Mental health in sports students – a cohort study on study-related stress, general well-being, and general risk for depression

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Abstract

Previous research on mental health in sports students often focused on individual aspects (e.g., stress, well-being, and risk for depression) instead of looking at mental health in its entirety. Therefore, the main objective of this study is to offer a more comprehensive analysis of mental health by focusing on the specific target group of sports students and examining study-related stress and its relationships to general well-being and general risk for depression at different points of time during their studies. The sample consisted of 648 sports students (413 male, 234 female, 1 other). The students belonged to one of three cohorts of sports students in Germany (first-year BA students; BA students in their final stages; MA students). Mental health was measured with study-related stress, well-being, and risk for depression. Overall and depending on aspects of mental health, between 5% and 20% of sports students showed rather poor mental health. More than 50% sometimes or rather frequently exhibited study-related stress. 21% of sports students showed impaired well-being levels and 11% had an increased risk for depression. Differences occurred between cohorts (i.e., more advanced sports students had poorer mental health). Moreover, the results of the regression analysis revealed that study-related stress is a predictor of well-being and risk for depression in sports students. The longer sports students studied, the lower was their experienced mental health. Possible explanations could be increasing study-related requirements or upcoming graduation (i.e., exams, fear of the future). Future research should examine causes of impaired mental health in sports students.

Keywords: psychological health, university students, athletes, higher education, study load

Introduction

Studies on mental health in students deal with various aspects, especially with stress, well-being, and risk for depression. Of these aspects, stress receives particular research attention. In terms of stress levels, university students experience high amounts of stress during their study programs (Bayram & Bilgel, 2008). These stress levels can have negative effects on students' academic performance (Bennett, 2007; Janse van Rensburg et al., 2011) but are also often associated with mental disorders (e.g., depression). Recent studies indicate prevalence rates for mental disorders in students between 20% and 30% (Bailer et al., 2007; Grobe et al., 2018; Gusy et al., 2016; Meier et al., 2010).

Within the group of students, sports students (i.e., sport science students as well as students of physical education (PE students)) represent a special target group when considering stress at university (i.e., study-related stress). They are confronted with study-related stressors that are not only caused by typical academic demands (i.e., examinations) but also by physical and sporting demands (i.e., physical performance, training) (Brown et al., 2015; Proctor & Boan-Lenzo, 2010; Wilson & Pritchard, 2005). This combination of academic and physical demands may have a special impact on study-related stress processes in sports students. Whether study-related stress affects the overall well-being of students and their general risk for depression is largely unknown. Therefore, the main objective of this study is to focus on the specific target group of sports students and to examine study-related stress and its relationships to general well-being and risk for depression at different points of time during their studies. The results of this study should be discussed with the perspective of developing specific health prevention programs for sports students.

Stress in sports students

According to the transactional stress model, stress arises when people perceive that they cannot adequately cope with given demands or with threats to their mental health (Lazarus, 1984). Stress is caused by personal appraisals in a process of transaction between person and environment (Lazarus & Folkmann, 1984). Regarding the stress of students, this means that a student rates the significance of a situation for their own mental health, e.g., the significance of an examination.

So far, only few studies have examined stress in sports students (Bastug et al., 2014; Demirel, 2016; Eraslan & Dunn, 2015; Kumar & Bhukar, 2013; Schäfer et al., 2019; Verma et al. 2011). The stress levels of sports students differ compared to students of other subjects (Demirel, 2016); furthermore, the stress levels of physical education teachers differ regarding their career phases (Schäfer et al., 2019). Demirel (2016) compared

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stress levels of sport science students and university students of other subjects. The results showed that sport science students had statistically significantly higher stress levels than non-athlete students. As possible explanations, Demirel (2016) mentioned special stressors for sports students, such as the fear of forthcoming or physical stress associated with their training program. Schäfer et al. (2019) examined perceived stress levels of physical education teachers in different career stages (PE students, pre-service teachers, and PE teachers). PE students perceived lower stress levels compared to pre-service teachers and PE teachers.

Further studies found that stress levels of sports students differed in terms of gender (Bastug et al., 2014; Eraslan & Dunn, 2015; Kumar & Bukhar, 2013; Verma et al., 2011) and age (Eraslan & Dunn, 2015): Perceived stress levels of female students were significantly higher than those of male students (Bastug et al., 2014; Kumar & Bukhar, 2013; Verma et al., 2011). In contrast to the aforementioned findings, Eraslan & Dunn (2015) indicated that the stress levels of the research sample does not differ significantly in terms of gender and age.

