

Health Problems in Conservatoire Students

A Retrospective Study Focusing on Playing-Related Musculoskeletal Disorders and Mental Health

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OBJECTIVE: To gain insight into the prevalence and characteristics of physical health problems and mental health problems in first-, second- and third-year conservatoire students of the classical music department. Also, differences in mental health and general health were investigated between students with playing-related musculoskeletal disorders (PRMDs) and students without PRMDs. **METHODS:** Eighty-nine classical music students of Codarts Rotterdam, University of the Arts, were asked to complete a questionnaire targeting PRMDs (components derived from Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians, MPIIQM), mental health (Mental Health Inventory-5), and self-rated general health (SF-1 from Short Form health survey SF-12). **RESULTS:** The response rate was 52% ($n=46$). Of all participants, 17.8% ($n=8$) had experienced PRMDs in the past 12 months and 45.7% ($n=21$) of the students reported poor mental health (MHI-5 \leq 60). Students experiencing PRMDs in the past 12 months reported poorer general health compared to students without PRMDs (43.8 vs 67.1 [range 0–100], $p=0.012$). No significant difference was found between the groups with regard to mental health (62.0 vs 66.5 [range 0–100], $p=0.522$). **CONCLUSION:** The burden of PRMD complaints in this population of conservatoire students seems relatively low. However, the number of students facing mental problems in this population is a cause for concern. Conservatoires should focus on the subject of mental health in their curricula to increase more awareness and prevent mental problems. To investigate possible causality between PRMDs and general health, prospective studies are needed. *Med Probl Perform Art* 2020;35(4):214–220.

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THE ACT OF PLAYING music at a professional level is physically and psychologically demanding. The skills needed in music performance are complex.^(1,2) Musicians make long hours, play in awkward asymmetrical postures and perform mostly repetitive movements.⁽³⁾ Moreover, musicians are exposed to constant pressure and face numerous mental challenges.^(4,5) Consequently, musicians are at risk for health problems during their careers.^(6,7) These problems can lead to an impaired level of playing⁽³⁾ and in some cases musicians are even compelled to stop playing entirely.⁽⁸⁾

One common health issue in musicians are physical complaints, particularly playing-related musculoskeletal disorders (PRMDs).^(8,9) PRMD is defined as “pain, weakness, numbness, tingling or other symptoms that interfere with the ability to play the instrument at the level you are accustomed.” This term was first introduced by Zaza (1998)⁽⁹⁾ and has the benefit of excluding minor pain symptoms and symptoms without an impact on the act of making music. Numerous studies have investigated the prevalence of PRMDs in professional musicians. The first systematic review targeting this topic found a point prevalence of PRMDs in musicians ranging from 39% to 87%.⁽⁹⁾ More recently, Kok et al. (2015) showed that music students experienced more than twice as many complaints in the arms, neck and shoulder area compared to medical students.⁽¹⁰⁾ Literature shows that up to 93% of professional musicians experience PRMDs at some point during their career.^(8,11–14) These studies indicate that PRMDs are a very common health issue in musicians.

PRMDs are not the only health issue confronting musicians; an equal source of concern is their mental health.^(1,5) Recent studies have shown that mental health issues like stress, depression and anxiety are more common in musicians than in the general population.^(5,6,12,15) A study by Vaag et al. (2016)⁽⁶⁾ showed that musicians scored twice as high on both anxiety and depression compared to the general population: 18% of the musicians reported psychological distress (e.g. depression or anxiety). Performance anxiety, depression and stress have considerable impact on musicians’ functioning.^(4,16) Mental skills therefore seem essential for musicians to cope with the high pressure of performing.⁽⁴⁾

An association between PRMDs and mental health has been suggested in previous studies: an association between performance anxiety and PRMDs was already investigated by Kenny and Ackermann (2015).⁽⁵⁾ Ioannou et al. (2018)⁽¹⁵⁾ found that within a group of students experiencing playing related pain, 40% had an increased level of trait anxiety. Moreover, the mental process of coping with PRMDs is influenced by issues like job insecurity, embarrassment and the attitude towards injuries.⁽¹⁶⁾ It is likely that when PRMDs arise, musicians do not want to adapt their playing routine; they often feel obliged to continue playing even though they experience pain while doing so. Therefore, it seems likely that musicians suffering from PRMDs experience poorer mental health as well.

