©Journal of Sports Science and Medicine (2020) **19,** 323-336
http://www.jssm.org

Research article

Prevalence of Biopsychosocial Factors of Pain in 865 Sports Students of the Dach (Germany, Austria, Switzerland) Region – A Cross-Sectional Survey

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Abstract
When sports are part of a person's profession or education, their careers are often handicapped by pain, a complex physical and mental state that may already occur at lower career stages. This study was designed to assess the occurrence of pain among sports students and the prevalence of relevant contributing psychosocial co-factors. Exploratory cross-sectional study surveying students at 89 sports faculties of universities in the DACH region using the German Sports Pain Questionnaire. It includes several validated surveys related to pain occurrence in different body regions, injuries, pain diagnoses and pain intensity, depression, anxiety, stress, self-compassion, analgesic and alcohol consumption, as well as sleep quality, health-related quality of life and impairments of quality of life by pain. A total of 865 sports students gave consent to participate in the study, and 664 participants (78%; 23.3 ± 2.84 years, 60% female, 40% male) completed the full survey. More than half of the students (53%; n = 403) showed current pain in 2 - 5 regions of the body, while subjective pain tolerance was enhanced. General injuries or accidents, medically and self-diagnosed pain diagnoses during the last eight weeks were reported by 30%. A current pain intensity ≥ 3 NRS was prevalent in 28% (n = 205), which correlated with increased pain-related biopsychosocial scores. Sports students had increased scores for depression, anxiety and stress, and self-compassion was reduced (compared to age-controlled national reference data, sports students head increased scores). The mean weekly training workload was 5 - 7 hours. Analgesics and alcohol consumption was increased, 61% reported insomnia. Across sports students, pain and biopsychosocial burden seem significantly increased when compared to other students and age-controlled cohorts. The data implies the need of giving greater importance to pain management at least from the time of sports studies in order to prevent pain and health risks in sports.

Key words: Pain management, elite athlete, pain questionnaire, quality of life, preventive medicine.

Introduction

In an athlete's life, uncontrolled pain can have a negative effects as it may be source of further and more serious injuries as well as a trigger for -or a consequence of- psychosocial problems and illnesses (Putukian, 2016). Sports students are a special group of athletes, with diverse demands. There are multiple interactions between pain and students' biopsychosocial health (Bailer et al., 2008), an increased stress level due to the double burden of theoretical requirements and performance pressure. In consequence, an impairment of students' mental and physical health is likely (Putukian, 2016).

Injuries seem to be a key stress factor for sport students (Putukian, 2016), which are more often affected by injuries than other student groups (Dreiskämper et al., 2015). Most recent studies on the psychosocial state of German students point to a concerning development of mental symptoms and fear of failure among the students (Beiter et al., 2015). Studies show that higher resilience and increased resources of athletes, e.g. self-compassion, lead to a better ability to cope with pain and injury (Reis et al., 2015). Beyond that, mental resources, skills for pain management, and coping strategies can affect the healing process of an injury (Kleinert, 2001).

However, little is known about the prevalence of pain in sports students. So far there are only a few studies dealing with this topic, and there is a need for a systematic assessment of biopsychosocial factors in athletes and sports students based on the recommendations of the International Association for the Study of Pain (IASP) for pain assessment and management of pain (IASP, 2018).

The aim of the present survey was to evaluate the prevalence of existing pain and injuries, to obtain a more differentiated understanding of coping with pain and stress in sports, and also to pay adequate attention to mental health and quality of life for sports students.

Methods

Study design

We conducted an exploratory cross-sectional electronic survey based on the German Pain Questionnaire, and adapted to sports students' needs, taking into account demographic particularities of sports students. The study was approved by the Ethics Committee of the Goethe University of Frankfurt am Main (reference number 2017-22), and is in accordance with the Declaration of Helsinki (Version Fortaleza 2013).

Participants

Potential participants were all current students at faculties of sports sciences in Germany, Austria, and Switzerland (DACH region), as well as in Luxemburg and Liechtenstein. Faculties were retrieved by online research and according to the list of the German Society of Sport Science (DVS, 2016). All faculties (deans, course directors, student associations) were contacted by mail (in total 321 inquiries) and by announcement in social networks. According to country size and population, the number of contacted

Received: 09 August 2019 / Accepted: 01 February 2020 / Published (online): 01 June 2020

universities was highest in Germany (62) and less in Switzerland (21) and Austria (5). Interested candidates could participate online if they met the following inclusion criteria: Participants had to confirm to be a registered student in a sports science course or in a teacher training with the subject of sport at higher education institutions, universities, and colleges. Prior to participation, all candidates provided online consent.

Experimental design and outcome assessment

From June to November 2017, the survey was publicly accessible via web-based academic survey system (SoSci Survey GmbH, Munich, Germany) to get a period prevalence. To address the different dimensions of pain, we developed the German Sports Pain Questionnaire (see supplementary data 2), which is a modified version of the German Pain Questionnaire (Nagel et al., 2012) including own questions, not validated yet, of demographic and anthropometric data, sports activity, history of past and present injury and medication, as well as seven validated questionnaires (all in German versions): The Regional Pain Scale (RPS) to determine the localisation of pain (Hauser et al., 2010); The 12-item Short Form Health Survey (SF-12) for physical and mental quality of life; The NRS pain scale to specify the localisation and sensation of pain (10-scaled Numerical Rating Scale NRS, with 0 = no pain and 10 = maximum pain); The Quality of Life Impairment by Pain Inventory (QLIP), showing the intra-individual development of the patient's impairments (Nagel et al., 2012); Two questions of the Patient Health Questionnaire (PHQ) to monitor the quality of sleep (Gräfe et al., 2004); The Depression, Anxiety and Stress Scales (DASS; Depression cut off 10, anxiety cut off 6, stress cut off 10, (Nilges and Essau, 2015)). In addition we assessed the Self-Compassion Scale Short Form (German Version; SCS-D SF) addressing the physical and mental health state (Hupfeld and Ruffieux, 2011). The sequence of all single questionnaires was in a standardised order: RPS, SF-12, NRS, QLIP, DASS, SCS-D SF. All participants could enter free comments concerning their experiences with pain and sports before submitting the survey that will be qualitatively analysed coping strategies for pain and injuries.

The NRS was also used to split the sample according to the World Health Organisation (WHO) and the standard criteria of expert standard Pain Management in care into two subgroups perceiving current pain lower or higher than “3” on the NRS (Schmidt, 2016). In addition, data was analysed for chronic pain, abuse of drugs and alcohol, training loads, and sex differences.

To allow interpretations, all results were compared to age-controlled reference and norm data (see Table 1).

Statistical analysis

Statistical data processing was performed using SPSS (Version 24; IBM Deutschland GmbH, Ehningen). Since all data had a normal distribution (Kolmogoroff-Smirnoff-Lilliefors test), data are expressed as means and standard deviations (95%-CI). For statistical analysis between different subgroups, the T-test for independent samples and the Chi² test for categorised data were applied. The level of statistical significance was set at $p < 0.05$. The Bonferroni test may be applied to compensate for multiple measurements when comparing the questionnaires (in total n = 9 scores), with $p < \frac{0.05}{9} = 0.0056$. The full dataset was analysed on basis of an intention to participate analysis.

