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Identifying physical and psychological risk factors for musculoskeletal pain in student musicians to tailor the curriculum: a cross-sectional study protocol

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ABSTRACT

Introduction Insufficient identification and understanding of risk factors make musicians engaging in professional practice particularly vulnerable to musculoskeletal pain. To support positive music learning and good mental, physical, and social health, student musicians need health support tailored to their needs and their instrumental practice. However, these preventive actions must be based on sound scientific approaches that reliably identify the most relevant risk factors. MuSa is a cross-sectional study examining contextual and internal risk variables associated with playing-related musculoskeletal disorders in student musicians.

Method and analysis The design is a monocentric cross-sectional study involving student musicians in Bachelor's 1, 2, 3 and Master's 1, 2. Free-form questions will identify students' lifestyle characteristics and work habits, and validated questionnaires will evaluate the interaction between pain due to music practice and psychological and physical risk factors. All data will first be analysed descriptively. Psychological network analysis will be used to explore the overall correlational structure of the dataset. A subgroup comparative analysis will be then applied according to the instrumental subcategories and work postures, including singers.

Ethics and dissemination The full protocol was approved by the Swiss Ethics Committee 'Commission Cantonale d'Ethique de la Recherche sur l'être humain de Genève' (CCER, no. 2022-02206) on 13 February 2023. Outcomes will be disseminated through publication in peer-reviewed journals and presentations at conferences.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The main objective of this study is to identify the risk factors for musculoskeletal pain associated with student musicians' playing practice.
⇒ Free-form questions will identify students' lifestyle characteristics and work habits.
⇒ Validated questionnaires will evaluate the interaction between pain due to music practice and psychological and physical risk factors.
⇒ The study was designed with the involvement of professional music teachers.
⇒ Non-participation of musicians in the survey may lead to an overestimation of the proportion experiencing pain.

INTRODUCTION

Musculoskeletal health plays a central role in people's daily lives, as it guarantees autonomy and unrestricted participation in socio-professional and leisure activities.[1] Musculoskeletal disorders (MSDs) induce pain, reduce motor function, and impair mental and social well-being.[2] In 2019, three out of five people reported work-related MSD in Europe.[3] Although physical problems generally first set in,[3] MSDs can involve physical and mental factors, with each influencing and exacerbating the other[4] and mediated by neurochemistry.[5] This situation highlights the importance of redirecting care toward primary prevention rather than biomedical treatments, as these are often ineffective once the injury has occurred.[2] This preventive approach is in line with the United Nations 2030 Agenda for Sustainable Development and directly related to Goal 3 'Good health and well-being'.[6] In general, the recommended strategies for limiting MSDs are:[2] (1) to develop preventive actions; (2) to carry out close monitoring of physical, psychological and functional capacities in order to identify risk factors at an early stage; and (3) to include musculoskeletal health in national policies in order to develop an effective care approach that takes into account the multiple components of MSDs and allows individuals to actively participate in care. Identifying different underlying risk factors is crucial for developing effective preventive approaches for high-risk activities.

Occupational activities involving high physical strain combined with psychologically stressful situations are associated with a significant increase in MSDs.[7] Musical practice involves intense, often complex, rapid movements accompanied by high psychosocial demands.[8 9] Whereas moderate-intensity artistic practices, including sensorimotor aspects, benefit health,[10 11] intensive practice is a risk factor that should be considered early in the learning process.[8] In fact, in sports, the leading risk factor for health problems in children and adolescents is the increasingly progressive specialisation of practice at higher levels of performance.[12] A specialised activity is defined as training throughout the year (>8 months per year), with the renunciation of other activities to focus on this one.[13]