To date, most studies about PRMDs have focused on professional musicians or a mixed population of professional and conservatoire musicians.⁽⁸⁾ Yeung and colleagues (1999)⁽¹⁷⁾ indicated that less experienced musicians are more likely to develop musculoskeletal complaints than more experienced musicians. Besides, health problems in this population can lead to study delay and even drop-out of study. Some studies already investigated PRMDs in the population of conservatoire students.^(10-12,14,15,18-20) Unfortunately, as was shown by Kok et al. (2016)⁽⁸⁾ the methodological quality of most of these studies is low, containing no or limited information on the used questionnaires or questions or contain low or response rates, consequently risking a selection bias.^(10-14,18,19) Therefore in this review only four studies with a focus on the specific population of conservatoire students were included.^(14,20-22) None of these four studies focus on both PRMD and mental health. Also, more specific characteristics of pain e.g. pain intensity and interference of pain with playing a musical instrument are lacking in a group of conservatoire students.⁽¹³⁾

After the review by Kok, several studies have been published focusing on PRMD in professional musicians, specific instrument groups and conservatoires students, but only two of these studies focus on both PRMD and mental health in the population of conservatoire students.^(15,23) However, these studies measure different items of mental health like stress symptoms and anxiety, which makes it difficult to compare mental health status of conservatoire students in these studies. A more general mental health measure enables us to make comparisons with other populations. Mental health in general has not been studied in the population of conservatoire students yet.

To develop the best preventive strategies for conservatoire musicians in order to prevent both physical and mental health problems, it is necessary to first establish the extent and characteristics of these problems in this population.⁽²⁴⁾ Thus, the current study aims to determine the prevalence of PRMDs and investigates whether classical music students suffering from PRMDs experience poorer mental and general health compared to students without PRMDs.

METHODS

Study Design and Procedure

This retrospective study was performed among first, second and third year bachelor students of the Classical Music department at Codarts Rotterdam, University of the Arts. In total 89 students were invited to participate. The bachelor Classical Music department consists of students playing a wide variety of instruments, with violin (19.6%), piano (10.8%), and singers (10.8%) being the largest groups.

All invited students ($n=89$) received an e-mail in May 2017 with the request to fill in a questionnaire using a web-based system, Performing artist and Athlete Health Monitor (PAHM).⁽²⁵⁾ PAHM was developed to monitor physical and mental health in professional and pre-professional athletes and performing artists. Additionally, members of the research team visited classes in which the students had time to fill out the questionnaire. All students were informed about the procedure and gave oral informed consent for using data for scientific purposes. Our data were collected for management purposes and for educational purposes and not for the purpose of this particular study. The study was approved by the Medical Ethics Committee (MEC-2019-0163) of the Erasmus MC, University Medical Center Rotterdam, the Netherlands.

TABLE 1. Overview of Questionnaires, Subscales and Items

	Item
Questionnaire	Main subject Study year Playing experience (yrs) Playing hours per week: within curriculum outside curriculum
MPIIQM ⁽²⁶⁾	PRMD in the past 12 months (yes/no)
Injury registration form ⁽²⁵⁾	Injury location Body side Diagnosis Duration (wks)
MPIIQM Subscales ⁽²⁶⁾	
Pain intensity	Worst (0-10) Least On average Right now
Pain interference	Mood (0-10) Enjoyment of life Playing technique Playing instrument because of symptoms
Mental Health Inventory 5 ⁽²⁸⁾	Nervousness (0-5) Down in the dumps Calm & peaceful Downhearted & blue Happy
SF-12 ⁽³²⁾	
SF-1	General health (0-100)