Well-being in sports students

There is no universal definition of well-being. There are rather many descriptions for this construct (Dodge et al., 2012). Psychological well-being is a central part of individual health (WHO, 1946) and shows the feelings of a person that range from negative mental conditions (e.g., depression) to positive mental conditions (e.g., life satisfaction) (Bradburn, 1969; WHO, 1946).

So far, well-being in sports students has been investigated in a few studies (Gönener et al., 2017; Güngör & Çelik, 2020; Juriana et al., 2019). Juriana et al. (2019) highlighted that most of the analyzed sports students had a moderate psychological well-being (73.5%). 13.1% of their sample belonged to the high category (good/high well-being) and 13.4% of the examined sports students belonged to the low category (bad/low well-being) of psychological well-being. Güngör & Çelik (2020) examined the mental well-being of sports students and revealed that the mental well-being levels of their study participants were above the average (obtained from the Warwick-Edinburgh Mental Well-being Scale). There were no significant gender or class differences. The results of Gönener et al. (2017) showed that male sports students had significantly higher (better) scores in mental well-being than female sports students. As in Güngör's & Çelik's study (2020), no significant differences were found between class variables.

Depression in sports students

The American Psychiatric Association defines depression (major depressive disorder) as "a common and serious medical illness that negatively affects how you feel, the way you think and how you act." (American Psychiatric Association, 2018). Feelings of sadness and/ or a loss of interest in activities a person once enjoyed are symptoms of depression.

To date, depression in sports students has been investigated in two studies (Boath et al., 2013; Demirel, 2016). Demirel (2016) showed that sports students had higher depression scores than students of other subjects. In contrast, Boath et al. (2013) found no differences between the depression scores of sports students and students of other subjects.

Research questions of the present study

In summary, there is a lack of consistent research on sports students' mental health. Most of the studies on mental health in sports students focused on stress especially. Only a few studies examined well-being and risk for depression. Additionally, it must be noted that the mentioned studies differ in many aspects (e.g., sample of sports students, measurements to assess the dependent variables, study design). Therefore, it is difficult to compare the results of the mentioned studies or to rate the mental health of sports students. Additionally, it is of interest to find out whether there are relationships between the three parameters study-related stress levels (i.e., stress in the context of studies and exams), levels of general well-being, and general risk for depression (i.e., stress and depression in overall life). Previous research provides evidence that these parameters are at least moderately correlated with each other (Beiter et al., 2015; Dalton & Hammen, 2018; Eganov et al., 2020; Lebensohn et al., 2013; Yüksel & Bahadır-Yilmaz, 2019; Zhang et al., 2018). Here, it is relevant to find out whether and to what extent study-related stress statistically predicts general well-being and risk for depression. Therefore, the following research questions were developed:

- 1) How high are study-related stress levels, levels of general well-being, and general risk for depression among sports students?
- 2) Are there differences in study-related stress levels, levels of general well-being, and general risk for depression between different semester cohorts and different study programs (i.e., BA, MA)?
- 3) Is there a correlation between study-related stress, general well-being, and general risk for depression?
- 4) Is study-related stress of sports students a statistical predictor of general well-being and general risk for depression?

Material & methods

Participants

The sample consisted of 648 sports students (36.1% female; age: $M = 22.61$ years, $SD = 3.28$ years). The students belonged to one of three cohorts of sports students. The 1st cohort consisted of first-year students in the bachelor program (BA; $n = 286$, 34.9% female; age: $M = 20.61$ years, $SD = 2.65$ years; semester: $M = 1.09$, $SD = 0.4$). The 2nd cohort consisted of sports students in the final stages of their BA program ($n = 209$, 33.4%

female; age: $M = 22.9$ years, $SD = 2.23$ years; semester: $M = 5.43$, $SD = 0.95$). The 3rd cohort consisted of sports students in the middle of their master program (MA; $n = 163$, 42.9% female; age: $M = 25.88$ years, $SD = 2.64$ years; all students were in the 3rd semester).