Children and teenage musicians who aim to become professional begin their training at an early age and are quasi-systematically involved in specialised instrumental practice, elevating the risk of MSDs. While studies of children with specialisation practice are limited, Aparicio *et al* found a higher prevalence of pain in musician children compared with non-musicians,[14] and 14% of adolescent music students report playing-related musculoskeletal disorders (PRMDs).[15] For other artistic practices (eg, dance), previous studies have shown that transitioning from leisure to professional practice is a particularly critical time for health problems to arise.[16] When students enter higher education, the volume and intensity of practice increase sharply, and the competition is intense. The difference between success and failure is played out on stage in front of an informed public, creating tension.[17] Studies have shown a higher prevalence of pain, stress, psychological issues and the use of medical treatment among student musicians compared with non-musicians.[18–21] Nevertheless, musicians often rate their health status more positively, which could be directly linked to the 'no pain, no gain' mentality.[18] The prevalence of observed disorders appears to be higher among first-year students and in Master's degree programmes, highlighting the need for implementing enhanced prevention programmes specifically tailored for new students.[19 22] While studying at a conservatory for professional musicians, approximately 10% of student musicians experience critical health problems that can significantly impair their learning or require them to stop their curriculum.[22]

This transitional period at the start of professional training, which poses increased risks of MSDs, has not been thoroughly studied among student musicians. However, professors at the Geneva University of Music (Haute école de musique de Genève (HEM)) observed fragility and encountered difficulties in managing health issues among their undergraduate students. Moreover, student musicians need health support tailored to their needs and their instrumental practice. Some studies showed a beneficial effect of preventive actions when support was adapted to the specific context.[19 23]

Despite the known risks and the fact that musical practice can be compared with intense physical activity because of the repetition and intensity of complex movements,[24] musicians rarely benefit from the health support found in sports disciplines during their learning process and professionalisation. Yet, the injury rate is as high as in many sports disciplines, and the characteristics of pain origin are similar: specialisation of the activity, intense physical and mental demands, early learning, performance, and competitions.

In a 2018 European study involving 560 student musicians, 65% of participants reported PRMD over the past 12 months.[8] A systematic review of 21 articles (involving 5424 professional musicians) dealing with MSDs in musicians showed that prevalence varied from 41% to 93%.[25] The pain, even if it does not have a clearly identified cause, generates significant mental and physical fatigue that affects the quality of learning for student musicians or may even necessitate a career break.[8] In professional musicians, the upper limbs and neck seem to be the most affected areas,[25–27] but the specific locations of disorders vary depending on the positioning of the upper limbs in relation to the instrument,[8] as well as the overall posture.[28]

Previous studies have suggested the main risk factors to be type of instrument, posture, gender, sedentary lifestyle, perfectionism, anxiety, stress and working methods.[8 25 27 29 30] In dancers and athletes, risk factors are usually separated into intrinsic and extrinsic factors.[31] Zaza proposed the same classification for musicians.[32] Intrinsic factors would be age, gender, past injuries, vulnerability to stress, laxity, physical abilities (eg, muscle tone and strength) and personality traits (some people are more resistant to stress than others, which influences performance experience).[9 33 34] Extrinsic factors include learning conditions, instrumental technique and the environment.[9] In addition to the type of instrument and the position of the arms,[8] the main risk factors in student musicians vary across the studies. Ballenberger *et al* identified the most critical risks as stress and a history of PRMD,[21] while Cruder *et al* observed perfectionism, fatigue and years of practice.[8] Specifically, technical demands, physical constraints, training errors, lack of planning (periodisation), environmental conditions (eg, during concerts: temperature, lighting, audience, other performers), footwear and clothing, and ancillary activities may be additional risk factors. Repeated improper movement patterns, influenced by the aforementioned factors, can lead to brain plasticity cases similar to those observed with optimised movement patterns.[17] Some specific risk factors have also been identified according to practice, for example, singers with 46% of dysphonia over their careers[35] and 13%–20% of flautists presenting jaw disorders.[36] In instrumental practice, it is crucial to identify PRMD and the primary risk factors, allowing approaches to be adapted to each context and each individual. Existing

systematic reviews emphasise that studies on MSDs in musicians typically involve small sample sizes and insufficiently valid assessment tools.[25] Some authors have developed validated questionnaires to assess musculoskeletal pain[26 37] and performance anxiety[38] in musicians that should be more widely used. While many studies have been published on preventive actions in dancers and athletes, a recent systematic review highlights the absence of studies evaluating the effectiveness of MSD preventive actions in musicians.[30]