TABLE 2. Participant Characteristics (n=46)

Age (yrs)	21.3±3.09
Gender (%)	
Female	60.9%
Male	39.1%
Study year (%)	
1	56.5%
2	15.2%
3	28.3%
Playing hours	
Curriculum 1st yr	24.23
Curriculum 2nd/3rd yrs	30.10
Outside curr. 1st yr	10.77
Outside curr. 2nd/3rd yrs	14.10
Instrument (% , n)	
Violin	21.7% (10)
Vocals	15.2% (7)
Piano	10.9% (5)
Viola	8.7% (4)
Clarinet	6.5% (3)
Cello	4.3% (2)
Composition	4.3% (2)
Flute	4.3% (2)
Horn	4.3% (2)
Other	19.8% (9)

Questionnaire

Since a short, practical questionnaire for conservatoire students focusing on general, physical and mental health is not available yet, we needed to combine questionnaires and subscales. An overview of questionnaires, subscales, and questions can be found in Table 1.

All students were asked about gender, age, main subject, study year, playing experience in years and average amount of playing hours per week (within and outside the conservatoire's curriculum). Furthermore, the following items, subscales and questionnaires were used in our study: The MPIQM (Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians) is a valid and reliable questionnaire and has good psychometric properties.⁽²⁶⁾ A question on previous PRMDs (previous 12 months) and the subscales pain intensity and pain interference of PRMDs were extracted from this questionnaire. Previous PRMDs in the last 12 months were assessed with one question (yes/no). In case of indicated PRMDs, the student was asked for further details by filling in an injury registration form based on an international consensus statement on injury surveillance in sports (location, body side, duration and diagnosis).⁽²⁵⁾

In case of indicated PRMDs, the student was also directed to the subscales pain intensity and pain interference of the MPIQM, targeting pain intensity and pain interference in the previous 12 months.⁽²⁷⁾ Students were asked to rate their pain intensity on a 0-10 scale on the following pain items: 'worst', 'least', 'on average' and 'right now.' Adding up the scores on these four items resulted in a sum score ranging from 0 to 40 with higher values indicating higher pain intensity. The mean score was calculated by dividing this score by four. Pain interference was

measured on a scale 0–10 including the following items: 'mood', 'enjoyment of life', 'playing technique', 'playing instrument because of symptoms' and 'playing instrument as well as you would like'. Adding up the scores on these five items resulted in a sum score ranging from 0 to 50 with higher values indicating more pain interference. The mean score was calculated by dividing this score by 5.⁽²⁷⁾

Mental health in the previous four weeks was measured using the Mental Health Inventory 5 (MHI-5) which is a subscale from the Short Form-36.^(28,29) The MHI-5 measures depression, mood and anxiety disorders in the past four weeks and consists of five items on a 6-point scale ranging from 0 'all of the time' to 5 'none of the time'. In positively formulated questions 'all the time' is ranked with a score of 5 and 'none of the time' with a score of 0. In case of negatively formulated questions 'all the time' is ranked with a score of 0 and 'none of the time' with a score of 5. Adding up all five items and multiplying this by four produces a total score of 100, with higher scores indicating better mental health.⁽²⁹⁾ Those participants with a MHI-5 score ≤ 60 were defined as having poor mental health.⁽³⁰⁾ The MHI-5 is a short, reliable and valid tool in measuring mental health.^(29,31)

General health was assessed using the first question (SF-1) of the Short Form Health survey (SF-12) asking the students to rate their overall health in the last 4 weeks on a 5-point scale. The SF-1 represents self-perceived health and can be a predictor of different health outcomes, e.g. return to work.^(32,33) The five answer categories were "excellent" (100) "very good" (75), "good" (50), "fair" (25), and "poor" (0).

