 0.04	0.05	- 0.09**	0.44***	- 0.31***	0.37***	- 0.19***
Fear of Failure			1.00	- 0.46***	0.07*	- 0.006	0.14***	- 0.27***	0.27***	- 0.30***	0.26***
Achievement Motivation				1.00	- 0.04	0.03	- 0.13***	0.38***	- 0.38***	0.37***	- 0.22***
Ego Orientation					1.00	0.25***	0.12***	- 0.04	0.12***	- 0.03	0.09**
Social Recognition						1.00	0.23***	0.06	- 0.009	0.001	0.06
Locus of Control – External							1.00	- 0.09**	0.19***	- 0.13***	0.16***
Positive Attitude Towards Life								1.00	- 0.49***	0.63***	- 0.36***
Depressive Mood									1.00	- 0.57***	0.35***
Self-Esteem										1.00	- 0.42***
Anxiety											1.00

[a] *P < 0.05; **P < 0.01;***P < 0.001.

athletes, who had previously been offered a PES, and those performing sports associated with a higher risk of doping, are more doping susceptible; a circumstance already previously assumed in view of the influence of availability of PES on behaviour (26), but not tested so far.

Health-psychological variables explained approximately as much of variance in doping susceptibility as did situational and socio-demographic variables. This op-

Table 3. Linear Hierarchical Regression Analysis of Predictors of Doping Susceptibility

Variable	Adjusted R^{2a}	Beta	P	F	df	VIF
Step 1	0.115		< 0.001	23.408	(5, 854)	
Gender		0.10	0.003			1.17
School		0.14	< 0.001			1.06
Risk Sport		0.20	< 0.001			1.01
PES Offer		0.17	< 0.001			1.13
Step 2	0.222		< 0.001	20.602	(6, 848)	
Gender		0.15	< 0.001			1.26
School		0.13	< 0.001			1.07
Risk Sport		0.17	< 0.001			1.03
PES Offer		0.18	< 0.001			1.17
Fear of Failure		0.12	0.001			1.50
Achievement Motivation		-0.21	< 0.001			1.98
Goal Orientation - Ego-Orientation		0.20	< 0.001			1.10
Step 3	0.237		< 0.001	5.144	(4, 844)	
Gender		0.12	0.001			1.41
School		0.13	< 0.001			1.08
Risk Sport		0.16	< 0.001			1.07
PES Offer		0.18	< 0.001			1.18
Fear of Failure		0.11	0.003			1.55
Achievement Motivation		-0.18	< 0.001			2.07
Goal Orientation - Ego-Orientation		0.18	< 0.001			1.15
Depressive Mood		0.12	0.002			1.74
Self-Esteem		0.10	0.023			2.16

Abbreviation: VIF, variance inflation factor.
[a] R^2, Explained variance.

poses findings from previous research, where situational variables either did not explain (17, 19), or only explained a small proportion, of the variance in doping susceptibility (25). It seems that for adolescent, situational variables play more of a role as compared to adult athletes. In particular, the strong positive association between previous PES offers and doping susceptibility underlines the importance of the trainers, peers and sports physicians in preventing doping (27-29). Among the health-psychological variables, fear of failure and ego-orientation were positive predictors; performance motivation was a negative predictor for doping susceptibility.

The positive predictive value of fear of failure on doping susceptibility might be explained with doping as being considered as means to prevent the failure in competition. Fear of failure in competition can have several causes and, as indicated by previous studies, is gender-sensitive. In detail, according to a study by Levine et al. (30), high levels of fear of failure are associated with low self-esteem and are more prevalent in men vs. women. Our study contradicts this finding as in our sample female athletes exhibited higher fear of failure scores. In regard to our sample, this discrepancy might be explained by the fact that females also showed lower values in self-esteem which is negatively associated with fear of failure (30) and considered to be the most frequently aversive consequence (31). Additionally, Conroy and Coatsworth (32) found that self-blame predicted the extent of fear of failure in adolescent athletes. Another explanation could be found in the different sources from which males and females derive their self-esteem. For example, Josephs et al. (33) argued that women's self-esteem is linked to attachments to important others, whereas men's self-esteem relates to personal achievements. Even though causality cannot be

inferred, another variable negatively associated with self-esteem was being offered a PES. Closely related this was positively associated with anxiety. It might be that being offered PES by important others, an important source of self-esteem for women (33), undermines their belief that success can be achieved without doping. Another reason might be the induced lacking efficacy beliefs of the important other, who offered PES, towards the athletes to achieve winning without doping. Given these findings, and the positive predictive value of fear of failure on doping susceptibility, increasing self-efficacy expectations and self-esteem, as well as reducing fear of failure in young athletes appears to represent a crucial target for doping prevention efforts. Interestingly though, the latter seem not to be the most significant predictors for doping susceptibility, because even though females exhibited higher scores in fear of failure and lower values in self-esteem, it has been the males who showed higher scores in doping susceptibility

The ego-oriented perspective positively predicted doping susceptibility in our study. While earlier findings pertaining to this association were ambiguous in view of adolescents (7, 34), a recent meta-analysis by Ntoumanis et al. (3), mostly including adults, suggested a slight negative association between ego-involved goal orientation and doping intentions and behaviour. This association seems reasonable though in view of athletes whose only goal it is to be the best, compared to others, regardless of whether or not they perform at their personal best, might be more prone to use prohibited substances to achieve this goal. In line, research from health psychology indicated that individuals who are intrinsically motivated foster a healthier lifestyle (35-37). Unfortunately, due to low reliability, intrinsic motivation was not further analyzed as part of this study. Related to the above, the inverse association between performance motivation, linked to competitiveness, and doping susceptibility suggests that the more the athlete is stimulated by athletic challenges, which could be considered as intrinsic motivation as well, the less susceptible he or she is to doping.