Measures

Study-related stress. Study-related stress was measured using the German version (Fliege et al., 2001) of the Perceived Stress Questionnaire (PSQ; Levenstein et al., 1993). The PSQ is an instrument to assess experienced stress (independent of a specific or objective event). The PSQ consists of 20 items in four scales with five items on each scale: “worries” (e.g., “You are afraid of the future.”), “tension” (e.g., “You have trouble relaxing.”), “joy” (e.g., “You feel you’re doing things you really like.”), and “demands” (e.g., “You feel that too many demands are being made on you.”). Three scales assess internal stress reactions (worries, tension, and joy) and the scale “demands” assesses the perception of external stressors. In order to measure *study-related stress*, the PSQ instruction asked the students to indicate how often a statement of the questionnaire applied to them during the last four weeks of their studies (“How do you feel about your studies? Among the four answers, please mark the one that indicates how often the statement applies to you during the last four weeks.”). The PSQ has a 4-point scale (1: “almost never,” 2: “sometimes,” 3: “often,” 4: “usually”). Mean values were formed for each scale. For an overall study-related stress score, the mean values of all items were computed. For this study, values above 3 represented a high study-related stress level. The PSQ is an economic, reliable (overall score: $\alpha = .75$; worries: $\alpha = .80$; tension: $\alpha = .81$; joy: $\alpha = .75$; demands: $\alpha = .35$), structurally stable, and valid instrument that enables assessing perceived stress in different subject groups.

General well-being. Well-being was measured using the German version (Bonsignore et al., 2001) of the WHO-5 Well-Being Index (WHO-5; WHO, 1998). The WHO-5 is a screening tool that assesses psychological well-being during the past two weeks with five items (e.g., “Over the past two weeks...I have felt calm and relaxed.”) on a 6-point scale from 0 (“at no time”) to 5 (“all of the time”). For an overall score, mean values of each item were calculated. High values of the WHO-5 represent a good well-being. The WHO-5 is an economic, reliable ($\alpha = .84$), and valid instrument to assess psychological well-being (Bonsignore et al., 2001). With a total score of 0 – 25, the WHO (1998) proposed a cut-off score of ≤ 12 to screen depression. In their systematic review, Topp et al. (2015) reported a mean sensitivity of 86% and a mean specificity of 81% for detecting a major depression in adults.

General risk for depression. Risk for depression was measured using the German version (Löwe et al., 2005) of the Patient Health Questionnaire (PHQ-2; Kroenke et al., 2003). The PHQ-2 is a screening tool to assess the risk for depression over the past two weeks with two items (instruction: “Over the past two weeks, how often have you been bothered by any of the following problems?”; items: “Little interest or pleasure in doing things.” and “Feeling down, depressed, and hopeless.”; $\alpha = .65$) on a 4-point scale from 0 (“not at all”) to 3 (“nearly every day”). High values of the PHQ-2 represent a high risk for depression. The PHQ-2 is a valid screening instrument to assess the risk for depression (Arroll et al., 2010). With a total score of six on a scale of 0 – 6, Löwe et al. (2005) found a sensitivity of 87% and a specificity of 78% for major depressive disorders. For any depressive disorders, the authors found a sensitivity of 79% and a specificity of 86%. Kroenke et al. (2003) proposed a cut-off score of ≥ 3 to screen depression.

Procedure

After approval by the ethics committee, participants were recruited during seminars at the university. For this purpose, the university teachers of the respective seminars were contacted by e-mail (via an internal mailing list) and asked to let the survey take place within their courses. Once consent was obtained, the study instructors went to the courses and distributed paper questionnaires to the students. The data collection took place at three different points in time (November 2016 (1st cohort: first-year BA students; 1st/2nd semester), January 2018 (2nd cohort: BA students in the final stages of their program; 5th/6th semester), and January 2019 (3rd cohort: MA students; 3rd semester)).

On the first page of the questionnaire, the participants were informed about the overall objectives of the study, the voluntary nature of participation, and the anonymization of their data or person. All students completed the questionnaires during their presence in seminars at the university. The completion of the questionnaires took about 20 minutes.

Data analysis

Data were analyzed by using *IBM SPSS Statistics 27*. First, the data set was cleaned by using outlier analysis. In order to examine study-related stress, well-being, and risk for depression, descriptive analyses were run. Differences between the three cohorts in study-related stress levels, levels of well-being, and risk for depression were calculated using multivariate analyses of variance (MANOVAs).