Qualitative Analysis

Free comments were classified into categories, as follows: (i) Performing sports despite pain and injury, (ii) Physiological contexts, (iii) Pain tolerance and pain sensitivity, (iv) Decision-making process concerning injury break, (v) Personal statements and coping strategies, (vi) Conditions for sports studies and (vii) Comments on positive effects of sport. Twenty-nine comments were considered being non-substantial in regard to pain and injury, or contained personal communications as well as positive feedback, and are not reported in this file.

Results

Participants’ characteristics

In total, about 2,500 clicks on the website have been recorded, while 865 sports students (23.35 ± 2.98 years; BMI 22.49 ± 2.41; 526 female, 339 male) gave consent to participate. 664 participants (78%) completed the full survey, 768 students finished at least the main part of pain-related questions. Most of the students were registered at German universities (88%). 12.8 % of the participants studied at Swiss and Austrian universities. The majority planned to graduate as a teacher (state exam 52%) or while receiving a Bachelor degree (44%). The mean progress in terms (2 terms/year) was 5.18 ± 3.02.

Survey’s results

The scores of the different pain items are summarised in Table 1. The RPS reported an average of 3.84 ± 2.98 (rating scala “0” no region of pain to “19” pain in all sites mentioned) sites of current, acute pain or tenderness, with a focus on: Neck (48 %), lower back (45 %), right (38 %) and left (26 %) shoulder, right (24 %) and left thigh (21 %), and knees (21 %; see Table 2). The mean value of the mental component score (MCS-12) was 47.64 ± 9.51 (range: 0-100; 100 = very good health), of the physical component score (PCS-12) 48.88 ± 6.59 (range: 0-100; 100 = very good health). The average current pain intensity was 1.83 ± 1.93 NRS (rating scala “0” no pain to “10” worst pain imaginable), while 91 students (13%) reported ongoing pain (polar question: yes or no). The pain-induced limitations of global quality of life (QLIP) scored 31.98 ± 6.54 (43 = excellent quality of life). The results of the DASS were as follows: Depression 3.20 ± 3.55, anxiety 1.87 ± 2.45, stress 3.79 ± 3.67 (0 = little risk for each subcale). Self-compassion was rated 38.40 ± 7.35 (60 = excel lent self-compassion)). Figure 1A shows an extrapolated spider diagram of all pain-related scores.

Workload, injuries and pain

93% of sports students reported performing sports regularly, and only 2.0 % stated being inactive. The focus of the main training load was in the students’ recreational sports: 29.5 % are five to seven hours active per week, 26.1 % three to five hours per week, while 17.7 % are practicing sports even for nine to twelve hours per week.

Table 1. Baseline data - mean and standard deviation of the survey components.

	Baseline data		Norm data	Maximum score
	n	Mean ± SD	Mean ± SD	Absolute value
RPS	768	3.84 ± 2.98	n/a; for sites of injuries see Fett et al., 2017	0 (sites of pain) Häuser et al., 2010
PCS-12	741	48.88 ± 6.59	56.62 ± 6.20 (age control) Nübling, 2006	100 (highest level of health) Utah Department of Health, 2001
MCS-12	741	47.64 ± 9.51	50.03 ± 9.37 (age control) Nübling, 2006	100 (highest level of health) Utah Department of Health, 2001
NRS pain intensity	736	1.83 ± 1.93	3 (clinically relevant cut off) Schmidt, 2016	0 (no pain) Schmidt, 2016
QLIP	721	31.98 ± 6.54	≤ 20 Überall et al., 2015 ≥ 32 back pain patients Überall et al., 2017	43 (no impairment) Nagel et al., 2012
DASS-D	687	3.20 ± 3.55	10 (clinically relevant cut off) Nagel et al., 2012	0 (no risk) Nagel et al., 2012
DASS-A	687	1.87 ± 2.45	6 (clinically relevant cut off) Nagel et al., 2012	0 (no risk) Nagel et al., 2012
DASS-S	687	3.79 ± 3.67	10 (clinically relevant cut off) Nagel et al., 2012	0 (no risk) Nagel et al., 2012
SCS-D SF	664	38.40 ± 7.35	46.76 ± 11.64 Raes et al., 2011	60 (excellent self-compassion) Raes et al., 2011

RPS Regional Pain Scale; PCS-12 Physical Component Summary of the SF-12 Short Form 12 Health Survey; MCS-12 Mental Component Summary of the SF-12; NRS Numerical Rating Scale; QLIP Quality of Live Impairment by Pain; DASS-D/-A/-S Depression, Anxiety and Stress Scales-Depression/-Anxiety/-Stress; SCS-D SF Self-Compassion Scale Short Form.

Table 2. Pain and/or tenderness in a joint or body region in the past seven days (n = 768). Data are number (%).

	No pain	Mild pain	Moderate pain	Strong pain	Yes, pain in this region
Neck (cervical spine)	403 (52.47)	204 (26.56)	129 (16.80)	32 (4.17)	365 (47.53)
Lower back (Lumbar spine)	419 (54.56)	194 (25.26)	129 (16.80)	26 (3.39)	349 (45.44)
Right shoulder	476 (61.98)	153 (19.92)	120 (15.62)	19 (2.47)	292 (38.02)
Left shoulder	571 (74.35)	126 (16.41)	56 (7.29)	15 (1.95)	197 (25.65)
Right thigh	586 (76.30)	125 (16.28)	45 (5.86)	12 (1.56)	182 (23.70)
Left thigh	608 (79.17)	117 (15.23)	33 (4.30)	10 (1.30)	160 (20.83)
Further mentioned					
Knee					163 (21.22)

Results of the Regional Pain Scale (RPS), most rated joints and body regions (> 20%).