Given the existing literature and its shortcomings, as well as the contextual aspect of this problem, this paper describes a cross-sectional study conducted to gain a better understanding of the health status of student musicians at the HEM and more precisely identify the risk factors for PRMD and MSDs. Moreover, the statistical approach of psychological network analysis has not been used previously, although it is relevant for identifying the strength of the relationships between risk factors and PRMDs.[39] Network analysis refers to a statistical approach used in psychological science to examine and understand complex relationships among multiple variables. It involves analysing the interconnections and dependencies between variables to uncover hidden patterns and dynamics within a system.[39] Network analysis involves visualising complex relationships among variables using nodes (representing variables) connected by edges of varying thickness to indicate the strength of connections. It is a valuable tool for exploring and interpreting relational data, particularly when dealing with many variables.[39 40] This study will provide a solid scientific basis for developing preventive actions that will be the subject of new studies in this field. The concrete application is to develop a health strategy for the HEM and transfer the developed knowledge and skills to other institutions related to musicians.

Objectives

This cross-sectional study has two aims:

- To describe the prevalence of PRMD among student musicians.
- To identify the physical and psychological risk factors for self-reported musculoskeletal pain among music students.

Our main hypothesis is that over 65% of student musicians have a history of MSDs and pain, half of which are directly attributable to music playing.[8 25] Physical risk factors influencing the development of pain and MSDs in instrumental playing include age, gender, duration of daily instrumental practice (including individual training and HEM courses), lack of warm-up exercises and breaks, sedentary lifestyle, and sleep duration. In the psychological domain, factors such as self-perceived health, stress, and perfectionism play a role.[9 33 34] These psychological factors align with personality traits based on the Big Five model: openness, conscientiousness, extraversion, agreeableness and neuroticism.[41]

METHODS AND ANALYSES

Patient and public involvement

This study does not involve patients or the general public. Music professors from the HEM participated in the conception of this study.

Thus, it is a co-production between health researchers and music professors, integrating pedagogical experience and observations of musicians in the learning phase.

Design and setting

The design is a monocentric cross-sectional study among student musicians at the HEM.

Participants

The population studied consists of students of the HEM—Geneva and Neuchâtel sites (all disciplines involving playing a musical instrument or singing). The HEM has 550 students from all five continents, nearly 90% of whom are performers. Approximately 250 are enrolled in the Bachelor's programme and more than 300 in the various Master's programmes (mainly concert, soloist and pedagogy orientations) within the institution's different departments. Since the study involves music students in higher education, recruitment at the HEM institution is appropriate and representative of all categories of the music curriculum.

Inclusion criteria

Students will be included if they are regularly enrolled at the HEM as adults (over 18) in a Bachelor's (years 1, 2 or 3) or Master's degree with a main discipline in musical instrumental practice or singing.

Exclusion criteria

- Students enrolled in composition and 'music and movement department' (less intense instrumental practice).
- Students who have undergone surgical interventions in the previous 12 months that affect music practice.

The project voluntarily addresses a large population to obtain a global view of the student musicians at the HEM and gain sufficient respondents for statistically valid statistics.

Recruitment

Information sessions will be offered to explain the project: the nature of the study, its purpose, the procedures involved, the expected duration, the potential risks and benefits, and any discomfort it may cause. Interested parties will receive the information sheet. These sessions will ensure that all students' questions are addressed. After these sessions, an email will be sent to briefly explain the project. After a minimum of 24 hours following the information, student volunteers will be able to sign the consent letter and complete the questionnaires online. The study has been approved by the ethical committee (CCER Geneva 2022-02206).