To investigate correlations between overall study-related stress levels, the four dimensions of stress, general well-being, and general risk for depression, a Pearson correlation analysis was performed. Subsequently, a multiple regression analysis (enter) was run to analyze whether and to what extent the four dimensions of study-related stress predict general well-being and general risk for depression.

Results

Levels of study-related stress, well-being, and risk for depression

Table 1 shows the descriptive data of study-related stress, well-being, and risk for depression. In terms of overall study-related stress, 44% of all sports students ($n = 645$) reported low levels of study-related stress (overall stress score, values lower than 2 “sometimes”). 50.3% reported moderate study-related stress levels (overall stress score, values between 2 “sometimes” and 3 “often”). Only 5.7% of students surveyed reported high study-related stress levels (overall stress score, values between 3 “often” and 4 “usually”).

Well-being was determined by calculating a cut-off score. Scores below or equal to 12 indicated an impaired well-being (WHO, 1998). With a cut-off score of ≤ 12 , 21.6% of all students surveyed ($n = 645$) showed an impaired well-being.

The risk for depression was also determined using a cut-off score. Scores above or equal to 3 indicated a high risk for depression (Kroenke & Spitzer, 2003). With a cut-off score of ≥ 3 , 11.6% of sports students surveyed ($n = 646$) had a high risk for depression.

Table 1. Descriptive data of study-related stress, well-being, and risk for depression

Variable	Scale	1 st cohort				2 nd cohort				3 rd cohort			
		BA students (1 st / 2 nd sem.: $n = 285$)				BA students (5 th / 6 th sem.: $n = 206$)				MA students ($n = 156$)			
		M	SD	Min	Max	M	SD	Min	Max	M	SD	Min	Max
Stress	Worries	1.83	0.61	1	3.8	1.96	0.6	1	3.8	2.07	0.61	1	4
	Tension	2.12	0.55	1	3.8	2.22	0.65	1	4	2.42	0.72	1	4
	Joy	3.03	0.51	1.6	4	2.82	0.6	1.4	4	2.68	0.57	1.4	4
	Demands	2.21	0.61	1	4	2.3	0.6	1	4	2.53	0.67	1	4
	Overall	2.03	0.45	1.15	3.45	2.16	0.51	1.2	3.6	2.33	0.54	1.05	3.65
Well-being		15.96	3.59	5	25	13.94	4.34	4	25	13.57	5.1	2	25
Risk for depression		1.1	1.02	0	6	1.51	1.08	0	6	1.74	1.24	0	6

Differences in study-related stress levels, levels of well-being, and risk for depression between the three cohorts

Overall study-related stress levels. In terms of overall study-related stress levels, the results of the MANOVA (see Table 2) showed significant differences between the three cohorts ($F(2, 641) = 18.84, p < .001, \eta^2 = .06$). While only 2.8% of the 1st cohort and 4.9% of the 2nd cohort reported experiencing stress “often” or “usually,” this value was already 10.3% for the students of the 3rd cohort. Bonferroni-adjusted post hoc tests revealed that MA students had higher overall stress levels than students of the 1st ($p < .001$) and 2nd ($p = .004$) cohort. The 2nd cohort had significantly higher overall stress levels than the 1st cohort ($p = .012$).

Four dimensions of study-related stress levels. To highlight differences between the four dimensions of stress within the three groups of students, a MANOVA was calculated. Results showed significant differences between the cohorts for worries ($F(2, 641) = 8.08, p < .001, \eta^2 = .03$), demands ($F(2, 641) = 11.01, p < .001, \eta^2 = .03$), joy ($F(2, 641) = 21.38, p < .001, \eta^2 = .06$), and tension ($F(2, 641) = 13.6, p < .001, \eta^2 = .04$) (see Table 2). Bonferroni-adjusted post hoc tests revealed that MA students (3rd cohort) had significantly higher worries (1st cohort: $p < .001$), higher demands (1st cohort: $p < .001$, 2nd cohort: $p = .002$), and higher tension (1st cohort: $p < .001$, 2nd cohort: $p = .008$) than BA students. The 1st cohort had significantly higher joy than the 2nd cohort ($p < .001$) and 3rd cohort ($p < .001$). The 2nd cohort in turn had significantly higher joy than the 3rd cohort ($p = .04$).