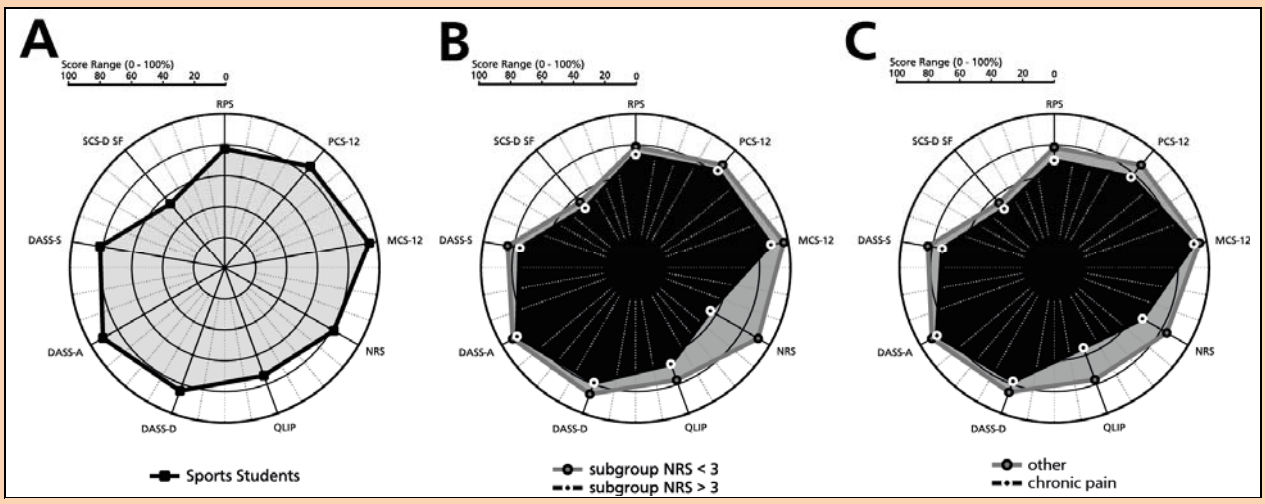

Figure 1. Polar Chart of Survey Items. Mean (A) and subgroup analysis, i.e. pain intensity (B; < 3 NRS (grey surface), ≥ 3 NRS (black surface)) or occurrence of chronic pain (C; chronic pain (black surface), other (grey surface)) of the survey components. Percentile 100 represents norm and comparative data towards a good constitution in each parameter; all scores have been scaled to 100% with 100% expressing age-controlled expected scores. In detail, scales have been transofrmed as follows (values in parentheses equal to 100%): Regional Pain Scale RPS (0 = no pain); PCS-12 Physical Component Summary of the SF-12 Short Form 12 Health Survey (norm data 56,62 for age 18-24); MCS-12 Mental Component Summary of the SF-12 (norm data 50,03 for age 18-24); NRS Numerical Rating Scale (0 = no pain); QLIP Quality of Live Impairment by Pain (43 = excellent quality of life); SCS-D SF Self-Compassion Scale Short Form (60 = excellent self-compassion); DASS-D/-A/-S Depression, Anxiety and Stress Scales-Depression/-Anxiety/-Stress (0 = little risk for each subscale).

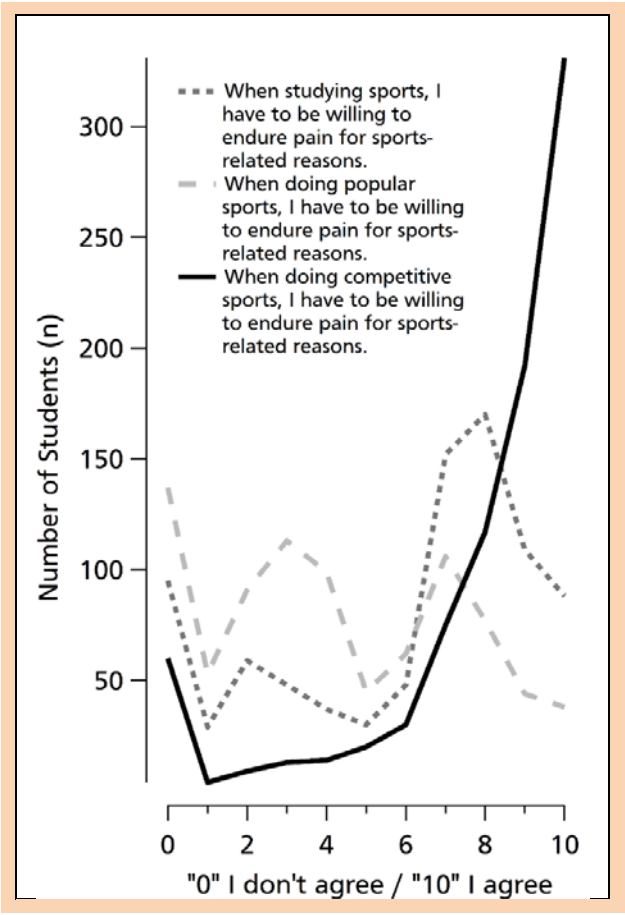

Figure 2. Pain tolerance in sports (n = 820). Rating of pain tolerance among sports students when characterising three different conditions: studying sports, performing recreational sports, and performing competitive sports. In this question, pain tolerance is not predefined, with answers according to the IASP definition, that pain is a subjective experience of the individual (IASP, 2017).

Nevertheless, looking at the training load in preparation for practical tests at university, 25.8 % stated one to three hours per week, 18.2 % five to seven hours, 10.3 % five to seven hours while 34.3 % reported not preparing actively for university tests. Neither training load nor adherence to a youth league revealed significant differences between scores ($p > 0.05$). Most rated disciplines in recreational sports were weight training and fitness (21.07 %), running (16.71 %), ball games (18.52 %) water sports (11.02 %) and mountain sports (10.29 %). Being in a club or practicing on a competitive level was found mostly for these disciplines: Soccer (23.88 %), handball (13.06 %), beach-/volleyball (8.77 %), gymnastics (8.58 %) and water sports (5.41 %). Still, 69% of the students had one or more practical sports courses. Within the previous eight weeks, almost three of four students suffered an accident or injury (of any kind), received a medical diagnosis related to pain, or perceived some form of pain that was not medically diagnosed. Every third participant (33%) had to postpone practical tests at university in the past due to injury and pain. This result is supported by the willingness to endure pain in sports studies (59.10 ± 29.54) (0 = no tolerance, 100 = complete tolerance; Figure 2) while pain tolerance seems greatest in competitive sports (81.09 ± 21.94) and is estimated to be the lowest in mass sports (41.29 ± 29.04). These three statements differ significantly (<0.001). In this question, we did not predefine pain tolerance, as we wanted the students to answer according to the IASP pain being the subjective experience of the individual (IASP, 2017).

Other co-factors of pain included problems to sleep through the night in the last two weeks (61%). Participants specified a constrained well-being due to a higher need to sleep as well as caused by a lack of energy and fatigue (81%).

Coping strategies: Qualitative assessment

Students describe a mental condition, which is characterised by considerable pressure, fear, passion, as well as physical and spiritual pain, in the context of pain and injury. Diverse reasons, voluntary or not, push the students into doing sports despite pain (see supplementary data 1). The students describe, that they get used to it or even manage to ignore the pain, which accompanies you during sports (supplementary data 1, 1.4, 1.11, 3.4). “I think it is completely normal for an athlete to have to endure pain, to some extent” (supplementary data 1, 1.4) - pain as an experience which teaches you to cope better with pain and to regulate your threshold for pain intensity. “Overcoming it [pain] is also a strong part [of contact sports] and I have experienced that it makes you mentally stronger, at least for the game” (supplementary data 1, 1.12). ”In competitive sports, pain (…) was part of everyday life. Without them, one almost felt as if something was wrong” (supplementary data 1, 1.11). The pressure to cope with pain may also turn into suffering and force: “I have already taken practical exams with torn cruciate ligaments and pain, only not to lose a semester” (supplementary data 1, 6.5); “The pressure to perform in exams then leads to the fact that one goes through the training or practical exams despite intensive pain, (…) Personally it happened to me that I only experienced intensively fun and joy to do sports again after I had passed all exams” (supplementary data 1, 6.7). Health seems to be of secondary importance, and injury breaks are taken only when the body refuses to work. “In my sports studies I have the feeling that pain is not taken seriously and you are expected to continue, regardless of symptoms.” (supplementary data 1, 6.4). For more comments, see supplementary data 1.

Abuse and consumption of stimulating substances and analgesics

Every third participant reported drinking alcohol at least once a week, and 9% of students mentioned being a smoker. Stimulating substances were rarely consumed.