Statistical Analysis

All statistical analyses were performed in SPSS ver. 25.0. A Mann-Whitney U-test was performed to investigate whether there was a significant difference between students with PRMDs and students without PRMDs in the previous 12 months on mental health. Additionally, a Mann-Whitney U-test was performed to investigate whether there was a significant difference between those two groups on general health.

RESULTS

Forty-six out of 89 classical music students (60.9% women; mean age 21.3 yrs [SD 3.09]) completed the questionnaire (Table 2). The response rate was 52% and included mostly violin players (21.7%, n=10), singers (15.2%, n=7) and pianists (10.9%, n=5). Most participants were first-year students (56.5%, n=26), followed by third (28.3%, n=13) and second year students (15.2%, n=7). The students had on average more than 10 yrs (10.67 years; SD 3.43) of playing experience. First-year students played on average 24.23 hrs within the curriculum and 10.77 hrs outside the curriculum. For second and third-year students this was 30.10 and 14.10 hrs, respectively. The non-responders in this study included mostly violin players (21.4%, n=9) as well, followed by piano (11.9%, n=5), organ (11.9%, n=5) and cello

TABLE 3. Means Scores on PRMDs, Mental Health, and General Health

	All Students	PRMDs	No PRMDs	PRMDs vs No PRMDs
Students (n)	46	8 (17.8%)	38 (82.2%)	
Mental health (0–100)	65.74 (15.84)	62.00 (11.90)	66.53 (16.57)	$p=0.522$
Poor mental health (score ≤ 60)	21	—		
General health (0–100)	63.04 (3.18)	43.75 (22.16)	67.11 (19.37)	$p=0.012^*$

* Significant difference between students with vs without PRMDs, $p<0.05$.

players (11.9%, $n = 5$). Most non-responders were third year students (50%, $n=21$), followed by second year students (40.5%, $n=17$) and only 4 (9.5%) first year students did not participate in the questionnaire.

PRMDs

Eight students (17.8%) reported a PRMD in the previous year (Table 3). The students experiencing PRMDs studied the following main subjects: piano ($n=2$), organ ($n=1$), flute ($n=1$), clarinet ($n=1$), harp ($n=1$), composition ($n=1$), conducting ($n=1$). Seven out of eight PRMDs were located in the upper extremities, including upper back ($n=2$), shoulder ($n=1$), wrist ($n=1$), hand/fingers/thumb ($n=1$), head/face ($n=1$) and jaw 9 ($n=1$). The remaining PRMD was located in the low back.

Pain Intensity and Pain Interference

Mean pain intensity score was 3.78 (SD 2.02) (scale 0–10) for students with PRMDs (Table 3). The pain score at its worst was 5.63 (SD 3.02) and at its least 2.25 (SD 1.91) (Table 4). On average the participants rated their pain level with a score of 4.00 (SD 2.14).

The mean score on pain interference, indicating the interference of pain while playing the instrument, was 5.60 (SD 2.62) (scale 0–10) (Table 3). The highest score was found on the item ‘difficulty playing as well as you would like’ (7.00, SD 3.12) (Table 4). An overview of the scores on all items can be found in Table 4.

Mental Health

Overall, the mean sum score on the MHI-5 was 65.74 (SD 15.84). 45.7% ($n=21$) of the students reported a poor mental health (≤ 60) (Table 3). There was no significant difference on mental health status between students with and without PRMDs ($p=0.522$).

General Health

The mean self-rated general health was 63.04 (SD 3.18) (Table 3). Students with PRMDs in the last 12 months had a significantly lower score on self-rated general health compared to students without PRMDs ($p=0.012$).

DISCUSSION

The aim of this retrospective study was to determine the prevalence of PRMDs and investigate whether there were

differences between conservatoire students with and without PRMDs on both mental health and general health. The main finding of this study was that 17.8% of the participants had experienced PRMDs in the last twelve months and nearly half the students reported poor mental health. Students scored higher on the pain interference scores rather than intensity of pain scores, suggesting issues related more to the interference of pain with the act of making music. Students with PRMDs had poorer general health scores than those without PRMDs.

