

Risk Factors and Coping Strategies of Playing-Related Musculoskeletal Disorder (PRMD) in Tertiary Student Pianists: A Phenomenological Study

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Purpose: While pianists enjoy the happiness of creating music, they also face many health problems, with playing-related musculoskeletal disorder (PRMD) being one of the most common occupational diseases. Compared with professional pianists, tertiary student pianists are easy to neglect, but they also suffer from playing-related injuries and face many difficulties and challenges. This study aims to investigate the risk factors of student pianists suffering from PRMD and the strategies to cope with PRMD from their lived experience using the method of descriptive phenomenology and the social cognitive theory (SCT) as the theoretical basis.

Patients and Methods: This study's data are derived from semi-structured one-on-one interviews with twelve student pianists at seven higher education institutions in China and are analyzed using Moustakas' improved Stevick-Colaizzi-Keen (SCK) phenomenological analysis method.

Results: This study developed nine themes related to PRMD risk factors and copy strategies within the SCT framework, they are: self-efficacy, personal psychological factor, self-regulation, piano-playing factors, receive medical treatment, outcome expectation, negative effects from social relations, help from social relations and physical environment.

Conclusion: The findings identify the profound influences of personal, social, behavioral, and environmental factors on the PRMD-related experiences of tertiary student pianists and highlight the importance of improving the self-efficacy and self-regulation ability of tertiary student pianists, as well as promoting social and healthcare attention and support for them.

Keywords: playing-related musculoskeletal disorder, PRMD, tertiary student pianist, risk factors, coping strategies, social cognitive theory, SCT

Introduction

The piano is a musical instrument that requires a lot of practice. Pianists, like athletes, need to practice complex techniques and repetitive passages for a long time to improve their playing ability.^{1,2} However, this cumulative practice causes pianists to overuse weak tendons, ligaments, muscles, and joints, leading to symptoms of discomfort, pain, and injury.³ So, pianists are not considered a safe profession; they also face a variety of physical and mental problems and challenges, of which playing-related musculoskeletal disorder (PRMD) is one of the most common health problems.⁴ Zaza⁵ defined PRMD as

any pain, weakness, lack of control, numbness, tingling, or other symptoms that interfere with a musicians ability to play the instrument at the level they are accustomed to, without taking into account very mild symptoms.

Compared with other performing artists, musicians' PRMD is more difficult to identify, and even musicians themselves tend to ignore pathological changes in their bodies.^{4,6-8} There are various risk factors for pianists to suffer from PRMD.

Excessive practice, playing posture, playing technique, piano structure, and performance anxiety may cause pianists to be injured and even make them give up their piano playing career.⁸⁻¹⁰ In the PRMD prevention and treatment field, not every country has specialized performing arts medical institutions that provide medical support and assistance to performing artists. Although general doctors, physiotherapists, massage therapists, acupuncturists, and other healthcare professionals can also provide medical intervention for pianists, due to their lack of knowledge of pianists' lived experiences and professional characteristics, they can only diagnose and treat pianists based on their clinical symptoms, so the coping strategies they provide may not be suitable for pianists.¹¹

The prevalence of PRMD in musicians is as high as 39%-87%,^{12,13} with a prevalence of 26-93% among pianists.¹⁴ However, PRMD is not only popular among professional musicians but also highly prevalent among student musicians, especially among tertiary students. The prevalence of PRMD among conservatory students ranges from 43% to 63%.^{15,16} Salonen¹⁷ suggests that 75% of student musicians have been affected by PRMD. Suffering from PRMD would make tertiary student musicians face slow learning progress, low learning efficiency, and even give up learning the piano.^{18,19} Due to the lack of attention in the healthcare field to tertiary student musicians, their experiences with PRMD are rarely publicized, so they have been neglected for a long time.^{20,21}

The research objects of the existing literature mainly include musicians who play different instruments, with the most investigation on orchestra musicians, less investigation on musicians who play a single instrument, and even less literature focusing on pianists.^{11,16} In addition, the risk factors for PRMD are different for musicians of different ages; young musicians are more likely to be injured due to lack of experience and over-practice, while old musicians are more likely to suffer from degenerative diseases.^{9,22} However, most existing literature does not distinguish the types of instrumental music musicians play and their age groups.²³ Therefore, it is necessary to conduct studies on musicians of similar ages and playing the same instruments to obtain more profound and representative results and fill gaps in the existing literature. This study is conducted in the context of China. In the field of professional or amateur instrumental music education in China, the piano is the preferred instrument for most students, and the proportion of piano students far exceeds other instruments.^{2,24} Therefore, this study chooses tertiary student pianists as the research object.

With the development of performing arts medicine, there have been many studies related to PRMD. Most studies related to the risk factors and coping strategies of PRMD are quantitative, and only a few qualitative studies have appeared. Ackermann et al²⁵ and Austen⁶ investigated the risk factors of musicians suffering from PRMD through interviews, and they found that excessive practice, lack of rest, and stress were the main causes of PRMD. The findings of these scholars were consistent with those of other quantitative studies, but their analysis of each risk factor was more in-depth and detailed than those of quantitative studies. Ryken et al²⁶ and Matei and Ginsborg²¹ investigated musicians' experiences of coping with PRMD. They found that musicians who actively sought medical help had better outcomes in coping with injuries than those who feared treatment. The literature investigating coping strategies of PRMD from the perspective of qualitative research is usually based on the details of musicians' own coping with PRMD and an in-depth analysis of their coping strategies and experiences with injury.

Quantitative studies can draw standard, precise, and objective conclusions about musicians' PRMD, but some conclusions are excluded, simplified, and lack sufficient evidence.²⁷ For example, in the investigation of PRMD risk factors and coping measures, quantitative studies usually conduct questionnaires on a large sample size of participants but ignore the risk factors not mentioned in the scale and ignore the individual differences in musicians' coping with PRMD. Compared with quantitative research, qualitative research makes it easier to find coping strategies that are less or not mentioned in previous literature and to find the personal and social factors that cause musicians to suffer from PRMD.⁴ Therefore, qualitative research is needed to supplement quantitative data to make research results more abundant and diverse. In addition, past literature has identified the benefits of investigating musicians' lived experiences related to PRMD in helping clinicians develop treatment plans,²⁸ noting that the most valuable part of the literature on musician PRMD is anecdotes from experienced practitioners about how to cope with injuries effectively. Thus, it affirms the significance of qualitative research.²⁹

In China, the term "PRMD" has not yet been popularized, and musicians' injuries related to performance are often referred to as "musicians' occupational diseases".³⁰ However, there are still few relevant studies and almost no studies related to tertiary student pianists. Therefore, this study comprehensively considered the actual situation of the study site

and the gap in past literature, narrowed the research scope to a homogeneous group of Chinese tertiary student pianists, and investigated their risk factors of PRMD and strategies to cope with PRMD through the description of their lived experiences. This study seeks to discover the factors and strategies rarely mentioned in the past literature, as well as the individual and social factors that are difficult to identify in quantitative studies. Although it is difficult to generalize qualitative research to a wider group of musicians, this study can be used as a preliminary study to strengthen the existing literature and provide new directions and possibilities for future research.