The most common analgesics among sports students in painful situations were ibuprofen (56%), paracetamol (27%), and aspirin (25%). Table 3 gives an overview of detailed abuse and consumption.

Subgroup analysis revealed no effects of alcohol (n = 242; 32,9 %), caffeine (n = 67; 9,1 %), or cannabis (n = 15; 2 %) on pain scores ($p > 0.05$). Still, smokers reported higher pain intensities (mean difference 0.856 cm VAS, $p = 0.001$) and stress scores (1.02 DASS-S, $p = 0.043$). The use of muscle relaxants (n = 28; 3,8 %), ibuprofen (n = 408; 55,4 %) and paracetamol (n = 191; 26,0 %) was associated with elevated pain intensities, and the latter two with

increased stress and a decrease in QLIP (all $p < 0.05$). The intake of aspirin (n = 185; 25,1 %), metamizole (n = 29; 3,9 %), and tramadol (n = 9; 1,2 %) was not associated with altered scores (n = 8).

Table 3. Abuse and consumption of stimulating substances and analgesics among sports students.

Substance abuse (n = 865)	**n**	**%**
None	552	63.82
Tobacco	76	8.79
Alcohol	281	**32.49**
Marijuana	16	1.85
Stimulating substances (n = 865)		
None	781	90.29
Ephedrine/caffeine tablets	4	0.46
Energy drinks	40	4.62
Caffeine in form of coffee, green or black tea, training booster, Tetrahydrocannabinol (THC)	41	4.74
Analgesics intake in pain (n = 811)		
Ibuprofen	452	**55.73**
Paracetamol	215	**26.51**
Aspirin	205	**25.28**
Tramal	9	1.12
Novalgin	38	4.69
Muscle relaxants	32	3.95

Subgroup analysis: Pain intensity NRS </≥ 3

According to the WHO and the standard criteria of expert standard Pain Management in care (Schmidt, 2016), pain intensity of the participants was divided into subgroups < 3 NRS (n = 531) and ≥ 3 NRS (n = 205). All pain scores significantly differed between both groups ($p < 0.001$; Table 4; Figure 1B). The willingness to endure pain in mass sports and the study of sports was significantly increased among participants with an increased intensity of pain.

Gender differences

Splitting the data for gender did not reveal significant differences for the subgroup analysis ($p > 0.05$).

Discussion

Major findings

This representative survey reports comprehensive data on pain prevalence and the presence of biopsychosocial cofactors among 865 students in sports sciences in the DACH region. The data show that almost one out of four students is impaired by pain to an extent that requires treatment according to the WHO (Nagel et al., 2012). These students report a current pain intensity of ≥3 NRS. About half of all participants (51.44%) show 2 - 5 body regions with acute pain, with three out of four students having suffered injuries during the last eight weeks, and an increased consumption of painkillers and alcohol. Students with a higher pain intensity show a significantly higher probability to suffer from depression, anxiety and stress as well as lower self-compassion. Of all sports students, 80.54% complain of fatigue and lack of energy, 60.61% report of sleep disorders. Students report the belief, that participating in sports, depending on the competitive level, is invariably linked to the occurrence of pain and injury.

Table 4. Subgroup analysis </≥3 NRS. Number of respondents, mean, standard deviation, and results of the test for statistical difference of the subgroups with respect to the single survey components.

	n	**M ± SD**	**p-value (95%-CI)**
RPS			
< 3 NRS	531	3.83 ± 2.88	< 0.001
≥ 3 NRS	205	5.41 ± 3.15	(-2.06; -1.11)
KSK12			
< 3 NRS	531	49.98 ± 5.30	< 0.001
≥ 3 NRS	205	46.01 ± 8.51	(2.72; 5.23)
PSK12			
< 3 NRS	531	48.74 ± 8.50	< 0.001
≥ 3 NRS	205	44.61 ± 11.26	(2.42; 5.84)
NRS pain intensity			
< 3 NRS	531	0.84 ± 0.79	< 0.001
≥ 3 NRS	205	4.41 ± 1.59	(-3.81; -3.35)
QLIP			
< 3 NRS	520	33.72 ± 5.23	< 0.001
≥ 3 NRS	201	27.48 ± 7.41	(5.11; 7.36)
DASS-D			
< 3 NRS	493	2.62 ± 2.96	< 0.001
≥ 3 NRS	194	4.66 ± 4.40	(-2.72; -1.37)
DASS-A			
< 3 NRS	493	1.62 ± 2.22	< 0.001
≥ 3 NRS	194	2.51 ± 2.85	(-1.34; -0.44)
DASS-S			
< 3 NRS	493	3.20 ± 3.23	< 0.001
≥ 3 NRS	194	5.29 ± 4.26	(-2.76; -1.42)
SCS-D SF			
< 3 NRS	472	39.06 ± 7.16	< 0.001
≥ 3 NRS	192	36.78 ± 7.58	(1.05; 3.50)

The Bonferroni test may be applied to compensate for multiple measurements (in total n = 9), with $p < \frac{0.05}{9} = 0.0056$. RPS Regional Pain Scale; PCS-12 Physical Component Summary of the SF-12 Short Form 12 Health Survey; MCS-12 Mental Component Summary of the SF-12; NRS Numerical Rating Scale; QLIP Quality of Live Impairment by Pain; DASS-D/-A/-S Depression, Anxiety and Stress Scales-Depression/-Anxiety/-Stress; SCS-D SF Self-Compassion Scale Short Form.

Comparability to other student peer groups

Pain

According to the results on pain mentioned above, there are significantly higher restrictions of quality of life in the subjects with pain intensity ≥ 3 NRS (28%), between the two groups (≥ 3 NRS; < 3 NRS). This score of NRS is interesting in so far as this pain level, light to moderate, is assigned to Step 1 of the pain ladder according to the standard criteria of expert standard Pain Management in care of the WHO (Schmidt, 2016). This pain level implies the need for at least non-opioid analgesics, in particular nonsteroidal anti-inflammatory drugs (NSAID) in pain therapy. This result is an alarming fact in that every third sports student is experiencing a pain level in need of treatment.

A survey among 2443 German students, dating from 2017, reinforces this observation: Schlarb et al. (2017) showed the prevalence of any functional somatic disorder - including the occurrence of pain- is 13%. This is less than we found among sports students in our study (33%). This can be underlined by a study comparing Chinese to German students (Chu et al., 2015), which suggests higher prevalence of pain among German students. Regarding symptomatic pain in German students, it has

been reported that the most frequent complaints were different kinds of pain, comparable to Spanish and Lithuanian students (Stock et al., 2003).