Compared to other studies evaluating health problems in professional musicians, the prevalence of PRMDs (17.8%) in the current study was relatively low.^(8,11,14) Though, previous studies focusing on conservatoire students showed a large variability in prevalence. Baadjou et al. (2015)⁽¹¹⁾ reported that 67% of the music students sustained a musculoskeletal complaint in the past 7 days, but the response rate in that particular study was only 9.4%. In contrast to Baadjou et al., Spahn et al. (2004),⁽¹²⁾ who obtained a response rate of 96%, found that 25% of the music students experienced PRMDs. Low response rates increase the risk of selection bias, resulting in an overestimation of the outcome measure,⁽³⁴⁾ in this case an overestimation of musicians reporting a health problem. Consequently, one should be careful to generalize results from studies with low response rates to the population at large.

Compared to the study of Spahn et al.,⁽¹²⁾ the prevalence of health problems in the current study seems low. An explanation might be that the students in that particular study were asked about their current experience of complaints and in our study complaints over a period of 12 months were asked. This may have led to a recall bias: it is possible that students were less accurate in recalling complaints they experienced in the previous year. A study in Norwegian athletes found that a decrease in the frequency of data collection reduced the amount of problems identified and recommended a retrospective period of four weeks or less.⁽³⁵⁾ Accordingly, future research should include recall time periods with a maximum of 4 weeks. Also, more first than second and third year students participated in this study. One possible explanation for a lower prevalence of PRMD in first year students might be the lower exposure compared to second and third year students. First year students have a total exposure of 35 hrs and 2nd and 3rd year students of 44 hrs (Table 2).

Denial of complaints or the frequently used expression ‘no pain, no gain’ might have had influence on the rela-

TABLE 4. Means (SD) Pain Intensity and Interference in Students with PRMDs

	Students with PRMDs (17.8%)
Pain intensity (0–10)	3.78 (2.02)
Pain at worst	5.63 (3.02)
Pain at least	2.25 (1.91)
Pain on average	4.00 (2.14)
Pain right now	3.25 (2.77)
Pain interference (0–10)	5.60 (2.62)
Difficulty usual technique	6.13 (3.00)
Difficulty playing your instrument	5.88 (3.83)
Difficulty playing as well as you would like	7.00 (3.12)
Pain interference with mood	5.50 (2.56)
Pain interference with enjoyment of life	3.50 (4.41)

tively low PRMDs percentage as well: pain might be denied, because of worries about the consequences (e.g. study drop-out), especially since participants may fear limited anonymity in smaller sample sizes. A qualitative study by Rickert et al. (2014)⁽³⁶⁾ found that an orchestral culture exists with a negative perception of injuries leading to injury concealment from colleagues and management staff. Therefore, pain might also be perceived as a normal playing condition. To investigate whether ‘no pain, no gain’ or denial of complaints are associated with the low prevalence of PRMDs in the current study, qualitative research is needed: such a study can provide us with a better understanding of context of PRMDs in the population of conservatoire students.⁽³⁷⁾

The interference of pain while playing an instrument seems more of an issue for conservatoire students than the intensity of pain. Although other studies focusing on health problems in conservatoire students have not used the exact same scoring (0–10) on the subscales pain intensity and interference, the subscales were measured before. Robitaille et al. (2018)⁽³⁸⁾ studied pain intensity and pain incapacity in a group of string music students using a VAS scale (0–100mm) to rate pain intensity at its worst, least, present and in general. On all items, participants rated the pain intensity lower than the participants in the current study. This may indicate that the threshold to consider pain as a PRMD was perhaps higher in the current study. Despite the fact that less PRMDs were reported, it seems that the interference of pain while playing can become a serious issue. Besides our suggestion that the perception of pain should be qualitatively investigated, conservatoires should address the influence of pain among students at their institution, as was also stated by Ioannou et al.⁽¹⁵⁾ This may interfere with the optimization of the student’s performance and it is therefore an important topic. Health education tailored to the musician can contribute to a more healthy and optimal performance.