Table 1 Free questions and all validated questionnaires

Tools	Survey name	Brief explanation	References
Free questions		Sociodemographic factors, health habits, musical practice habits	Inspired by Cruder *et al* (RISMUS study), exchange with HEM music professors and pretests[8]
Pain in musicians	MPIIQM	Questionnaire on pain locations and its consequences for instrumental practice	26
General health	Self-rated health (SRH)	Four items about self-reported health status	8 42
Physical activity	IPAQ-SF	Assessment of physical activity level by intensity (low, moderate, high)	8 44
Stress	Kessler Psychological Distress Scale (K10)	10-items on specific emotions measuring anxiety and depression	52
Performance anxiety	Kenny Music Performance Anxiety Inventory (K-MPAI-R)	40-items measuring performance anxiety	38
Perfectionism	MPS-25	25-items to evaluate the motivations underlying perfectionism	47
Fatigue	Chalder Fatigue Scale (CFQ11)	Evaluation of the severity of physical and psychological fatigue with a 4-point response	48
Personality traits	10-item Big Five Inventory	10-items to identify personality traits	41

HEM, Haute école de musique de Genève; IPAQ-SF, International Physical Activity Questionnaire-Short Form; MPIIQM, Musculoskeletal Pain Intensity and Interference Questionnaire developed for professional orchestra musicians.

Outcomes

Table 1 lists all the questionnaires. The RedCap platform (https://www.project-redcap.org/) was used to format the questionnaires and manage the data collection. Numerous pretests with HEM assistants and professors were conducted to ensure the questions were understandable and that the survey is feasible. Given the high number of international students, the questionnaire is offered in French and English. There will be only one measurement time for each participant. The time required to complete the questionnaires is estimated at 40 min.

Primary outcome

The primary outcome is the Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians (MPIIQM), which will identify the prevalence of pain related to musical instrumental practice or singing. This questionnaire has been validated with professional orchestra musicians.[26] The MPIIQM consists of 22 questions, 8 of which are used to collect information about the musicians and their practice, and 14 of which specifically address pain during or following music practice. This questionnaire includes a subscale of pain intensity (0–40) and pain's interference with music practice and daily activities (from 0 to 50). It is recommended to use means (or another index of centrality) to interpret these scores. A score of 0 represents the respective absence of pain and its non-interference with daily activities, and a score of 10 (averaged scores) represents intense pain and significant interference with daily life and, more particularly, instrumental practice. A minor set of specific questions on orchestra playing were adapted to student musician settings (instrumentalists and singers), staying as close as possible to the original text.

Secondary outcome

Secondary outcomes were selected to identify risk factors for musculoskeletal pain in musicians.

Free questions

The free-form questions were based on Cruder *et al*.'s approach[8] and arose from discussions with two music teachers, the head of research and the pedagogical coordinator of the HEM, as well as on pretests with music assistants. The questions help identify the students' backgrounds while identifying certain risk factors. These questions comprise three components: (1) sociodemographic, health, and clinical items (age, sex, height, weight, manual laterality, student job, health and educational history); (2) lifestyle (rest, diet, sleep, addictive behaviours); (3) questions about musical practice (age of commencement, primary and secondary instrument, number of hours spent practicing in courses at the HEM per day/week, number of hours spent practicing alone per day/week, academic level, breaks during practice, warm-up and cool-down exercises).