Looking at results from colleagues Fett et al. (2017) we have comparable groups regarding pain in competitive sports as well as in sports students. Their recent study investigated the occurrence of back pain in 1114 elite athletes and 166 sports students as active controls (Fett et al., 2017). Authors report 7-day-prevalence of low back pain in 34.0% of the elite athletes compared to 29.0% in the control group. This is not in line with our results suggesting a 7-day-prevalence of 45.4% in sports students. Regarding neck pain, authors report a prevalence of 23% in elite athletes (Fett et al., 2017), 22% in sports students, which is again remarkably less than observed in students we interviewed (47.5%). Still, the comparison of results differs as pain in sports may vary between disciplines, ethnicity or gender (Fett et al., 2017). For example, light differences in sex distribution between our survey (m/f 60.1/39.2%) and Fett and colleagues can be found (elite athletes m/f 46.5/53.1 %; control m/f 74.7/24.1 %), as well as variances in age (sports students 23.35 ± 2.98y; elite athletes 20.9 ± 4.8 y; active controls: 21.2 ± 2.0 y). Another, potentially important reason for the different pain prevalence might be the difference in sports disciplines: Elite athletes and active controls in Fett et al. were active in Hockey, Track and Field, Rowing, Skiing and Swimming, while the top 5 disciplines in our study were soccer, handball, beach-/volleyball, gymnastics and water sports.

Further painful body regions (as reported in Table 2) were both shoulders (left 25.7%, right 38.0%), both thighs (left 20.8%, right 23.7%), and the knees (21%). Various studies show these joints and regions to be typically prone to pain in sports (Askling et al., 2006; Gerhardt and Scheibel, 2016; Salati et al., 2017).

Biopsychosocial symptoms

Cut-off scores categorising the QLIP suggest a suspicious score at ≤ 20 (Uberall et al., 2015), and an acceptable score with minor/no impairment at ≥ 32 in the context of back pain patients (Uberall et al., 2017). The sports students in our study varied around the acceptable score cut-off (31.98 ± 6.54). However, students with higher pain intensities (NRS ≥ 3) report a significant lower QLIP score (27.48 ± 7.41; $p < 0.001$). They feel particularly restricted in their activities and needs by pain, see their mood impaired by the pain, and doubt that they can influence their pain in a soothing way. This group also names more additional complaints such as gastrointestinal problems, concentration problems, depression, sleep disorders, sweating, and listlessness.

Today, students in general seem increasingly suffering from poor mental health (Kohls et al., 2012; Pedrelli et al., 2015). Bailer et al. (2008) describe their results on psychological symptoms of 1130 students at the University of Mannheim, Germany, being alarming, and point to a great need for psychological care for students at German universities. 22.7% of the students are meeting at least the PHQ criteria for one psychological disorder. Apart from the alcohol syndrome (30.2%), three are somatoform (9.1%) and other depressive syndromes (8.1%). Performance and success pressure, as well as later career plans, are described as the most important concerns and worries among students (Beiter et al., 2015). These results, together with the fact that sports students also report a deterioration in sleep quality, sharpen the possible link between sleep, and both physical and psychological impairments (Schlarb et al., 2017).

Still, sports students seem to be even more likely affected by biopsychosocial factors of pain then matched age controls when comparing our results to reference data. Physical and mental health (PCS 48.88 ± 6.59; MCS 47.64 ± 9.51) are decreased by 7.7 and 2.4 points, respectively (Socio-Economic Panel 2004; PCS 56.62 ± 6.20; MCS 50.03 ± 9.37; (Moegling, 2006)). However, these differences are not clinically meaningful, according to problematical cut offs values mentioned in the German Pain Questionnaire (PCS < 29; MCS < 44; (Nagel et al., 2012)). We could not detect pathologies assessing the DASS. The values of the students (DASS-D 3.20 ± 3.55; DASS-A 1.87 ± 2.45; DASS-S 3.79 ± 3.67) are clearly below the cut-off values of the manual of the German Pain Questionnaire (cut off DASS-D 10; cut off DASS-A 6; cut off DASS-S 10; (Nagel et al., 2012)). However, sports students show a lower likelihood of depressive disorders, a reduced stress level, but an increased score for an anxiety disorder when compared to a DASS validation study among unspecified students (Nilges and Essau, 2015). Pain tolerance as rated by the sports students /see Figure 2) is likely to be influenced by self-experiences (IASP, 2017). In the case of studying sports this may contribute to the fact, that doing sports is not only leisure but also stressful, e.g. when passing competitive exams.

The effect of self-compassion on depressive symptoms has been investigated in 347 psychology students aged 17 - 36. (Raes, 2011) Sports students (38.40 ± 7.35) undercut their values considerably (46.76 ± 11.64). Self-compassion is an important variable among others for well-being in students (Gunnell et al., 2017), and emotional regulation in difficult sport situations in female athletes (Reis et al., 2015). In consequence, preventive possibilities to strengthen the self-compassion in sports students need to be discussed, and implemented as this skill is also a potential protective factor for depression (Raes, 2011).

As a final point, the remarkably high participation of female students needs to be highlighted: In the last years, women have clearly been underrepresented in sports studies (Statistisches_Bundesamt, 2014), gender differences in communicating pain (Strong et al., 2009). Female adolescents tend to be more cooperative and emotional in conversational contexts (Goldshmidt and Weller, 2000).

The role of psychosocial factors among sports students

Sporting ambitions have been described being a double burden for students as they are linked to associated stress and the potential risk factor for injuries (Putukian, 2016). In general, sport and activity are supposed to have a positive impact on health. Besides having the focus of the survey on the negative and impairing consequences of sports, there were also only 5 % of the personal comments on health and pain addressing a positive mind-set towards

the topic. Stress is an important factor influencing the athletes' psychological resources concerning return-to-play, healing, and mental strain from injuries. The author identifies an increased risk of mental health problems such as depression, eating disorders, and substance abuse (Dannecker and Koltyn, 2014), which cannot be confirmed for the sports students in this survey. Our data is in line with previous studies analysing social structures and norms that affect the individual assessment and coping with pain. The term "sports-specific pain culture" describes the paradoxical way of thinking and behaving in sports (Richartz, 2001). While knowing the risks and consequences of continuing sports despite pain and injury, athletes report that they accept a loss of health in exchange for improved performance and potential success. In this survey, students strongly agree with the hypothesis that competitive sports is only achievable when tolerating pain. Sports seem to be a field in which pain is sought out voluntarily (Moegling, 2006). Mayer and Tiehl (2011) specify this daily phenomenon as the "playing hurt" in elite sports: The conscious suppression of enormous risks of injury, long-term consequences as well as the integration of pain and injury as a normal part of everyday sports life. This philosophy can be impressively confirmed by the personal comments the students made at the end of the survey: *"Pain is part of my sport. Among other things, it is a confirmation and sign that I have trained hard"*, "*You should admit your pain and learn to deal with it as well as possible"*. This phenomenon has been named the "risk-pain-injury-paradox" (Nixon, 1994). Peer pressure from coaches, teammates, family, social environment, but also fans and media paired with simultaneously communicated concern for the athlete and the warning of overload. In consequence, the athlete finds himself in an ambivalent situation, in which her or his decision depends on how good and consolidated the relations to important persons of her or his sports network are. The topic of social influence in elite sports can be summed up into a problem of compatibility of all expectations with is well transferable into the group of sports students.

Protective resources

Empathy can be a potential protective factor for emotional problems such as depression (Raes, 2011). This is in line with a study suggesting athletes with a higher level of self-passion to deal better with emotionally difficult situations in a sporting context (Reis et al., 2015). In addition, increased self-passion can increase the well-being of students (Gunnell et al., 2017). Taking the results of our MCS-12, DASS, and SCS-D scores together, a mental constellation is likely reflecting the possible influence of pain and injury on students' psychological aspects.