The percentage of 45.7% participants scoring ≤ 60 on the MHI-5 is cause for concern. Comparing the mean score (65.74) with other studies in student populations confirms this. Hartley⁽³⁹⁾ found a mean score of 73.15 in a population of undergraduate students in the United States.

Houghton et al. (2011)^(31,39) found a mean score of 72.68 in Irish students. It is therefore essential that conservatoires use health interventions to screen and improve mental health of their students. No significant difference was found between students with and without PRMDs concerning mental health in the present study. However, the score on mental health problems in students experiencing PRMDs in the previous twelve months was slightly lower than in the group of students without PRMDs. Although no conclusions could be drawn, a large scale study including a larger sample of conservatoire students is needed to further investigate these findings.

Steinmetz et al.⁽⁷⁾ found a comparable self-rated general health score in a group of music students (3.45 on a range 1 ‘poor’ to 5 ‘excellent’) compared to this item in the current study (63.04). This was in agreement with results from a study including university students in the United Kingdom as well (66.01).⁽⁴⁰⁾ Literature shows that there is a strong association between poor self-rated health and poor physical functioning.⁽³³⁾ These findings correspond with the results of our study in which we found that students with PRMDs experienced poorer general health than the students without PRMDs. However, a prospective study is needed to provide more information about the causality.

Strengths and Limitations

To our knowledge, this is the first study focusing on general mental health instead of specific mental items, like performance anxiety and stress, in conservatoire students using the MHI-5. The MHI-5 is a very brief questionnaire, which is widely used in over 100 studies in a wide variety of populations e.g. patient groups and differences between males and females.^(41,42) This enables us to compare our results with the results from other target populations.

This study also has some limitations. Despite the fact that our study was one of the few studies in a population of conservatoire students with a response rate increasing the 50% the sample size of 46 students is still considered small which makes it difficult to draw firm conclusions about the results. More high-qualitative studies with high response rates and sample sizes are needed to gain insight into the relationship between PRMDs and mental health problems.

Also, we asked the students to recall their PRMDs over a period of 12 months which may have led to a recall bias. Retrospective periods of more than 4 weeks have led to recall biases in athletes reporting on their physical health.⁽³⁵⁾ For this reason we use the originally proposed recall period of four weeks for the MHI-5. However, due to these different recall periods, it is more difficult to draw conclusions about possible associations between PRMDs and mental health. Furthermore, we extracted some questions and subscales from different questionnaires. We used the subscales pain intensity and pain interference from the MPIIQM and a question about PRMDs in the last 12 months. Although this contributes to a short questionnaire covering different aspects of health in conservatoire

students, this may influence the validity of the questionnaire. Also, the frequently used definition of PRMD by Zaza (1998)⁽⁹⁾ stated clearly that ‘mild transient aches and pains should not be included’. This statement, combined with the possible ‘no pain, no gain’ attitude of some of the students, may have led to a low percentage of reported PRMDs. Lastly, the current study used a retrospective study design with a cross-sectional approach, which makes it difficult to draw conclusions in terms of causality between PRMDs, mental health and general health. In order to study causality between variables, prospective studies are needed.

In conclusion, the burden of PRMD complaints in conservatoire students seems relatively low. The results on the MHI-5 in the current study are alarming though and it seems important that conservatoires focus on the subject of mental health in the education offered to the students. An essential step in the process to designing preventive strategies for conservatoire students is establishing specific risk factors of health problems. To achieve this goal, prospective studies are required.

Authors contributions: SS, JS, RvR, MvM and SBZ designed the study protocol. SS collected, analyzed and interpreted the data and wrote the first draft of the manuscript. JS, MvM and RvR made substantial contributions to analysis and interpretation of data. All authors reviewed and edited the manuscript and approved the final version of the manuscript.

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