Variables of well-being added only marginally to the variance explained ($\Delta R^2 = 1.5\%$). Self-esteem, operationalized as belief in one's own skills, was positively correlated with doping susceptibility. However, this result should be interpreted with caution, as the direction of the association reversed in the regression analysis, indicating a suppressor effect (38, 39). Nevertheless, given the discussion above, self-esteem should not be underestimated as it seems to be a mediator of the level of fear of failure that is a positive predictor of doping susceptibility. Yet, this assumption needs to be verified by future studies. Depressive mood, which was presently applied as a predictor of doping susceptibility for the first time, showed a marked positive association. In accordance with previous studies demonstrating that adolescents' habitual well-being is gender-dependent (40, 41), our female athletes exhibited higher anxiety, less positive attitudes to life, lower self-esteem, and lower depressive mood levels. The last finding is interesting as the majority of depression research on adolescents and adults reports on females being more prone to depression than males. Nolen-Hoeksema (42) for example conclude that women experience depression twice as likely as compared to men, especially from an age of 15 years onwards. The adverse finding in our study might be caused by the nature of the questionnaire which focused on depressive mood in close relation to sport and is not directly comparable to the commonly used depressive mood scales. Possibly, in sport, male athletes who are much more focused on personal achievement tend to show more depressive mood symptoms if they do not achieve their sportive goals. Consonant with the positive association of depressive mood and doping susceptibility, doping susceptibility was higher in male athletes as compared to female athletes, which is in line with findings of previous research (43, 44).

Several limitations of this study should be addressed. A systematic bias conferred by socially desirable responding might be relevant given the self-response format of the questionnaire. However, Barkoukis et al. (17) analysed the effects of social desirability that were marginal. Nonetheless, associations between gender and certain of the FEMKES scales may be confounded by associations between gender and specific sports, in which athletes are exposed to greater pressure, leading to increased fear of failure. The limited variance explained by the well-being variables might be due to the instrument applied to assess well-being. Even though the BWF is a questionnaire designed to identify different facets of well-being in adolescents, its validity has not been tested in a sport context. By definition, due to the cross-sectional and correlational nature of this study, its results cannot be interpreted causally. Finally, regression weights and total variance explained are rather low, inducing caution in terms of generalization. In line, the obvious diffusion of different operationalisations for same constructs and different labelling of equally operationalized constructs leads to difficulties in comparability and the discussion of the findings. Further research, using the same approaches that have been shown to be reliable, and particularly longitudinal case-control studies, may facilitate the definition of causal relationships as an empirical basis for further development of prevention strategies.

Doping remains a highly relevant problem in sport, also in adolescent athletes. The integration of theoretical models developed in other areas of psychological re-

search - particularly in the context of health-related and preventive behaviours - into the present field has undoubtedly proven successful. This study has found support for previous results in this field also for adolescent athletes but also some discrepancies. Situational factors, such as school type (i.e. being at a sport-high-school) and training environment, as well as gender-specific differences, were shown to be more relevant in the adolescent setting. Facets of well-being appear to add only marginally to the explanation in variance of doping susceptibility, whereas the stimulation of self-esteem, that might be mediating the level of fear of failure, seems to be a very promising prevention approach. Fear of failure as such can be considered to be of particular importance explaining doping susceptibility, a fact that has not received much attention in research and practice thus far. Nevertheless, possible implications of the findings of this study may be considered for creating and adapting prevention measures. By definition, it would not be appropriate to predict actual doping behaviour in individual cases for example based on high values of fear of failure. In this regard and in agreement with Petroczi et al. (45), the authors would like to stress that psychological concepts can contribute to understanding doping behaviour in order to inform intervention; but the development of diagnostic tools based on these concepts is still in its infancy. The study corroborates the predictive value of classical psychological constructs in doping research, initially analyzed in view of adult athletes, also for adolescents' doping susceptibility. Nevertheless, identified variables that predict higher doping susceptibility cannot be taken as indicators of athletes' actual doping behaviour but should rather be considered as possible starting points for interventions.

Footnote

Authors' Contribution: Cornelia Blank (CB), Wolfgang Schobersberger (WS), Veronika Leichtfried (VL) designe the study and performed the data collection. CB and VL performed the statistical analyses and the preparation of the results. WS and Stefan Duschek (SD) significantly contributed to writing the discussion section. All authors revised and agreed on the final manuscript.

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