Out of this perspective, there is the need to focus on various programs and findings supporting the thesis, that strengthening mental health in sports can have a protecting effect: Interventions to increase self-efficacy seem to have positive effects on sports performance among athletes (Zagorska and Guszkowska, 2014), but also during injury rehabilitation (Clement et al., 2015; Wesch et al., 2012). In addition to the multifactorial effects of sports resilience (Galli and Vealey, 2008), hardiness is positively associated with good performance and psychological well-being in athletes, while negatively linked with psychological distress (Nezhad and Besharat, 2010). Psychological strategies can decrease stress among athletes (Dawson et al., 2014; Reed and Giacobbi, 2004), as well as strengthen coping strategies and pain management skills (Deroche et al., 2011; Ghazaie et al., 2015). Consequently, there is a wide range of measures and possibilities that could be applied protectively to the sports students to strengthen resources.

Implications for daily life

Parallels can be seen between sports students and competitive athletes with regard to the performance mentality, health-related ways of thinking, but also multifactorial strains. Pain is part of everyday sports life in top athletes, occurring through injury but also independently of injuries, and being influenced by a variety of factors (Hainline et al., 2017b). A review on health in elite sports clearly shows that the health status of athletes at performance level is evaluated differently (Thiel et al., 2010): You are healthy when you are able to train and to take part in competitions. Pressure to perform and psychophysical stress are part of everyday life in top-class sport in order to exercise at a certain level, and pain is already taken into account in training recommendations (Dannecker and Koltyn, 2014).

Their assessment of acceptance and handling with pain in competitive sports confirms that sports students can be compared with top athletes with respect to pain problems as well as regarding performance, success pressure, and multifactorial physical and mental strain. However, a comparison of health care in top athletes and sports students reveals differences: Psycho-regulatory training methods, biofeedback, and psychological training are one of the central conditions for top performance (Heaney et al., 2015; Wiese-Bjornstal, 2010), there are even current statements on pain management in elite sports (Hainline et al., 2017a). Medical care, especially psychological support, has already reached a high level in the field of competitive sports, while the pain management for sports students indicates a high need for development.

Limitations

Data acquisition in large cohorts is a common limitation in survey studies. We belief that the choice of an online-based survey and its distribution via contact persons at the universities and social networks can be considered as a strength of this data acquisition. We achieved a high responder rate and a large case number, and included students from other German-speaking countries (DACH). However, we cannot exclude that non-responders would have altered the results. In addition, we cannot rule out that some students participated twice.

The survey was compiled in accordance with DSF guidelines and expert opinions, and is based on validated questionnaires (Nagel et al., 2012). The questionnaires have been validated in age-controlled but not sports-controlled cohorts, and included questionnaires that present standard instruments in investigating pain for many years. However, this is the first time this questionnaire was

implemented in its full version in a large sports cohort, and future confirmatory studies are necessary to eliminate systematic errors.

Reporting and interpretation of the results is based on the guidelines for cross-sectional studies of the STROBE initiative (ISPM - University of Bern 2009). We assume our sample size to be adequately robust to represent the chosen cohort.

Finally, the comparison of pain experienced by sports students to athletes in other disciplines is limited. Reasons for this focus on the special multifactorial demands in sports studies. In addition, students between universities could differ due to different degrees of physical strain.

Conclusion

We can confirm a high period prevalence of pain (28%) among sports students, noting a relationship between pain and various factors in the context of a multifactorial biopsychosocial overload problem. It seems like the students feel left alone with their problems concerning various health and career aspects.

Therefore, the role of pain needs to be on increased focus in the public discussion. As the results of the survey emphasise development needs regarding pain management, the communication between students, lecturers, and universities need to be optimised. This re-evaluation of the treatment of injuries, pain, and health restrictions can be an initial step of preventing pain and health risks among sports students.

Acknowledgements

The experiments comply with the current laws of the country in which they were performed. Parts of this study constitute the Master Thesis (MA) of Anke Bumann. We thank Dr. Christian Koelbl, MD, PhD, Assistant Professor at Columbia University Division at Mount Sinai Medical Center, Miami Beach, USA to revise our manuscript. No funding was achieved for this study. The authors have no conflict of interest to declare.

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Key points

- The German Pain Questionnaire, based on validated international questionnaires, has been adapted to the needs and wants of sports students.
- Young athletes, i.e. sports students, represent an adequate cohort to investigate bio-psycho-social factors of pain at an early stage of their career.
- The study draws an alarming picture of sports students' health state.
- The study highlights key points that may be suitable to develop preventive and rehabilitative instruments.

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Supplementary data 1

Qualitative analysis of statements of Sports Students regarding their reasons to deal with pain in sports. Comments have been classified into categories on (i) Doing sports despite pain and injury, (ii) Physiological contexts, (iii) Pain tolerance and pain sensitivity, (iv) Decision-making process concerning injury break, (v) Personal statements and coping strategies, (vi) Conditions for sports Studies and (vii) Comments on positive effects of sport. In total, 29 comments were considered being non-substantial in regard to pain and injury, or contained personal communications as well as positive feedback, and are not reported in this file.

i. Performing sports despite pain and injury

1.1	At first I was only diagnosed with a bruised wrist. Since I wasn't able to take more than five weeks off, I played handball again and took three practical exams (e.g. court sports, rhythmic gymnastics), thickly taped, with ibuprofen before game and training. As it didn't get any better after three months, I went to the hand surgery: I was diagnosed with a fractured scaphoid with subsequent surgery. If you have any questions, please feel free to write to me. Best regards
1.2	When I tore my ligaments last year, the pain wasn't the worst. The restriction of sports activities made it most difficult for me.
1.3	I experienced that pain and sport are usually connected.
1.4	Personally, I think it is completely normal for an athlete to have to endure pain, to some extent. Because no matter what sport it is, there are always situations that the body doesn't know about and therefore he finds it painful. A good example for this are the parallel bars in gymnastics: For a non-gymnast, this device is initially associated with pain, of course, but over time you get used to it.
1.5	Despite pain in my lower leg I passed my track and field athletics exam. For sports as a hobby, for me there no need to endure pain. Sport should be fun and not painful.
1.6	When you do sports on performance range, a slight pain that does not prevent you from training is considered to be normal. In competitive sports, the threshold for stopping training or taking a general break is clearly shifted backwards.
1.7	When it comes to achieving top athletic performance in competitions or exams, the majority of athletes agree to live with pain, as the doctor usually recommends a sports break, which is not viable at such times.
1.8	Since sports training can also be defined as the controlled destruction of the body structures, a certain amount of pain is indispensable in everyday sports at least at a certain performance level. However, a distinction must be made between intensity and perception: Pain caused by muscle soreness can thus be perceived as unpleasant, but also as satisfying (as a sign of a hard workout). However, real, intense pain always has a warning function and, in my opinion, has no right to exist

	at any level of sport. Whether pain should lead to the discontinuation of a training session or competition should always be the decision of the athlete.
1.9	Because of joy, motivation and pressure to train further, because one has a goal, the training or the competition is continued despite pain. Athletes think atypically, may not always have the health aspect and the best for their own body in mind at this moment, as long as it is still possible.
1.10	If it doesn't hurt too much, I just keep going, especially when it's about something (competition) or when I love the sport I'm doing!
1.11	Chronic complaints/pains accompany you for a long time. However, depending on the intensity of pain, you get used to it and can still make your everyday life and leisure time. In competitive sports, pain (more muscular than injury-related) was part of everyday life. Without them, one almost felt as if something was wrong. Concerning injury-related pain you need to assess and weigh up for oneself when it is time to think again about the structure of the surrounding structures despite the pain.
1.12	Since American football is a contact sport, pain is definitely part of it! Overcoming it is also a strong part and I have experienced that it makes you mentally stronger, at least for the game. But also a soccer game is played with light to moderate pain, which is possibly also due to the experiences from football sports.
1.13	Pain is part of sports.