Levels of well-being. Within the three cohorts, the results for impaired well-being differ significantly ($F(2, 641) = 21.28, p < .001, \eta^2 = .06$; see Table 2). While 10.5% of the 1st cohort showed an impaired well-being, 27.7% of the 2nd cohort and 33.8% of the 3rd cohort reported an impaired well-being. Bonferroni-adjusted post hoc tests revealed that less advanced sports students (1st cohort) had significantly higher well-being levels than the 2nd ($p < .001$) and 3rd cohort ($p < .001$). There were no significant differences between the 2nd and 3rd cohort.

Risk for depression. Within the three cohorts, the results for students reporting a high risk for depression differed significantly ($F(2, 641) = 18.48, p < .001, \eta^2 = .06$; see Table 2). While 6% of the 1st cohort had a high risk for depression, 11.7% of the 2nd cohort and 21.7% of the 3rd showed a high risk for depression. Bonferroni-adjusted post hoc tests revealed that more advanced sports students (2nd & 3rd cohort) had a significantly higher risk for depression than less advanced sports students (1st cohort: $p < .001$). There were no significant differences between the 2nd and 3rd cohort.

Table 2. Results of the MANOVA of study-related stress, well-being, and risk for depression

MANOVA all DVs						
Variable	Scale	df ¹	df ²	F	p	η^2
Stress	Worries	2	641	8.08	< .001	.025
	Tension	2	641	11.01	< .001	.033
	Joy	2	641	21.38	< .001	.063
	Demands	2	641	13.6	< .001	.041
	Overall	2	641	18.84	< .001	.056
Well-being		2	641	21.28	< .001	.062
Risk for depression		2	641	18.48	< .001	.055

Relationship between study-related stress, well-being, and risk for depression

Table 3 shows bivariate correlations between *overall study-related stress*, the four stress dimensions (worries, tension, joy, and demands), *well-being*, and *risk for depression*. Results showed that correlations between all examined variables were significantly high.

Overall study-related stress showed a high positive correlation with *well-being* ($r = .62, p < .001$) and a high negative correlation with *risk for depression* ($r = -.70, p < .001$). Results were similar for the four dimensions of stress: Except for the positively oriented dimension *joy*, all subscales of stress had a positive correlation with *well-being* and a negative correlation with *risk for depression*. Conversely, the dimension *joy* showed a positive correlation with *well-being* ($r = -.54, p < .001$) and a negative correlation with *risk for depression* ($r = .65, p < .001$). Except for the dimension *demands*, all results of the correlation analysis can be described as high correlations (according to Cohen, 1988). Demands correlated moderately with *well-being* ($r = .39, p < .001$) and *risk for depression* ($r = -.58, p < .001$).

Table 3. Bivariate correlation of study variables (i.e., study-related stress, well-being, and risk for depression)

Variables	N	(2)	(3)	(4)	(5)	(6)	(7)
(1) Overall stress	647	.84**	.89**	-.75**	.82**	.62**	-.70**
(2) Worries	647	-	.69**	-.55**	.57**	.56**	-.51**
(3) Tension	647	-	-	-.57**	.70**	.55**	-.67**
(4) Joy	647	-	-	-	-.39**	-.54**	.65**
(5) Demands	647	-	-	-	-	.39**	-.58**
(6) Well-being	646	-	-	-	-	-	-.65**
(7) Risk for depression	645	-	-	-	-	-	-

Note. ** $p < .001$, two-tailed

Study-related stress as a predictor impaired well-being and risk for depression

In order to examine whether study-related stress is a predictor of impaired well-being and risk for depression, multiple regression analyses were conducted.

Results showed that study-related stress is a significant predictor of well-being ($F(4, 644) = 198.51, p < .001$); the dimensions of stress predicted 55.1% of the variance of well-being. The analyzed regression model revealed *tension* ($\beta = -2.797, p < .001$) and *joy* ($\beta = 2.979, p < .001$) as significant predictors of well-being (see Table 4).

Study-related stress was a significant predictor of risk for depression ($F(4, 645) = 114.33, p < .001$). The dimensions of stress predicted 41.3% of the variance of risk for depression. The analyzed regression model revealed *worries* ($\beta = .274, p < .001$), *tension* ($\beta = .261, p < .001$), and *joy* ($\beta = -.256, p < .001$) as significant predictors of risk for depression (see Table 4).