Table 2 Self-rated health questionnaire

Items	Questions	Answers		
1	How would you rate your general health status?	Bad	Reasonable	Good
2	How would you rate your general health status compared with 5 years ago?	Worse	About the same	Better
3	How would you rate your health status compared with others in your age group?	Worse	About the same	Better
4	Do you think your health prevents you from doing things you would like to do?	To a great extent	Partly	Not at all

Self-rated health

The self-rated health (SRH) tool allows respondents to self-assess their general health.[42] The SRH outcomes in musicians may have previously been related to the presence of general musculoskeletal pathology and not PRMD,[8] while health perception appears to be highly influenced by context.[42] In addition, SRH appears to be a strong predictor of the onset of arm pain,[43] supported by the fact that musicians have a predominance of PRMD in the upper extremities.[25] This SRH tool allows an assessment of health in comparison to the past, the same age group and health conditions' impact on activities. The scale consists of four questions to be scored on a 3-point Likert-type scale (table 2). A high score represents good general health.

Physical activity

The International Physical Activity Questionnaire-Short Form (IPAQ-SF) is a questionnaire validated in English and French that evaluates physical activity, levels of sedentariness and the intensity of physical activities performed during the last 7 days.[44] This tool assesses vigorous and moderate physical activity, walking and sitting, and the time spent on these activities. The short version used includes seven questions. The IPAQ-SF allows a classification according to three levels of physical activity:[45] inactive, moderate (moderately active) and high (health-promoting physical activity). The 'high' level corresponds to individuals who are active beyond the public health recommendations (1.5–2 hours/day); the 'moderate' level is determined according to three criteria (+20 min intense/day for 3 days or 30 min moderate minimum/day for 5 days or 600 min/week all activities combined); the 'inactive' level corresponds to individuals who do not meet the above criteria.

Stress scale

The Kessler Psychological Distress Scale (K10) is a validated scale designed to provide a global measure of mental load based on questions about the anxiety and depressive symptoms a person has experienced in the past month (4 weeks).[46] This scale includes 10 questions using a 5-point Likert-type scale, with scores ranging from 10 to 50.

Four categories are used to interpret this test:[46]

- Low score (10–19) corresponding to a state of good mental health.
- Lower average score (20–24) corresponding to low psychological distress.
- Higher average score (25–29) corresponding to moderate psychological distress.
- High score (30–50) corresponding to severe psychological distress.

Performance anxiety

The Kenny Music Performance Anxiety Inventory is a validated questionnaire measuring performance anxiety, specifically in musicians.[33 38] It includes 40 items using a 7-point Likert-type scale to measure the discomfort caused by anxiety associated with musical performance. A high total score corresponds to high anxiety and distress regarding musical performance and vice versa.

Motivations underlying perfectionism

The 'Perfectionism Motivation Questionnaire' (MSP 25 items) is a validated questionnaire that provides an overview of perfectionism and its underlying factors in an individual (table 3).[47] This tool separates self-determined and non-self-determined factors using seven subscales: intrinsic motivation (four items), identified regulation (three items) for the self-determined factor (three items): introjected regulation (three items), social external regulation (six items), positive and negative material external regulation (three items each) and motivation (three items). The MSP includes 25 items, answered on a 7-point Likert-type scale.

A high score on a subscale ('Questions' in table 3) indicates a strong association between that factor and perfectionism.

Fatigue

The Chalder Fatigue Scale (CFQ11) is a self-administered questionnaire that measures the extent and severity of physical fatigue (items 1–7) and psychological fatigue (items 8–11).[48] The scale consists of 11 questions answered on a 4-point scale, with scores ranging from 0 to 33. The total scores can be calculated globally or by using the two subscales (physical

Table 3 Perfectionism Motivation Questionnaire

Questions	Does not correspond with me at all	Corresponds to me very little	Corresponds to me a little	Corresponds to me moderately	Corresponds to me quite a lot	Corresponds to me a lot	Exactly corresponds to me
…because it brings me closer to the top in my music domain place and the concrete privileges that come with it							
…because I feel guilty when I cannot meet my success criteria							
…although I do not see what this gives me							
…because getting closer to perfection gives me a pleasant energy							
…because it allows me to avoid the disapproval of my relatives							
…because it allows me to avoid dangers or accidents that could harm me or my loved ones							
…because it allows me to be fully committed in what is important to me							
…because it allows me to be respected by others							
…because it gives me access to honours, first place, etc							
…because it allows me to be appreciated by some people							
…even if I have no good reason to be							
…because it is a good way to realise my projects							