ii. Psychological context

2.1	I have played handball for 15 years, but due to my studies and my home club I take a break. Whenever I had any pain in my muscles or joints, I just kept going. I tried carrying it of well. Or if I simply couldn't take any more, I took a very short break (e.g. walking back into the defence more slowly) or even continued. In addition, sport (handball) helped me a lot to psych up myself if I had problems or was in a depressed episode again. I was in my element and I was good at it. That gave me the strength to continue.
2.2	What is meant by athletic pain? I have interpreted it in such a way that it is both physiological and psychological. In the case of a marathon, the pain that can be felt (of the muscles, respiratory tract, etc.) and the pain of perseverance (psychological - "torturing yourself"). Then there is the pathological pain, due to degeneration or physiological changes caused by physical exertion. Plus the psychological pain, e.g. burnt out, tired, unmotivated, etc.
2.3	Personally, I think that the ability to endure physical pain during sports, for example, is greatly influenced by whether or not I am stressed by university/exams, complicated family matters, quarrelling with my partner, a cold, etc.
2.4	I think whoever has pain in sports or through sports does something wrong. Of course there can be injuries which you are usually more exposed to when doing sports than in everyday life. However, for me sport is something that helps against pain (headaches, mental pain, and listlessness).
2.5	I do have more psychological problems with my torn ligament than physical. I am afraid, it will happen again.
2.6	The mental pain during defeats is often much greater than the physical pain during training!
2.7	Emotional pain in failure is more difficult to cope with than physical pain. Pain goes away, success remains.

iii. Pain tolerance and pain sensitivity

3.1	Pain is relative in itself, so it's a matter of individual perception. As a gymnast, pain is part of our sport to a certain extent. But this makes it difficult to say if/when one is "really injured".
3.2	I would have added as a possible question, the extent to which pain has already occurred in accidents. I think it is crucial what pain someone has endured in order to be able to judge how he can cope with his everyday life with relatively less pain. Personally, I have already been hit by a car, have broken my vertebrae, etc. and can therefore very successfully eliminate minor pains such as two or three broken ribs or a broken nose and thus continue to play sports and cope with my everyday life without any losses.
3.3	Before my Achilles tendon rupture I also had other sports injuries (e.g. ligament ruptures). Usually, my sensation of pain is not very great for the somatic pain. Most of the time on the day of the accident and sometimes the day after, I am very annoyed that it has happened and that I am physically and sportively limited for a certain time. But then I quickly become "reasonable" and concentrate on getting well again and temporarily enjoying other things than sport in order to make my life worth living. In fact, I tend to recover quite quickly. I can handle pain well because I know that it is temporary. On the other hand (and mainly) because I consciously decide to do (so much) sport and at the same time consciously take the risk of hurting myself (as well as the positive consequences for my health). My principle is: When I make a decision, I have to live with the consequences. I am always free to reflect on the (possible) consequences, to study the pros and cons and to change my decisions. So far, however, the fun and health aspects of sport have been so important to me that I accept the possibility of injury (and therefore pain).
3.4	In my opinion, the pain tolerance becomes higher through competitive sports and one gets used to the fact that muscles, joints or other things ache regularly. Often the pain is also ignored.

3.5	I have been living for ten years with a broken vertebra in my lumbar spine due to a gymnastics accident at the vault. I can handle it very well and usually don't notice it anymore. My experience of pain has increased considerably since then.
3.6	I learned from my trainer that you shouldn't always complain about pain, especially with small things (stomach ache, etc.). Besides, there are people in the world who are much worse off than me! Due to my injury at the cruciate ligament and the training pause, I learned that you have to take such situations as they come, after all, you can't change anything in this moment. The only thing you can do: Always look positively into the future and make the best of it!
3.7	Pain (sore muscles) after sports has a rewarding effect on me.
3.8	As an athlete, in my opinion, I missed the mention of simple muscle soreness. These are pains that most people are happy to accept or even long for.

iv. Decision-making process concerning injury break

4.1	In sports studies, the feeling of being physically exhausted (a lot of training on hot days, aching muscles, pain due to too much training (shins), etc.) is simply part of it. It's up to you to assess your physical abilities and also to break off strains in time that are too strenuous on your body. In addition, one can do a lot of preventive work and should do so. Protracted sports injuries may be annoying, but even then you should not start too early again in the long run and brake yourself. One should admit one's pain and learn to deal with it as well as possible and to find one's own mediocrity between bearable, non-damaging pain and admitting the pain.
4.2	In any case, it is not bad to obey the advice of a doctor for a break of sports in order not to risk even worse injuries/pains.
4.3	I have already done sports while injured (strained ligaments/ligament strain). From experience, sports enthusiasts don’t adhere the break recommended by the doctor. Thus, you can feel the injury for a longer time and I also had some relapses.
4.4	For me personally, pain is an aspect that can often not be avoided in sport or almost 'belongs' to sport in a small way. In spite of pain, I often do sport and more or less consciously neglect my health. Since I have not had any major injuries so far, I have not had any problems during my studies. Especially during my studies to become a teacher, the demands during the semester (examinations excluded) can usually be taken with pain. What bothers me personally about my handling of pain and what I would like to change in the future is the conscientious handling of injuries (especially knee problems, which occur more frequently). This is difficult for me, because it is required both in my studies to do sports, but also privately the urge to do sports, usually outweighs the fear of health hazards.
4.5	After injuries, I often started sports much too early, so that the healing process, and thus the pain, lasted longer. Pain in sports is often neglected too much. The doctor is only consulted in case of more serious injuries. However, slight pain can also lead to incorrect posture.
4.6	If you are in pain, you should not continue to train unconditionally, but go to the doctor and follow his instructions. You have to work with the doctors to get better.

v. Personal statements and coping strategies

5.1	Sports and pain belong together. In order to perform better, one must be able to cope with pain to a certain extent.
5.2	No pain, no gain :)
5.3	For me, Pain goes with sports. Among other things, it is a sign that I have trained hard and a confirmation.
5.4	Pain is part of sports.
5.5	A brief comment on the last question: I am currently writing my Master's thesis and therefore no longer have an examination phase. During my studies I only felt pain in the area of "gymnastics". Nothing was ever diagnosed, despite repeated MRI on the knee. Meanwhile I have no more pain there. The outer ligament is due to Illiotibialis syndrome and goes away immediately after the running session in which it occurs. All in all, I survived my studies without much pain. Nice idea for a thesis!
5.6	Use common sense!
5.7	I think that I have a very good way of dealing with pain and at the same time I am rarely affected by injuries and pain. There were very few injuries due to sport, but they could be cured completely. Recently I have had some hip problems (on the right), which I can get under control through physiotherapy.
5.8	I have occasional pain during sports, but not much. I don’t participate in competitive sports and do not feel the need to continue to push my body despite pain. When certain movements hurt during sports, I simply try to avoid them.
5.9	Worst pain of my life during the operation - necessary to restore the cruciate ligament and thus the sports function.
5.10	I had a herniated disc, but I am good with it and I am almost painless.
5.11	Sometimes you just have to "clench one’s teeth and to follow through it".