Material and Methods

Design

This study aimed to investigate participants' risk factors for PRMD and strategies for coping with PRMD from the perspective of their lived experiences using qualitative research methods. The term "lived experience" points this study towards a phenomenological approach. The research design of descriptive phenomenology is most suitable for this study. It allows the researcher to explore a specific experience or phenomenon from participants' personal experiences to gain insight into the common experiences of a homogeneous group without interference from the researcher's own experiences and ideas.^{31,32}

Participants

This study selected 12 student pianists from 7 higher education institutions in China as participants and conducted semi-structured in-depth interviews with them respectively.³³ All participants received informed consent before participating in the study and had the right to withdraw from the interview at any time without penalty. The participants agreed that their interview transcripts be quoted directly in this study anonymously. This study was conducted following the Declaration of Helsinki and obtaining official approval from the Ethics Committee for Research involving Human Subjects Universiti Putra Malaysia. Participants were selected using purposive sampling. The inclusion criteria for participants included: Participants were tertiary student pianists, were suffering from PRMD with at least level 3 severity (self-assessed according to the modified version of Fry's³⁴ method, the severity levels range from 0 to 7), were able to clearly describe and were willing to talk about their experience with PRMD, had strategies for coping with PRMD, and had received any medical treatment. Starting in August 2023, the researcher communicated with 42 tertiary student pianists with the help of piano teachers at 7 higher education institutions. They were briefed on the purpose and significance of the study, learned about their basic information related to PRMD, and asked about their willingness to participate in the study. After excluding candidates who did not meet the inclusion criteria and were unwilling to participate in the study, 12 participants were ultimately identified in November 2023.

The adequacy of sample size for phenomenological studies is tested by data saturation.³⁵ Most studies suggest that the optimal number of participants in phenomenological research is 6–12 and believe that data can reach saturation when 6–8 people are interviewed.^{36,37} The data in this study reached saturation when the 10th participant was interviewed, and no new themes emerged in subsequent interviews, thus confirming the adequacy of the sample size. [Table 1](#) presents the demographic characteristics of the participants.

Data Collection

Data collection for this study was conducted from December 2023 to March 2024, after receiving formal ethical approval and participants signing informed consent. Data for this study came from one-on-one semi-structured interviews with 12 student pianists at seven higher education institutions in China, with the researcher serving as the interviewer. Before the interviews began, the researcher introduced each participant to the purpose, significance, procedure, and potential risks of participating in this study (recalling the experience of suffering from PRMD may cause psychological discomfort). The time and place of interviews mainly depended on the participants' willingness. The researcher would try to create a warm and comfortable environment for each interview. The final locations were piano classrooms, cafes, dessert shops, and the researcher's home. The researcher preliminarily determined the interview questions based on the literature review and research purposes, and then they conducted a pilot study with five tertiary student pianists who met the inclusion criteria

Table 1 Demographic Characteristics of Participants (n=12)

Participant	Age	Gender	Education	Piano Learning Years	PRMD Severity
P1	23	Female	Master	8	Level 5
P2	21	Male	Bachelor	15	Level 5
P3	26	Female	Master	17	Level 4
P4	20	Female	Bachelor	16	Level 6
P5	20	Female	Bachelor	10	Level 6
P6	19	Male	Bachelor	9	Level 4
P7	17	Male	Bachelor	4	Level 3
P8	21	Male	Bachelor	8	Level 4
P9	22	Female	Bachelor	9	Level 5
P10	25	Female	Master	19	Level 6
P11	21	Male	Bachelor	10	Level 4
P12	22	Female	Master	18	Level 5

for this study. According to the pilot study results, the researcher slightly modified the interview questions and procedures and finally determined the interview guide (As shown in [Supplementary Material 1](#)).

During the interviews, the researcher and participants always maintained an open attitude. Interview questions might modified and added to the specific circumstances of each participant to obtain more comprehensive data. All participants were interviewed only once, and the interview officially ended when the researcher thought she had asked all the questions related to the research topic and that the participants had fully shared their lived experiences related to PRMD. The data reached saturation after the 10th participant was interviewed, and no new themes emerged. The average length of the interviews was 43 minutes. After obtaining the consent of the participants, the researcher recorded the entire interview and then verbatim transcribed it. Transcribed documents would be returned to participants for clarification and confirmation to ensure the accuracy of the data. The researcher must ensure the privacy and anonymity of participants. All recordings, transcripts, and basic information about the participants are kept in encrypted files on the researcher's laptop for academic purposes only, with no one but the researcher can access the information. In order to ensure the anonymity and privacy of participants, this study used P1, P2, ..., P12 to replace the real names of the 12 participants, whose identifying information would not be identified in the article.

Data Analysis

This study adopted Moustakas' improved Stevick-Colaizzi-Keen (SCK) phenomenological analysis method to analyze data and used qualitative data analysis software NVivo 12 to assist the analysis. The SCK method enables researcher to observe data using an iterative process and generate detailed and in-depth descriptions of participants' experiences.³² The analysis steps are as follows:

The first step is to transcribe interview records. The interview transcripts in this study were transcribed verbatim to enable researcher to record participants' lived experiences related to PRMD in their entirety. Since all participants in this study were Chinese and their oral English could not reach the level of in-depth communication, all interviews were conducted in Chinese. The transcripts were translated into English by the researcher, and then back translation was done to confirm whether the translated English was accurate. Then is familiarising. The researcher used open coding to classify the data and familiarize themselves with each participant's lived experiences related to PRMD. The third step is to identify significant statements. Identify significant statements from the verbatim records related to PRMD risk factors and coping strategies. The fourth step is to converting significant statements into formulated meanings. Draw specific meanings from significant statements. The next step is to categorise meanings to develop themes. Integrate the meanings behind each significant statement in order to develop themes relevant to the research objectives. Next up is exhaustive description. The identified themes are incorporated to provide a comprehensive and systematic description of the participants' experiences based on their statements. The seventh step is producing the fundamentals. Duplicate, abusive, and unimportant descriptions were removed from the composite structure, focusing on the fundamental structure of

participants' lived experiences related to PRMD risk factors and coping strategies. The last step is producing seeking verification for validation of findings. Transcripts and coding stripes were sent to participants to view if the researcher had accurately described their lived experiences.

Credibility

In order to ensure the credibility of this study, first of all, reasonable recruitment methods were used to ensure that participants met the research objectives. After data collection, the researcher transcribed the interview verbatim and sent the transcript and coding stripes to the participants for confirmation and clarification. In addition, some studies have found that the reporting of qualitative research is not transparent and standardized enough, which may affect the credibility of the research.³⁸ Therefore, this study used the 32-item list of Consolidated Criteria for Reporting Qualitative Research (COREQ) to evaluate the research team and reflexivity, and the study design, data analysis, and findings were reviewed to enhance the credibility of this study further.³⁹ As a phenomenological study, the researcher always maintain rigor as a research tool in the process of data analysis. A series of methods (using qualitative data analysis tool NVivo to assist analysis, not assuming possible results, separating the researcher from the phenomenon) are adopted to avoid personal experiences or bias affecting the results of data analysis. In addition, for a phenomenological study, it is important to avoid the subjectivity of the researcher affecting the results and to maintain the rigor of the data analysis. The researcher always maintains their identity as data analysis tools, avoids preconceived concepts affecting the research results, and does not make any assumptions about the research results in the data analysis process. The researcher also maintained communication with phenomenological research experts, tertiary piano teachers, and musculoskeletal clinicians throughout the study process, accepting their supervision and external review of the entire study process.