Continued

Table 3 Continued

Questions	Does not correspond with me at all	Corresponds to me very little	Corresponds to me a little	Corresponds to me moderately	Corresponds to me quite a lot	Corresponds to me a lot	Exactly corresponds to me
…because it reassures me not to break or damage my objects by accident							
…because I am disappointed with myself when I do not act perfectly							
…to show others what I am worth							
…because at the end of the day, there is something to gain (eg, medal, award of excellence, prize, money, scholarship, etc)							
…because it allows me to feel emotions that I like							
…because I make sure I do not cause problems that could harm me or my relatives							
…to avoid disappointing some people							
…because I feel pleasure when I surpass myself							
…because it provokes pleasant sensations in me							
…although it does not make any difference whether I engage in perfectionism or not							
…because it allows me to reach my goals							
…because I would blame myself for not doing things perfectly							

Continued

Table 3 Continued

Questions	Does not correspond with me at all	Corresponds to me very little	Corresponds to me a little	Corresponds to me moderately	Corresponds to me quite a lot	Corresponds to me a lot	Exactly corresponds to me
…because if it's not perfect, I could lose my reputation							

People can exhibit varying degrees of perfectionism. In this questionnaire, we want to examine why people are perfectionists. To answer the questions presented in table, refer to your field of study in music. Each question begins with the sentence, 'I am a perfectionist …'.

and psychological fatigue) separately. According to this rating, a low score corresponds to low fatigue and vice versa.[49] It can also be scored using a binary notation for scores ranging from 0 to 11 (the first two responses being worth 0 and the next two being worth 1). This scoring separates respondents into two categories: those who are not very fatigued (a score of 3 or less) and those with severe fatigue (a score of 4 or more).

Personality traits

The Big Five Inventory (BFI-10) is a short version of a questionnaire used to identify personality traits according to a five-factor model.[41] The BFI-10 includes five 2-item scales that place the respondent on one of five personality dimensions: extraversion, agreeableness, conscientiousness (professional), neuroticism and openness (to experience). This tool involves 10 items using a 5-point Likert-type scale, ranging from 'strongly approve' to 'strongly disapprove'. A high score on any of the subscale means this dimension represents a characteristic trait of the respondent's personality.

Bias

Non-response

There may be a tendency for musician students to be more inclined to answer the questionnaire if they are familiar with musculoskeletal pain. This situation will inflate the prevalence estimate found in the study sample in the event of a substantial refusal to participate. To avoid this problem, respondents will be informed of the importance of their contribution to the study. Additionally, to ensure thorough follow-up, we will make contact with all remaining potential participants either through direct communication or by sending a reminder email.

Recall bias

To limit the risk of bias related to the single moment of response, many questionnaires specify a period to be taken into account for answering (eg, in the last 6 months or the last 7 days). In addition, the questionnaires were sent during a standard period within the curriculum, avoiding examinations, orchestra sessions and vacations.

Selection bias

The HEM allows 100% of the student musicians to be contacted. The students will be informed orally and via their institutional email address. This approach ensures that all the students in the target population are contacted.

Sample size

The psychological network method used to explore the overall correlational structure of the data set does not require a sample size calculation because it is an exploratory analysis. According to the central limit theorem, a sample size of at least 30 participants is required to obtain a Gaussian distribution.[50 51] Given the number of students at the HEM, the inclusion of 100 students from a population of 450 seems realistic.

Data analysis and statistics

All data will first be analysed descriptively. For qualitative data, frequencies and percentages will be calculated. Quantitative data will be reported by means and SD if the data respect the normal distribution. Otherwise, medians and quartiles will be reported.