5.12	As for the listlessness & fatigue mentioned in the questionnaire, it is related to my circulation (not sport). Due to the lack of energy I tend to have a bad mood. Studying helps me, despite the pain, because it encourages me to do sports (so it doesn't bother me).
5.13	Frequent muscle soreness after sports competitions.
5.14	After 16 years without big injuries, the small damper, where I had to run with crutches, did me good, but even after six weeks I am very careful and not as daring as much as before... but I gain confidence and strength.
5.15	I do have fibromyalgia. This is why I started doing sports. So I regularly do have pain, I am a pain patient, but I think it would be much worse without doing sports. Good luck for your thesis!
5.16	I've often had ligament tears, which always throw you back, but you can keep up your fitness in the gym to come through... but if you get two injuries you said “It works again!” - It’s very frustrating... But that will pass!
5.17	Pain takes you further in a way. You learn to coordinate things and to deal better with pressure and stress.
5.18	Since I got injured more and more often during my sports studies (last year five times), I learned to deal with it, but also to pull the "emergency brake" for me at a certain point. (Example: Practical examination in snow sports - injured by several falls or a strong fall before the day of the examination. This meant that only a minimal vertical movement was possible and I tried to cover the pain for my personal circumstances with a lot of ibuprofen (a total of approx. 1200mg). After the return, I was signed off work from the doctor for five weeks plus physiotherapy or lymphatic drainage. In consequence the test was, in my opinion, badly performed due to this bad conditions.

vi. Conditions for sports studies

6.1	The demands placed on sports students are in some cases exaggerated if one assumes that sports students are already active people and probably already do enough sports outside of university. I see little sense if I have to do another 8-12 hours of sports per week for the university.
6.2	At the moment I am doing an internship abroad and therefore do sport less intensively than during my studies. During my sports studies (teaching), I try to reach a relatively good level in unfamiliar sports within a short time. This is a strain that many bodies cannot withstand and then react with pain to the overload (my experience during my studies).
6.3	Pain in sports is now (unfortunately) almost normal for me. Apart from the muscle aches, injuries in sports studies happen quite quickly, especially if you take a practical course in a sport that you haven't been involved with very often before. A slight injury, such as a strain or the like, is not a bad thing in itself - it becomes annoying and problematic if you cannot train for the examination due to the injury or participate in it at all. Or you have to train under pain so that you don't have to take the course and the exam again. This can be quite frustrating in the long run, or if it happens repeatedly.
6.4	In my sports studies I have the feeling that pain is not taken seriously and you are expected to continue, regardless of symptoms. According to the motto: "Bite your teeth together and get through" (will be over sometime).
6.5	Personally, I have already taken practical exams with torn cruciate ligaments and pain, only not to lose a semester.
6.6	Had severe pain around the distal biceps tendon last year. Nevertheless, I passed the practical exams in weightlifting, bouldering and gymnastics, despite worries about injury.
6.7	Due to the necessity to keep one's body fit during sports studies, there is not only physical pressure, but also psychological pressure if it does not work as it should or injuries occur. The pressure to perform in exams then leads to the fact that one goes through the training or practical exams despite intensive pain. Personally it happened to me that I only experienced intensively fun and joy to do sports again after I had passed all exams.

vii. Comments on positive effects of sport

7.1	I think whoever has pain in sports or through sports does something wrong. Of course, there can be injuries, which you are usually more exposed to when doing sports than in everyday life. However, for me sport is something that helps against pain (headaches, mental pain, listlessness).
7.2	I have made the experience that I have become a little more conscious in dealing with my body through the beginning of my sports studies. Through lectures in physiology and anatomy, I got to know my body a little better and created consciousness.
7.3	I think that I have a very good way of dealing with pain and at the same time, I was rarely hit by injuries and pain. There were very few injuries due to sport, but I cured them completely. Recently, I have had some hip problems (on the right), which I can get under control through physiotherapy.
7.4	I have occasional pain during sports, but not much. I am not in competitive sport and do not feel the need to continue to drive my body despite pain. When certain movements hurt during sport, I simply try to avoid them.

Supplementary data 2

Single questionnaires and components of the survey.

Section	Issue	Kind of question
Own questions		
Demographic and anthropometric data	University, course of studies, semester, age, weight, height, sex, nationality	Open and polar
Abuse and consumption of stimulating substances and analgesics	Tobacco/nicotine, alcohol, other drugs, ephedrine/caffeine tablets, energy drinks, other (open question for each)	Open, polar
Sports and exercise	Disciplines in practical courses at university, sport disciplines beside university (recreational, club, competition), training workload of each	Open, polar
Pain tolerance	"When studying sports, … "When doing popular sports, … "When doing competitive sport, … I have to be willing to endure pain for sport-related reasons. Please rate on a scale from …"	Rating scale ("0" I don't agree, "10" I agree)
Analgesics intake in pain	Ibuprofen, Paracetamol, Tramal, Novalgin, Muscle relaxants, other	Open, polar
Pain, injuries and diseases	Injury or accident in the past eight weeks, pain diagnosed by oneself or doctor, respite, decline or lose competition or workout due to pain, diseases	Open, polar
Current pain intensity (NRS)	"Please rate your currently felt pain on a scale from …"	Rating scale ("0" no pain, "10" worst pain imaginable")
Free comment on experiences with pain and sports	Participants could write down their experiences concerning pain, injuries and diseases in the context of doing sports and studying sports	open
Validated questionnaires		
Localisation of current pain	Tenderness or intensity of pain in 19 different body regions / German Version of RPS (Häuser et al., 2010), eleven additional regions	Open, multiple choice
Physical and mental quality of life	German version of SF-12 (Morfeld et al., 2011)	multiple choice
Quality of Life Impairment by Pain Inventory	German version of QLIP (Nagel et al., 2012)	Open, multiple choice, polar
Sleep quality	Two questions (c and d) of PHQ-D (Loewe et al., 2002)	Multiple choice
Depression, anxiety and stress	DASS-D (Nilges & Essau, 2015)	Multiple choice
Self-compassion	SCS-D SF (Hupfeld & Ruffieux, 2011)	Multiple choice

Regional Pain Scale RPS; SF-12 Short Form 12 Health Survey; NRS Numerical Rating Scale; QLIP Quality of Live Impairment by Pain; SCS-D SF Self-Compassion Scale Short Form; DASS-D/-A/-S Depression, Anxiety and Stress Scales-Depression/-Anxiety/-Stress.