Theoretical Underpinnings

This study uses Bandura's Social Cognitive Theory (SCT) as the theoretical framework to support the research. SCT is a widely used theoretical model in health behavior and phenomenological research.^{40,41} SCT is suitable for this study because it focuses on the interaction of personal cognition, behavior, and environment.^{42,43} This study also focuses on the interaction of participants' personal perceptions and thoughts in social Settings and provides insights into their relevant lived experiences based on their behaviors related to PRMD. Bandura⁴⁴ argued that individuals can take control of their lives by increasing self-efficacy and outcome expectations and becoming self-regulators. Self-efficacy, self-regulation, and outcome expectation are also the three elements that this study focuses on. By assessing the components of SCT, this study provides a deeper understanding of student pianists' lived experiences associated with suffering from PRMD and coping with PRMD and how these experiences are influenced by personal, behavioral, and environmental factors. [Figure 1](#) is the theoretical framework of this study.

Results

Based on participants' lived experiences related to PRMD, this study identified nine themes related to PRMD risk factors and coping strategies from the perspective of personal, behavior, and environment factors of SCT, they are: self-efficacy, personal psychological factor, self-regulation, piano-playing factors, receive medical treatment, outcome expectation, negative effects from social relations, help from social relations, physical environment.

Personal Factor

Self-Efficacy

Participants felt that being a pianist meant their competence and worth, expressed their social identity, and could bring them happiness. They have a strong love and subjective initiative for playing the piano even if they suffer from PRMD. After suffering from PRMD, some participants also actively sought coping strategies and professional treatment because they wanted to continue their piano-playing career.

Being a pianist is a symbol of my ability and what others think of me. It also represents my identity and my future career path. So, no matter what kind of physical pain I suffered, I would keep playing the piano (P11).

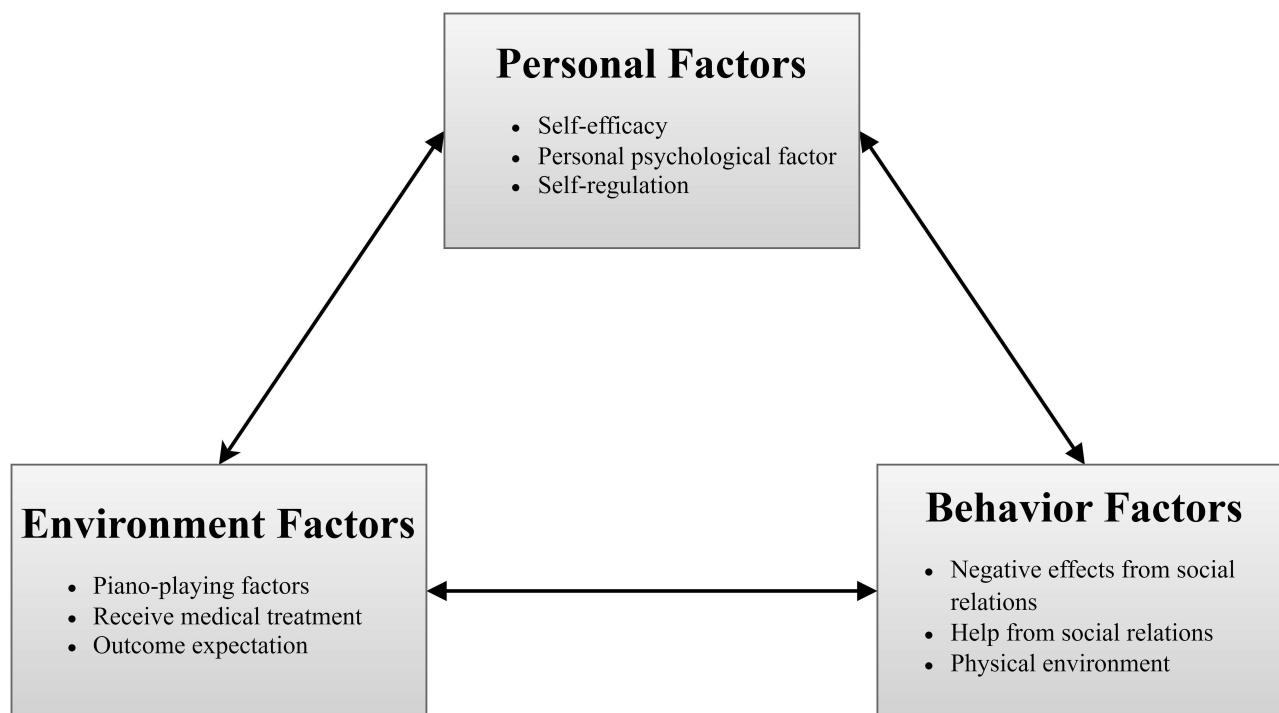


Figure 1 Theoretical framework of this study.

Playing the piano makes me feel that I am a valuable person and it can bring me happiness. It makes me feel like I have been creating my own little value for society and the world of music. Playing the piano is my lifelong love, and the piano is the most important friend in my life, so why would I give up my friend just because I am injured? (P4).

Playing the piano gives me a sense of happiness that I cannot achieve doing anything else. My family, friends, and classmates will appreciate me. I can move them with my playing, and they provide me with good emotional value. So, every day, I look for a way to heal my body, and I pray to get better soon (P2).

Some participants also mentioned that because of their love of playing the piano, they often continued to play despite physical pain, which was an important reason for their PRMD or worsening of the condition. Some participants also mentioned that their piano-playing ability was much worse after the injury, and even their daily life was affected by the physical discomfort. These experiences can cause participants to have negative thoughts and emotions, lose motivation to cope with PRMD and lose confidence to become professional pianists in the future.

After the injury, I could not help asking myself every day, can I still become a pianist after graduation? Will my health get worse? Am I still a pianist? Am I worth anything? I do not even want to play the piano anymore. It is too painful (P9).

I felt like I was losing faith in my body. Especially when my shoulder peri-arthritis and lumbar muscle strain were the most serious, I could not get out of bed, and I could only lie in bed and rest every day, and I needed help from my family for simple daily living (P7).

Personal Psychological Factors

The participants' own psychological factors also increased their risk of PRMD to some extent. P2 and P8 used to lack confidence in their piano playing, thinking their playing lagged behind other students, so they often forced themselves to over-practice. P3 and P9 have a certain degree of perfectionism. They would prolong the piano playing time and shorten the rest time when they were not satisfied with their playing, and they even wanted to present the best performance every time. These behaviors and mental states put a great psychological burden on the participants and also caused them to suffer injuries because their musculoskeletal muscles were unable to withstand the load caused by excessive practice. P10 and P12 suffered from performance anxiety. When they played in public, they got sweaty, chills, stiff bodies, and

twitching fingers. In severe cases, they could not even play a complete piece of music in public, and even if they did not perform in public, they would be nervous and uneasy when practicing the piano.

Performance anxiety is the biggest problem I face right now. Not to mention playing in the concert hall, I cannot play the piano properly now. Sitting on the piano bench, I began to sweat and get cold (P10).