The psychological network analysis with Spearman correlations will be adopted to explore the overall correlational structure of the datasets to ensure the data are insensitive to outliers and non-normality.[39 40] The psychological network methodology allows the connections between all variables (risk factors, pain, MSDs, instrumental practice) to be visualised by nodes in a single graphical representation. This method is most appropriate for exploratory analysis when many variables are involved, and it is specifically recommended for cross-sectional studies with repeated measures,[39] as in this study. The thickness of the edges of the network will represent the strength of the correlations, and the proximities between the variables will be identified by the absolute value of the Spearman correlation. The distance between two nodes thus varies inversely with the strength of the absolute value of the correlational link: highly correlated nodes appear close together, while weakly correlated nodes appear far apart. This method allows several closely associated variables to be grouped into a 'latent variable' that may shed new light on the origins of MSD and suggest combined treatment in future preventive approaches.

Participants will then be categorised according to instrumental subcategories (instrumentalists according to arm position and singers) and work postures (standing, sitting or both), and results will be compared between groups if the number of students per group is sufficient. A χ^2 test will be used to compare categorical variables, while a non-parametric Kruskal-Wallis test will analyse continuous variables. A p value lower than 0.05 will be considered significant. As this is an exploratory study, the raw p values will be reported along with corrections for multiple comparisons. All statistics will be performed on SPSS or R software.

DISCUSSION

The MuSa study is a cross-sectional study that examines the risk variables associated with student musicians' practice-related pain. The originality of this study lies in various factors related to its conceptualisation and target population. This project was co-constructed by scientists in the field of health (Geneva School of Health Sciences) and professional music teachers at the HEM, which allows the protocol to be based on scientific knowledge and feedback from the field. This point is critical for meeting the demands of the HEM and establishing effective health support for student musicians. Free questions were drafted to meet this dual requirement, and validated questionnaires were selected. Numerous pretests with HEM assistants and professors were conducted to ensure the questions were understandable and interesting and to confirm the survey's feasibility. Another original element in this study is its focus on the physical and mental risk factors associated with music practice and work habits. The final multivariate statistical approach using network analysis may allow the identification of intricate links between the multiple factors around health issues and the detection of latent variables, potentially encompassing both physical and psychological factors. To reduce bias, validated and music-specific questionnaires will be used. Moreover, all HEM students in the curriculum will be contacted and informed of the study to obtain a maximum number of participants studying various musical instruments.

This study provides a basis for developing numerous health promotion and pain prevention approaches tailored to the context of student musicians. More specific research projects will be developed based on the most relevant risk factors related to musicians' pain and latent factors based on strongly associated variables. From a practical point of view, the implementation of preventive and adapted actions will help develop students' health awareness, taking into consideration the results of this study. The effectiveness of these actions can then be evaluated and will address the lack of scientific knowledge on the effectiveness of preventive actions in student musicians' curriculums. These perspectives should improve the students' mental, physical and social health, promoting learning in favourable conditions and leading to happier lives and more fulfilled careers.

Ethics and dissemination

Ethical committee

Ethics approval has been granted by the Swiss Ethics Committee of the CCER Geneva (2022-02206).

Recruitment and consent

Prospective, written consent will be obtained from all participants.

Data collection, storage and access

Data will be de-identified and entered into a secure folder and electronic database. Only the investigators and a statistician will have access to the final dataset.

Dissemination strategy

Outcomes will be disseminated through publication in peer-reviewed journals, professional journals and presentations at national and international conferences.

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Contributors CEJ: conceived and designed the study, drafted and revised the manuscript. AS: participation in the conception of the study and management of the REDCap platform (https://www.project-redcap.org/). DAN-D: management of the REDCap platform. A-VB (as the study's principal investigator): conceived and designed the study, funds raising, management of the project, drafted and revised the manuscript.

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