Table 4. Multiple regression analyses for well-being and risk for depression

Predictors	Well-being (N = 644)				Risk for depression (N = 645)			
	β	T	p	R^2_{kor}	β	T	p	R^2_{kor}
Worries	-.01	-.14	.887	-	.27	6.45	<.001	-
Tension	-.41	-9.34	<.001	-	.26	5.26	<.001	-
Joy	.39	11.55	<.001	-	-.26	-6.67	<.001	-
Demands	-.06	-1.46	.145	-	-.95	-1.05	.296	-
Total	-	-	-	.551	-	-	-	.413

Discussion

The main aim of this study was to describe the mental health of sports students. Therefore, the present study examined three aspects of mental health, namely study-related stress levels, levels of well-being, and the risk for depression in sports students. The four main results of the study are: (1) More than 50% of the whole sample sometimes or frequently showed study-related stress. Moreover, 21% of the sports students examined showed an impaired well-being and 11% had an increased risk for depression. (2) Differences occurred between cohorts. MA students (3rd cohort) had higher overall stress levels than less advanced BA students (1st cohort). Furthermore, less advanced BA students (1st cohort) had significantly higher well-being scores than both more advanced BA students (2nd cohort) and MA students (3rd cohort). Moreover, sports students who studied longer (2nd and 3rd cohort) had a significantly higher risk for depression than first-year sports students (1st cohort). (3) For study-related stress, we found significant positive correlations with well-being and significant negative correlations with risk for depression. (4) Finally, study-related stress was partly a predictor of both general well-being and general risk for depression in sports students.

(1) Regarding study-related stress, general well-being, and general risk for depression, between 5% and 20% of sports students showed rather poor mental health. In terms of study-related stress, more than one in two sports students reported sometimes or more frequently experiencing study-related stress. However, only about 5% of students surveyed reported high study-related stress levels (values above 3). Bastug et al. (2014) found that sports students had a moderate level of global stress. Instead of assessing global stress, the present study was the first to examine study-related stress of sports students. This was necessary to determine the extent to which study-related demands lead to stress.

Regarding the students' well-being, it can be emphasized that the results of impaired well-being levels (21% of the examined sports students showed impaired well-being levels) are higher than previous studies have shown (Juriana et al., 2019). In Juriana's study (2019), only 13.4% of the examined sports students showed lower well-being levels. However, it is difficult to discuss the different well-being scores, as Juriana did not provide more detailed information on age, gender, or grade level of the sports students.

Moreover, in our study, 11.6% of all sports students had a higher risk for depression. So far, only two studies examined depression scores of sports students (Boath et al., 2013; Demirel, 2016) and compared the results with the depression scores of students of other subjects. However, in these studies, no statement was made about the level of the risk for depression (statements on, e.g., lower or higher risk for depression). Depression is known to lead to a variety of emotional and physical problems (American Psychiatric Association, 2018), which can lead to the impairment of a sports student's performance (e.g., at university, in sports). About one in ten sports students at increased risk of depression. In the future, it will therefore be important to identify students at risk as early as possible and to carry out prevention work in order to promote students' health and ability to lead.

(2) Mental health (e.g., study-related stress levels, general well-being, and general risk for depression) differed between the studied cohorts. MA students had higher study-related stress levels than less advanced BA students (1st cohort). Furthermore, less advanced BA students had significantly higher well-being scores than BA students who were in the final stages of their studies (2nd cohort) and MA students (3rd cohort). Moreover, BA students in the final stage and MA students had a significantly higher risk for depression than less advanced BA sports students. These results show that the longer students study, the lower their experienced mental health. This is equivalent to the results of Cetinkaya (2019). Cetinkaya (2019) analyzed career stress levels of sports students and also found differences in the levels of stress depending on the duration of their studies. In Cetinkaya's study (2019), sports students who were at the graduation level had more career stress than students who were new to their studies. One explanation for higher study-related stress, lower general well-being, and higher general risk for depression in BA students in the final stages of their studies and MA students could be their study requirements, which may increase at the end of their studies or close to graduation. Shortly before graduation, important exams are due for sports students. In addition, thoughts about their professional future (job expectations) might have a negative impact on their mental health as well.