One participant had severe peri-arthritis of the shoulder. The long-term pain and difficulty sleeping made her have insomnia, often needing to rely on sleeping pills to fall asleep, and sleep disorders led to the aggravation of her shoulder peri-arthritis.

Peri-arthritis of the shoulder has a great impact on my health and playing level. Especially at night, I have experienced countless sleepless nights, and I can only rely on sleeping pills to sleep. It is really hard (P5).

Self-Regulation

In coping with PRMD, participants would self-regulate by adjusting their playing techniques, improving their playing habits and lifestyle, and psychological adjustment. Almost all participants attempted to adjust their playing techniques and improve their playing habits after suffering PRMD. Participants would consciously warm up before formal piano playing after injury, and they would do some stretching exercises and finger flexibility exercises to adjust the body to the best state; they would also play some slow and simple piano works or play scales, arpeggios, and finger exercises to let the mind enter the performance state in advance, so as to reduce the possibility of injury in the process of playing. In addition, some participants also consciously took breaks during the playing, after high-intensity playing, and when PRMD was severe to relieve physical and mental tension and discomfort.

While trying to adjust my playing technique, I slowly understood that the fingers are only a fulcrum of the body's strength in the process of playing. Especially when playing difficult pieces, the pianist should try to transfer the power of the whole body to the fingertips and make full use of the power of the whole body rather than the simple force of the hand (P1).

When my tenosynovitis got severe, the doctor told me to take a month off because my condition was really serious. That month, I hardly played the piano. I followed the doctor's advice because I was afraid that I would leave the piano-playing career for medical reasons (P4).

In addition to changing their playing methods, the participants also tried to adjust and improve their daily lifestyle. Six participants mentioned the benefits of exercise for their pain and discomfort relief. Stretching, jogging, finger exercises, aerobics, yoga, and Pilates are the types of exercise they mention. After suffering from coercive spondylitis, P2 would pay special attention to the body's warmth and meals of nutrition, tied to avoiding blowing cold wind, drinking cold water, and other things that make the body feel cold. After diagnosing peri-arthritis of the shoulder, P5 began to pay attention to the balance of nutrition in her diet and avoid eating irritating things such as peppers and mustard. P11 began to learn about coping with PRMD after injury, hoping to learn more scientific and effective ways to cope with physical pain and discomfort.

Finally, two participants mentioned the benefits of positive psychological hints and meditation practice.

When practicing or learning a difficult technique, I would tell myself,

You can do it; you have the ability to play it

I think only when I am in a positive state can I actively devote myself to high-intensity piano playing and overcome PRMD (P3).

I think meditation practice is also useful. Every time I practice, my whole body feels relaxed. I feel that the whole person has entered a world without pressure and trouble, and my mind has been completely healed. My shoulder also felt relaxed, and the pain seemed to disappear for a moment (P1).

Behavior Factor

Among the behavior factors, piano playing factors, receiving medical treatment, and outcome expectations were the themes reported by the participants.

Piano Playing Factors

Participants cited prolonged over-practice and poor playing posture as important reasons for their PRMD.

I have been practicing piano for at least 8 hours every day since college. Even if I feel sick, I will not stop. Gradually, my fingers and palms began to spasm, and my palms would shrink uncontrollably when I played the piano. I found out I had focal dystonia (P3).

I found that not only me but also my classmates and teachers, when they played the piano, especially when they were involved in the performance, would unconsciously be in a state of hunchback, high and low shoulders, neck forward, and scoliosis. Holding such a position for a long time is definitely not good for the musculoskeletal (P5).

Playing difficult piano pieces and complex playing techniques also caused musculoskeletal injuries.

My fingers feel overstretched when I play Liszt, Brahms, and Rachmaninoff, and my shoulders and arms often feel strained and sore (P1).

Many Chinese piano works are adapted from ethnic instrumental music and folk songs. The harmony, form, and composition techniques are closer to the style of traditional Chinese music and the ethnic instruments, so some playing techniques are not suitable for piano. For example, I recently played Zhang Chao's "Pihuang". I needed to imitate the sound of many national instruments and deal with the complex rhythm in some passages, which made me feel very awkward fingers and quite uncomfortable (P11).

Some participants also mentioned that they had learned the piano professionally from a young age and had years of playing experience, so the early start of professional learning and accumulation of a long playing career were also potential risk factors for injury.

I have been aspiring to be a pianist since I was very young. I also began to play difficult piano pieces from a very young age. But I was still a child then, and the physical burden of these works may not be what a child can bear (P12).

Receive Medical Treatment

All participants had a history of medical treatment. Traditional Chinese medicine (TCM) therapy, physiotherapy, and drug therapy were the treatments they reported. TCM was the treatment the participants chose the most (N=8) and also the one that the participants trusted the most.

When I was hospitalized for lumbar disc herniation, the TCM doctor gave me acupuncture, moxibustion, and TCM massage. At that time, I could barely walk because of the pain in my lower back and back. However, after a period of treatment, I was able to get out of bed and do simple activities. So, I think Chinese medicine treatment is excellent (P10).

I visited orthopedic surgeons, took oral medications, and took triamcinolone injections. I also tried ultrasound and infrared therapy. In terms of Chinese medicine, I tried acupuncture and massage. As said before, I tried almost every form of treatment I could think of (P12).

It is important to note that although the participants all underwent different forms of treatment, none of them were completely cured. Most participants' symptoms of PRMD were only somewhat relieved after treatment, but it was very easy to relapse after stopping treatment or excessive playing the piano, and some participants' symptoms did not improve at all. But they still actively accept the treatment and do not blame the doctor for not curing them.

My doctor was very responsible and patient. Although my pain often recurs, I do not think the doctor is to blame. As pianists, as long as we do not stop playing, we are reusing injured body parts, so we cannot heal (P7).

Although my osteoarthritis has not been cured, I still trust the doctors. Tenosynovitis, shoulder and neck pain, dystonia, and so on, which we pianists often suffer from, are all chronic diseases, which do not mean that I will be cured by a visit to the doctor. I think the meaning of treatment is more to prevent the disease from getting worse and relieve the pain (P1).

Outcome Expectations

Participants' expectations about the outcome of coping with PRMD influenced their effectiveness in alleviating and treating PRMD, as well as their confidence in continuing their piano-playing career. Participants expected to find ways to cope with PRMD in anticipation of a better physical condition and a long-term piano-playing career.

I think the reason why I was able to continue to seek various coping strategies was because I always expected that one day, my tenosynovitis would recover, and I would be able to play without the limitations of my physical condition. I know it is hard, but I have been looking forward to it (P12).

However, such expectations need positive feedback to have a lasting positive effect. After trying various coping strategies and failing to improve their physical condition, some participants experienced feelings of disappointment, helplessness, and sadness and even lost motivation to continue to cope with PRMD and become professional pianists in the future.

During that time, I felt like I had lost my confidence in treating PRMD, and I felt like I was not going to recover. I also had no motivation to work hard for my future as a professional pianist. I felt inferior. I was a terrible pianist. I was a downer (P1).

When I found that I was ill, my condition was very serious, and I had no way to control the situation, I felt very helpless. I had some negative thoughts and I even thought about giving up therapy because it did not seem to be working either. I was so upset and sad (P5).

Environment Factor

Among environment factors, participants mentioned the influence of social relationships and physical environment on their experiences with PRMD.

Negative Effects from Social Relations

Almost all participants mentioned the influence of their piano teacher on their piano learning experience. As tertiary student pianists, piano teachers sometimes became a potential factor in their suffering from PRMD. Some participants' piano teachers were too strict and demanding of them to play, which caused them to over-practice because they wanted to meet the teacher's demands. Some participants had poor piano teachers, which led to them learning poor playing habits and techniques that could cause musculoskeletal injuries.

Before going to college, I met piano teachers who were very limited in their ability to teach. Sitting posture, hand shape, and playing techniques never seem to care, nor do they care about students' bodies, and they even think that pain is necessary to improve the ability to play the piano. Such unprofessional teaching also brought great risks to my health (P1).

In addition to the piano teacher, parents also had a profound influence on the participants. Some participants may live in a depressed family environment for a long time due to their parents' excessive expectations, rigorous and repressive parenting style.

I have been living in a very stressful and depressing family environment. My parents really want me to be a professional piano player like Lang Lang. They have been demanding me with this standard since I was a child and are very strict with my piano learning (P6).

Four participants mentioned how peer pressure affected them. They would be sad, anxious, depressed, and have other negative emotions because they compare with their classmates, think that their classmates are better than their playing ability, and worry that their playing ability is behind them.

The doctor told me to rest after my injury, but I saw my classmates practicing hard. I do not think I deserve a break and do not dare. But the more I thought about it, the more anxious I became, the more my fingers hurt, and the worse I played (P4).

Help from Social Relations

Although social relations were one of the risk factors for injury, they were also help and support participants after they suffered from PRMD. The piano teacher provided professional help to the participants, such as assisting them to improve their playing techniques and methods. Families offered emotional and financial support to participants. Classmates and friends provided them with company, encouragement, and an exchange of experiences as tertiary student pianists.

My teacher used to be very strict with me. He wanted me to spend all my time playing the piano. After the injury, I found he was gentler and began praising my playing. She also helped me adjust my playing techniques and methods and helped me find the best playing state for me" (P10).

”My family gave me unwavering support after I suffered from PRMD. They are paying for my treatment. They have always accompanied me, encouraged me, and taken good care of me in life (P2).

I met a group of like-minded partners, and we can exchange experiences and listen to each other. I am so grateful to them for giving me the motivation to face the pain and to continue to pursue my musical dreams (P8).

In addition to the close social ties, tolerance and understanding of the audience and listeners also reduced the psychological stress of the participants, giving them the motivation to maintain their piano-playing career and cope with PRMD.

After the injury, I had several sudden spasms of the palm and stiff fingers in concerts, which forced me to make many mistakes in playing. But my audience did not blame me. They applauded to show their encouragement. It really inspires me and keeps me motivated to keep playing (P12).

Physical Environment

In addition to social relations, four participants mentioned that the physical environment was also a risk factor for them to suffer from PRMD, which was mainly reflected in the two aspects of the place where they play the piano and the piano itself.

The piano room in our school is tiny. So, most of the time, I had to be assigned to a small, unventilated, narrow room to playing. Oh, and the piano room is not soundproof. I often can not hear myself playing. Especially in the winter, there is no heating in the piano room. I had to endure the cold of my body and the stiffness of my fingers during the playing. It is really bad for my fingers (P3).

The height of the piano stool and the distance between the body and the piano can not be ignored. If the height and distance are not appropriate, our shoulder and arm movements are in a state of absence, and the body will subconsciously tense and tighten. The power of the body cannot be transferred naturally to the fingertips. This is bound to cause physical discomfort (P6).

Discussion

Summary of the Findings

This study is the first to investigate the lived experiences of Chinese tertiary pianists related to PRMD. Using SCT as a theoretical framework, this study investigated the risk factors for PRMD and strategies for coping with PRMD from three dimensions: personal, behavior, and environment. This is a new attempt at performing arts medicine, which has innovative significance in methodology and theory.

Based on the lived experiences of the participants, this study explored the risk factors for their PRMD, the details of their coping with PRMD, and their subjective thoughts and feelings, and found risk factors and coping strategies that were less mentioned in the previous literature, thus filling in and expanding the existing literature.⁴⁵ This study can enlighten tertiary student pianists to pay attention to their health problems and provide them with some strategies to prevent and cope with PRMD. This study can also enable piano teachers and healthcare providers to understand student pianists’ lived experiences so as to provide them with more appropriate music education, health education, and medical help. Finally, from a qualitative point of view, this study identifies the personal and social factors that influence the tertiary student pianist’s PRMD-related experiences and provides some new possibilities and directions for future research.

Risk Factors for PRMD

Participants generally had a high sense of self-efficacy and expectation of results for playing the piano, which motivated them to continue playing for a long time and is an important reason why they continued to play even after suffering PRMD. However, their playing level and state would be affected due to physical discomfort, and even their daily life would be limited. Pianists face an awkward relationship between the need to perform and poor physical condition. This can reduce their self-efficacy and outcome expectations, making them lose hope and expectation for future playing careers and physical recovery, and even feel that they have lost their identity as pianists. Past literature has also

mentioned that suffering PRMD can reduce musicians' professional well-being, make them suspect, lose social support, and even interrupt their careers. Thus, experiences associated with PRMD give them a sense of "loss of identity".^{6,46}

This study supports the views of the literature. The psychological burden of the participants was partly external, such as high expectations from others, high learning pressure, high peer pressure, low support learning environment, and high-intensity playing demands. Some of it also comes from themselves, such as performance anxiety, perfectionism, lack of confidence, and self-doubt. Regardless of where these psychological burdens came from, participants felt varying levels of stress, anxiety, fear, and depression and could even be unable to play properly or force themselves to over-practice because of these emotions. However, as an injured student pianist, due to physical reasons, high-intensity piano playing not only fails to improve the playing ability but may lead to more severe physical pain and discomfort. The deterioration of the physical condition can lead to more serious psychological problems. Therefore, if the psychological problems of tertiary student pianists are not paid attention to and solved, it is easy to form a causal relationship and a vicious circle with PRMD.

Previous literature found that students majoring in music playing the piano for 6–8 hours on average every day, and long-term playing is an important reason why student musicians suffer from PRMD.^{47,48} As noted in the literature, participants also played for long hours each day and cited over-practice as the main cause of their injuries. Previous literature has also noted pianists' physical injuries from poor performance habits during playing.⁴⁹ Similar to previous studies, participants in this study believed that poor playing posture caused their injuries. This study also found that some piano playing techniques (octave, chord, arpeggio), some specific styles of piano works (Chinese piano works) and some composers' works (Liszt, Rachmaninoff) were also potential factors that caused the injuries of pianists. In addition, the participants' early start in professional piano learning and long playing career were also among the causes of PRMD. Pianists who began to learn the piano at a young age may bear a greater burden on their musculoskeletal system due to immature physical development, increasing the likelihood of suffering from PRMD in the long run.