(3) This study highlighted that study-related stress, general well-being, and general risk for depression are highly correlated with each other, thereby confirming previous research (Beiter et al., 2015; Dalton & Hammen, 2018; Lebensohn et al., 2013; Yüksel & Bahadır-Yilmaz, 2019; Zhang et al., 2018). However, the effect strengths were rather moderate (between $r = .60$ -.70), which indicates that these parameters represent different constructs. Consequently, when considering mental health (in sports students), all parameters (stress, well-being, and risk for depression) must be measured. Previous studies of mental health in sports students often only examined these parameters separately (Boath et al., 2013; Cetinkaya, 2019; Demirel, 2016; Güngör & Çelik, 2020; Juriana et al., 2019).

(4) Study-related stress was partly a predictor of general well-being and general risk for depression in sports students. More than half (55%) of the variability in general well-being levels and 41% of the general risk for depression in sports students could be explained by study-related stress. More specifically, study-related high tension and study-related low joy were significant predictors of impaired general well-being in sports students. Additionally, study-related high worries, study-related high tension, as well as study-related low joy were significant predictors of higher general risk for depression in sports students. These results can be explained by

two possible effects: Firstly, study-related stress can lead to a lower general mental health (i.e., well-being and risk for depression). This confirms observations according to which context-specific stress (in this case, the context of studying) has an impact on mental health in overall life. Long-term, constant stress can especially play a role in the development of mental diseases such as depression (Hammen et al., 2009; Monroe & Reid, 2009). Secondly, the results can also be interpreted in a reverse causal direction: Sports students with lower general well-being and higher general risk for depression might perceive study-related stress symptoms (i.e., worries, tension) more intensively. Thus, sports students with poor mental health might perceive and assess study-related demands (e.g., academic or physical demands) more problematically, possibly due to subjectively lower resources.

The following strengths of the study can be highlighted: Due to the large sample size of this study ($n = 645$), the presented results can be considered as reliable. Furthermore, and to the best of our knowledge, this study is the first to investigate the mental health of sports students by examining three basic constructs (study-related stress, well-being, and risk for depression). Based on the present results, a comprehensive picture of the mental health of sports students can be obtained. With this knowledge, target-specific interventions can be developed to promote sports students' mental health.

However, there are also some limitations of the study that need to be considered when interpreting the results. First, this is a cross-sectional study. Therefore, the results do not allow interpretation of causal relationships of the studied variables (i.e., relation between stress and depression). Yet, these cross-sectional results reveal target groups for stress-reducing interventions in sports students. Second, stress was measured in relation to studying, whereas well-being and risk for depression were measured as global constructs and relate to a person's entire life. This approach was intentional and necessary to determine whether study-related stress processes have an impact on mental health in overall life. However, no statements can be made about the global stress levels of sports students. Third, so far this study only examined sports students. Therefore, transferring the results to students of other disciplines is limited. Consequently, future studies should compare the mental health of sports students with the mental health of students of other subjects.

Conclusions

Sports students represent a special target group when considering mental health at university. They are confronted with stressors that are caused not only by typical academic demands (i.e., examinations) but also by physical and sporting demands (i.e., physical performance, training) (Brown et al., 2015; Proctor & Boan-Lenzo, 2010; Wilson & Pritchard, 2005). The present study provides a good picture of the levels of mental health in sports students. Specifically, one of five students showed an impaired well-being level with more advanced sports students had poorer mental health than younger students. Moreover, we found that study-related stress strongly correlates with general well-being and general risk for depression in sports students. From a theoretical point of view, these results confirm assumptions modelling pathways from contextual processes (e.g. university life) to global processes (i.e. global life). However, given the cross-sectional design of our study, future longitudinal studies should examine the cause-effect relationships of stressors, stress responses, lower well-being, and risk for depression in the daily lives of sports students. Moreover, future studies in the area of sports students' mental health should examine specific study-related requirements and clarify the extent to which these are related to low mental health in sports students overall life. Based on this, universities should, if necessary, make adjustments within the study requirements as well as targeted offers for health promotion. Such measures are especially necessary since long-term permanent stress can play a role in the development of mental diseases such as depression (Hammen et al., 2009; Monroe & Reid, 2009). Besides future research, already our results show the importance of a student health management at universities. Moreover, establishing prevention programs on mental health (e.g., stress management to build up appropriate coping strategies) seems to be especially important for more advanced students or students at graduation level.

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