The participants in this study were all tertiary student pianists, so the education they received was also a cause of their injuries. In their growth and learning process, piano teachers and parents have the greatest influence on them. SCT states that environment factors, such as social relationships, can support or hinder a person's behavior.⁵⁰ Παππά⁴⁹ points out that pianists are a less self-determined profession and usually do not have the freedom to schedule their work. The participants in this study were all tertiary student pianists who depended on their parents for financial support and teachers for guidance, so they may have had lower levels of self-decision-making. The excessive demands and expectations placed on the participants by their parents and piano teachers can put great psychological pressure on them, forcing them to play the piano intensively for long periods. In addition, many participants' piano teachers did not have good teaching ability and performance levels and could not provide good music education for students, resulting in them being injured because of learning wrong playing techniques and methods.

Finally, participants also mentioned the influence of the physical environment on them. As student pianists, the place where they learn and play the piano, the piano's structure, and other objective things that are difficult to change are also why they suffer from PRMD. Participants mentioned the physical harm caused by playing in a cramped, unventilated, unsoundproofed, cold piano classroom, as well as the effect of bench height and body position from the piano on playing comfort. Previous research has also found that other factors related to the instrumental itself, such as large piano size, heavy keys, wide keys, and poor quality, can cause damage to pianists.^{48,49,51}

In conclusion, although the most essential reason for tertiary student pianists to suffer from PRMD is playing the piano, the risk factors of PRMD are multifaceted. This study investigates the personal and social factors that lead to piano injury in tertiary students from a qualitative perspective. The results of this study support the previous literature and identify some specific risk factors that have been less mentioned in the past, thus proving the feasibility of using qualitative methods to study the risk factors of PRMD.

PRMD Coping Strategies

Previous literature has suggested that musicians generally have high career satisfaction, which enables them to persist in playing despite physical discomfort, and even think that sacrificing health for playing instrumental music reflects their artistic value.^{33,52} The study also found that participants' high self-efficacy and outcome expectations stemmed from their

identification as pianists and their love of playing the piano. They believed that being a pianist reflects their identity, ability, and value, so they would try to maintain their piano playing career even if they are physically injured, actively seek various measures to cope with PRMD, and expect their physical recovery and performance level to improve.

Self-regulation refers to the ability to monitor and manage one's energy state, emotions, thoughts, and behaviors in an acceptable manner.⁵³ SCT defines self-regulation and self-efficacy as a way of experiencing a greater agentic perspective to increase an individual's sense of efficiency in their behavioral performance and enhance agency beliefs.⁴⁴ Coping with PRMD is a long process, and participants do not always obtain others' help, so self-regulation is particularly important. Participants would reduce their musculoskeletal overuse by adjusting their playing techniques and improving their playing habits. Improving lifestyle can also reduce the likelihood of pianists suffering PRMD and worsening PRMD to some extent.^{11,49} In addition, previous literature confirmed the positive effects of psychological practice on stress management, reduction of PRMD induced by psychological factors, and coping with PRMD.⁵⁴⁻⁵⁶ This study found that in addition to professional regulation from psychotherapists, self-regulation of tertiary student pianists in the process of long-term coping with PRMD is also very important. The positive mental cues and meditation practicing the participants tried also helped relieve some of the psychological stress and physical pain and helped them establish an optimistic mental state.

Past literature has found that physical therapy, oral medications, injectable medications, and surgery are the most common ways to treat musician PRMD.¹¹ All participants in the study received different types of treatment, including traditional Chinese medicine (TCM), physical therapy, and medication. Unlike previous literature, the results of this study showed that participants were more inclined to choose TCM treatment. This result may be related to the location of the study in China. Participants believed that TCM has the least side effects on the body and can reduce the pain and discomfort of the body from the perspective of conditioning the body, so they have the deepest trust. At present, only a few literature have studied the coping strategies of PRMD from the perspective of TCM, but the existing literature also proves that TCM can effectively reduce the pain and discomfort caused by PRMD.^{57,58} Participants reported good results from physical therapy, but it was often expensive and required visits to fixed facilities, so it was not readily available to them. Only participants with severe PRMD received the medication, but they were concerned that it would negatively affect their health in the long run.

It is important to note that none of the participants in this study were completely cured. Most participants experienced only varying degrees of remission after treatment. This result is consistent with previous findings that PRMD in musicians is difficult to cure and prone to relapse.¹⁷ Participants cited for not being cured mainly because they could not stop playing the piano. They did not blame their therapist and believed that they had received short or long-term relief from treatment, so they had a positive attitude towards treatment. Tertiary student pianists had not yet formally entered the professional world, so they were more comfortable with therapy and did not worry that disclosure of injury would affect their playing career, which was in contrast to the distrust between musicians and therapists in previous studies.¹¹ Previous literature suggested that musicians who actively accept therapy and trust therapists are more likely to get good feedback in therapy, and this study further confirms the importance of injured musicians and therapists taking time to establish a trusting relationship.^{59,60}

In addition to self-regulation and medical treatment, this study also found that help from social connections had a positive impact on post-secondary student pianists coping with PRMD. Piano teachers, parents, classmates, friends, and even audiences and listeners can provide tertiary student pianists with different levels of support and help. SCT proposes that social and family support is the primary support for individual behavior by environmental factors.⁵⁰ Previous literature has highlighted the benefits of providing musicians a relaxed, trusting, understanding, and supportive work environment.^{58,61} Participants also reported that the help, understanding, and support provided to them by their non-medical professional social relations were also very important, such as piano teachers who helped students adjust poor playing habits and techniques, parents who provided emotional and financial support to participants, classmates and friends who provided companionship and encouragement, and audiences and listeners who were tolerant and understanding. While much of this help and support was mental and emotional, participants found it beneficial, giving them more courage and motivation to cope with PRMD and sustain their careers.

The focus of this study is not to explore coping strategies that are widely applicable to musicians but to investigate strategies and approaches that are feasible for tertiary student pianists based on participants' lived experiences of coping with PRMD and to understand their details, thoughts, and feelings in coping with PRMD, so as to inspire more pianists with similar experiences and to complement and expand the existing literature. The study also identified the importance of participants' own and social factors in their coping with PRMD, as well as the geographical characteristics of participants when choosing treatment modalities. The results of this study also highlight the importance of building a trusting relationship between musicians and therapists.

Strengths and Limitations

This study innovatively uses descriptive phenomenological methods and SCT framework to investigate the risk factors and coping strategies of tertiary student pianists suffering from PRMD, thus expanding the use of methodology and theory and providing more directions and possibilities for future research. In addition, this study is the first to investigate the lived experiences of Chinese tertiary student pianists related to PRMD, thus filling a gap in this research field. The results of this study also provide important guidance and references for tertiary student pianists themselves, educators, social relations, and healthcare workers to better deal with the health problems of student pianists. Although this study is a new attempt at performing arts medicine, it may be difficult to generalize the results to more pianists due to the small sample size. The data for this study came from one-on-one interviews, and although a range of methods were employed to avoid self-reporting bias in participants affecting study results, it is still not certain that bias is completely avoided. However, this study still provides some new research directions and practice areas and obtains the results that can support and enrich the previous research, thus proving the rationality and feasibility of this study. Future studies can try to use SCT to investigate musicians' health problems with a larger sample, and qualitative studies can also be used to further investigate more quantitatively studied topics related to PRMD, in order to strengthen and enrich the existing literature.

Conclusions

Based on social cognitive theory (SCT), this study investigated the risk factors and coping strategies of PRMD in tertiary students from the lived experience perspective. In coping with PRMD, it is important for pianists to receive professional treatment from health care providers, self-regulation, and help from social relationships. The study emphasizes the positive effects of developing high self-efficacy, high outcome expectations, and becoming a self-regulator for tertiary student pianists to cope with PRMD and maintain a piano-playing career. Piano teachers and parents should provide supportive education for tertiary student pianists and give them a healthy learning and growth environment. Social relations should give injured student pianists more understanding, tolerance, and support. Healthcare professionals need to develop coping strategies that are more appropriate for them based on their lived experiences and professional needs. This study hopes that in the future, more relevant fields can pay attention to the lived experience of injured tertiary student pianists and pay attention to the important but easily neglected group so as to improve their social security and well-being comprehensively.

Data Sharing Statement

Data are available from the corresponding author upon request.

Institutional Review Board Statement

This study was approved by the Ethics Committee for Research involving Human Subjects Universiti Putra Malaysia and the seven higher education institutions involved in the study ([Supplementary Material 2](#)).

Informed Consent Statement

Participants who were interested to participate in the present study signed informed written consent. Participants under the age of 18 received informed consent from their parents. Participants informed consent included publication of anonymized responses/direct quotes.

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References

1. Suzuki A, Mitchell HF. What makes practice perfect? How tertiary piano students self-regulate play and non-play strategies for performance success. *Psychol Music*. 2022;50(2):611–630. doi:10.1177/03057356211010927
2. Yong DQ, Li TH, Song K, Liu Q. Dui chengdushi chuangujian yinyue zhidu de jidian sikao [Some thoughts on the establishment of "Music Capital" in Chengdu. Music Exploration]. *Yinyue tansuo*. 2019;4:116–121.
3. Roos M, Roy J-S, Lamontagne M-E. A qualitative study exploring the implementation determinants of rehabilitation and global wellness programs for orchestral musicians. *Clin Rehabil*. 2021;35(10):1488–1499. doi:10.1177/02692155211010254
4. Cruder C, Barbero M, Koufaki P, Soldini E, Gleeson N. Prevalence and associated factors of playing-related musculoskeletal disorders among music students in Europe. Baseline findings from the Risk of Music Students (RISMUS) longitudinal multicentre study. *PLoS One*. 2020;15(12):e0242660. doi:10.1371/journal.pone.0242660
5. Zaza C. Playing-related musculoskeletal disorders in musicians: a systematic review of incidence and prevalence. *CMAJ*. 1998;158(8):1019–1025.
6. Austen C "I'm not injured, this is just my life": an exploration of the experiences of conservatoire students with chronic playing-related musculoskeletal disorders [doctoral dissertation]. Royal College of Music; 2020.
7. Wagner C Injuries in Professional Orchestral Musicians-An Overview of Current Data and Trends [doctoral dissertation]. 2023.
8. Rousseau C Prevention of musculoskeletal injuries in orchestra musicians [doctoral dissertation]. United Kingdom: Liverpool John Moores University; 2022.
9. Macdonald HM, Lavigne SK, Reineberg AE, Thaut MH. Playing-related musculoskeletal disorders, risk factors, and treatment efficacy in a large sample of oboists. *Front Psychol*. 2022;12:772357. doi:10.3389/fpsyg.2021.772357
10. Davies J. Alexander Technique classes improve pain and performance factors in tertiary music students. *J Bodyw Mov Ther*. 2020;24(1):1–7. doi:10.1016/j.jbmt.2019.04.006
11. Shanoff C, Kyurim K, Guptill C, Thaut M. Playing-related injuries and posture among saxophonists. *Med Probl Perform Art*. 2019;34(4):215–221. doi:10.21091/mppa.2019.4032
12. Walankar P, Patil N. A Cross-Sectional Study on Prevalence of Musculoskeletal Pain in Dhol Players in India. *Med Probl Perform Art*. 2021;36(2):72–77. doi:10.21091/mppa.2021.2010
13. Zięba E, Zieliński G, Ginszt M. Etiology and epidemiology of playing-related musculoskeletal disorders—a systematic review. *J Educ Health Sport*. 2019;9(7):115–135.
14. Panebianco C. Musculoskeletal and other performance related disorders in South African undergraduate music students. *J Occup Health Epidemiol*. 2017;6(2):61–69. doi:10.29252/johe.6.2.61
15. Gembris H, Menze J, Heye A, Bullerjahn C. High-performing young musicians' playing-related pain. Results of a large-scale study. *Front Psychol*. 2020;11:564736. doi:10.3389/fpsyg.2020.564736
16. Portnoy S, Cohen S, Ratzon NZ. Correlations between body postures and musculoskeletal pain in guitar players. *PLoS One*. 2022;17(1):e0262207. doi:10.1371/journal.pone.0262207
17. Salonen BL Tertiary music students' experiences of an occupational health course incorporating the body mapping approach [doctoral dissertation]. University of the Free State; 2018.
18. Kok LM, Huisstede BMA, Voorn VMA, Schoones JW, Nelissen RGH. The occurrence of musculoskeletal complaints among professional musicians: a systematic review. *Int Arch Occup Environ Health*. 2016;89(3):373–396. doi:10.1007/s00420-015-1090-6
19. Steemers S, van Rijn RM, van Middelkoop M, Bierma-Zeinstra S, Stubbe JH. Health problems in conservatoire students: a retrospective study focusing on playing-related musculoskeletal disorders and mental health. *Med Probl Perform Art*. 2020;35(4):214–220. doi:10.21091/mppa.2020.4029
20. Détári A, Nilssen TM. Exploring the impact of the somatic method 'Timani' on performance quality, performance-related pain and injury, and self-efficacy in music students in Norway: an intervention study. *Front Psychol*. 2022;13:834012. doi:10.3389/fpsyg.2022.834012
21. Matei R, Ginsborg J. Health education for musicians in the UK: a qualitative evaluation. *Health Promot Int*. 2022;37(2):daab146. doi:10.1093/heapro/daab146
22. Rader NC Body mapping-informed pedagogy in the beginning string classroom: a quantitative investigation [doctoral dissertation]. Boston University; 2023.
23. Ling CY, Loo FC, Hamedon TR. Playing-related musculoskeletal disorders among classical piano students at tertiary institutions in Malaysia: proportion and associated risk factors. *Med Probl Perform Art*. 2018;33(2):82–89. doi:10.21091/mppa.2018.2013
24. Zhu W. Study on the problems existing in Chinese piano education and improvement measures. *Kuram Uygul Egit Bil*. 2018;18(6):2775–2781. doi:10.12738/estp.2018.6.178
25. Ackermann BJ, Adams RD, Marshall ES. The experiences of pianists with playing-related musculoskeletal disorders (PRMDs): a phenomenological investigation. *Psychol Music*. 2015;43(4):480–495.

26. Ryken E, Wilcox LM. Preventative and treatment experiences of six musicians with playing-related musculoskeletal disorders. *Med Probl Perform Art.* 2017;32(3):167–175.
27. Taherdoost H. What are different research approaches? Comprehensive Review of Qualitative, quantitative, and mixed method research, their applications, types, and limitations. *J Manag Sci Eng Res.* 2022;5(1):53–63. doi:10.30564/jmser.v5i1.4538
28. Bastepe-Gray S, Riley MA, Klotchkov N, Supnekar J, Filippi L, Raghavan P. Ecology of musical performance as a model for evaluation and treatment of a musician with a playing related musculoskeletal disorder: a case report. *J Hand Ther.* 2021;34(2):330–337. doi:10.1016/j.jht.2021.04.025
29. Guptill C, Golem MB. Case study: musicians' playing-related injuries. *Work.* 2008;30(3):307–310.
30. Tang XY. Occupational diseases susceptible to teachers and piano players. *Chin J Ethnic Folk Med.* 2010;5:73–74.
31. Creswell JW, Poth CN. *Qualitative Inquiry and Research Design: Choosing Among Five Approaches.* Sage publications; 2016; doi:10.1177/1524839915580941
32. Moustakas C. *Phenomenological Research Methods.* Sage publications; 1994.
33. Xiaoyu M, Musib AF, Selvarajah IV. Subjective experiences of tertiary student pianists with playing-related musculoskeletal disorder: a transcendental phenomenological analysis. *Front Psychol.* 2024;15:1303046. doi:10.3389/fpsyg.2024.1303046
34. Fry HJH. Overuse syndrome in musicians—100 years ago: an historical review. *Med J Aust.* 1986;145(11–12):620–625. doi:10.5694/j.1326-5377.1986.tb139514.x
35. Shorey S, Ng ED. Examining characteristics of descriptive phenomenological nursing studies: a scoping review. *J Adv Nurs.* 2022;78(7):1968–1979. doi:10.1111/jan.15244
36. Thomas SP, Pollio HR. *Listening to Patients: A Phenomenological Approach to Nursing Research and Practice.* Springer Publishing Company; 2002; doi:10.5860/CHOICE.39-6465
37. Boddy CR. Sample size for qualitative research. *Qual Mark Res Int J.* 2016;19(4):426–432. doi:10.1108/QMR-06-2016-0053
38. Aguinis H, Solarino AM. Transparency and replicability in qualitative research: the case of interviews with elite informants. *Strateg Manage J.* 2019;40(8):1291–1315. doi:10.1002/smj.3015
39. Booth A, Hannes K, Harden A, Noyes J, Harris J, Tong A. COREQ (consolidated criteria for reporting qualitative studies). In: *Guidelines for Reporting Health Research: A User's Manual*; John Wiley & Sons. 2014:214–226. doi:10.1002/9781118715598.ch21
40. Painter JE, Borba CPC, Hynes M, Mays D, Glanz K. The use of theory in health behavior research from 2000 to 2005: a systematic review. *Ann Behav Med.* 2008;35(3):358–362. doi:10.1007/s12160-008-9042-y
41. Kosteli MC, Williams SE, Cumming J. Investigating the psychosocial determinants of physical activity in older adults: a qualitative approach. *Psychol Health.* 2016;31(6):730–749. doi:10.1080/08870446.2016.1143943
42. Becker CM, Bokor A, Heikinheimo O, et al. ESHRE guideline: endometriosis. *Hum Reprod Open.* 2022;2022(2):hoac009. doi:10.1093/hropen/hoac009
43. Quayam S, Abumehdi M. An Interpretive Phenomenological Analysis of paediatric cardiology trainee experiences during COVID-19. *Med Educ.* 2022;56(5):527–534. doi:10.1111/medu.14738
44. Bandura A *Social Foundations of Thought and Action.* 1986;23-28(1986) 2.
45. Rousseau C, Barton G, Garden P, Baltzopoulos V. Development of an injury prevention model for playing-related musculoskeletal disorders in orchestra musicians based on predisposing risk factors. *Int J Ind Ergon.* 2021;81:103026. doi:10.1016/j.ergon.2020.103026
46. McCready S, Reid D. The experience of occupational disruption among student musicians. *Med Probl Perform Art.* 2007;22(4):140–146. doi:10.21091/mppa.2007.4031
47. Parry CBW. Prevention of musicians' hand problems. *Hand Clin.* 2003;19(2):317–324. doi:10.1016/S0749-0712(02)00126-9
48. Allsop L, Ackland T. The prevalence of playing-related musculoskeletal disorders in relation to piano players' playing techniques and practising strategies. *Music Perform Res.* 2010;3(1):61–88.
49. Παππά Ε. The importance of proper upper-body posture in the prevention and treatment of playing-related musculoskeletal disorders (PRMDs) in pianists [master's thesis]. 2019.
50. Bandura A. Social cognitive theory: an agentic perspective. *Annu Rev Psychol.* 2001;52(1):1–26. doi:10.1146/annurev.psych.52.1.1
51. Yoshimura E, Chesky K. The application of an ergonomically modified keyboard. *MTNA e-J.* 2009;2009:2–13.
52. Park A, Guptill C, Sumsion T. Why music majors pursue music despite the risk of playing-related injuries. *Med Probl Perform Art.* 2007;22(3):89–96. doi:10.21091/mppa.2007.3021
53. McClelland M, Geldhof J, Morrison F, et al. Self-regulation. In: *Handbook of Life Course Health Development*; 2018:275–298. doi:10.1007/978-3-319-47143-3_12
54. Kuo FL Holistic Health and the Prevention of Performance-Related Musculoskeletal Disorders in Orchestral String Musicians [doctoral dissertation]. Canada: University of Toronto; 2012.
55. Fine PA, Wise KJ, Goldemberg R, Bravo A. Performing musicians' understanding of the terms “mental practice” and “score analysis”. *Psychomusicology.* 2015;25(1):69–82. doi:10.1037/pmu0000068
56. Keller PE. Mental imagery in music performance: underlying mechanisms and potential benefits. *Ann N Y Acad Sci.* 2012;1252(1):206–213. doi:10.1111/j.1749-6632.2011.06439.x
57. Harvie A, Steel A, Wardle J. Traditional Chinese medicine self-care and lifestyle medicine outside of Asia: a systematic literature review. *J Altern Complement Med.* 2019;25(8):789–808. doi:10.1089/acm.2018.0520
58. Stanhope J, Tooher R, Pisaniello D, Weinstein P. Have musicians' musculoskeletal symptoms been thoroughly addressed? A systematic mapping review. *Int J Occup Med Environ Health.* 2019;32(3):291–331. doi:10.13075/ijomh.1896.01340
59. Rotter G, Noeres K, Fernholz I, Willich SN, Schmidt A, Berghöfer A. Musculoskeletal disorders and complaints in professional musicians: a systematic review of prevalence, risk factors, and clinical treatment effects. *Int Arch Occup Environ Health.* 2020;93(2):149–187. doi:10.1007/s00420-019-01467-8
60. Ting A, Rucker J. Evaluation and treatment of musicians from a holistic perspective. *Open J Occup Ther.* 2019;7(4):1–10. doi:10.15453/2168-6408.1581
61. Ericsson K, Naber A, Laursen A. Exploring the Impact of Occupational Adaptation-Focused Interventions on Music Student Health. *OTJR.* 2023;43(4):608–615. doi:10.1177/15394492221142593

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