EFFICACY AND BENEFITS OF PROVIDING A SCREENING CLINIC FOR PERFORMING ARTS STUDENTS

By

Shaun Bean

Joanna Centeno

Elizabeth Williams

A doctoral project submitted in partial fulfillment
of the requirements for the

Doctor of Physical Therapy

Department of Physical Therapy
School of Integrated Health Sciences
The Graduate College

University of Nevada, Las Vegas
May 2022

UNLV | GRADUATE COLLEGE

Doctoral Project Approval

The Graduate College
The University of Nevada, Las Vegas

May 13, 2022

This doctoral project prepared by

Shaun Bean

Joanna Centeno

Elizabeth Williams

entitled

Efficacy and Benefits of Providing a Screening Clinic for Performing Arts Students

is approved in partial fulfillment of the requirements for the degree of

Doctor of Physical Therapy
Department of Physical Therapy

Catherine Turner, Ph.D.
Examination Committee Chair

Daniel young, Ph.D.
Research Project Advisor

Merrill Landers, Ph.D.
Chair, Department of Physical Therapy

Kathryn Hausbeck Korgan, Ph.D.
Vice Provost for Graduate Education &
Dean of the Graduate College

Abstract

In past years, University of Nevada, Las Vegas physical therapy students (UNLVPT) have provided UNLV dance students with screening clinics, injury evaluations, and treatment sessions to help address their need for direct and specialized services. Through this project, UNLVPT has worked to help reduce injury risk in dancers and provided treatment and rehabilitation for injuries that have occurred. Due to the COVID-19 pandemic, our group was unable to treat dancers in person over the course of the 2020-2021 school year. In response to these limitations, we worked to reformat our screening process to make it practical in a virtual setting. Part I of this paper discusses the rationale behind providing this clinic, and our successes and challenges faced with managing the clinic.

In addition to the virtual screenings, we were asked to help set up the College of Fine Arts Clinic for Health and Injury Prevention (CFA-CHIP). This clinic is a more permanent solution for providing care to all performing art students in the College of Fine Arts (CFA) at UNLV. Through this process, we also worked to develop a screening protocol for musicians based on injury risk factors and common injuries seen in musicians. Part II of this paper will discuss the need for injury prevention and risk factors for musicians, as well as propose a generalized screening protocol for all musicians to be used at the CFA-CHIP.

Table of Contents

Abstract……..……...iii

Table of Contents…….…….iv

Part I: Dancer Screening……1

Introduction……...1

Rationale and Justification of Need…….…….2

Potential Impact and Clinical Significance…….……..3

Purpose…….…….3

Methods…….……3

Results…….……..5

Student Reflections…….……..6

Discussion……...12

Limitations……..14

Suggestions for Future Students…….14

Part II: Musician Screening……..15

Musician Background…….15

Review of Research……15

Proposed Screening Protocol……..17

Summative Conclusions…….……..19

References……20

Curriculum Vitae……..24

Part I: Dancer Screening

Introduction

Injuries among collegiate dance students are prevalent, with a rate of 78%-95% for one academic year among pre-professional dance students (Caine et al., 2015; Kenny et al., 2018; L. Lee et al., 2017; Winden et al., 2019; Yau et al., 2017). Injuries can delay a student's progression through their dance program, impede their graduation, and in severe cases prematurely end their dance career (Ekegren et al., 2014). High levels of psychological distress, anxiety and paranoia have also been found in dancers after injury (Air, 2013; Mainwaring & Finney, 2017). Therefore, it is important to prevent injury, thereby increasing the career longevity and emotional well-being of dance students.

It is important to understand and analyze common risk factors that may predispose dancers to injuries. Injuries can be caused by a variety of factors that the dancer may or may not have full influence over (Armstrong, 2019). Bronner & Bauer (2018) state that common risk factors for dance-related injuries include "muscle tightness, motor control, previous injury," and flexibility (p.43). Hypermobility and hypomobility may also play a role in a dancer's ability to stabilize their lower extremities in frequently used dance positions, often at extreme ranges of motion (Campbell et al., 2019; Steinberg et al., 2012). Hypermobility may cause a greater injury risk due to less stability of the joint at extreme ranges of motion, and hypomobility may lead to injury due to compensations needed to complete dance movements causing added stress on other body parts. Repetitive motions in these positions can lead to overuse injuries (Yau et al., 2017; Lee et al., 2017). A lack of cardiovascular fitness has also been shown to increase risk of injury, especially when associated with fatigue (Bronner et al., 2016; Campbell et al., 2019; Twitchett et al., 2011).

Researchers and experts in the field of dance medicine have found that screening clinics may help with injury prevention, education for the self-care of injuries and fitness, effective dance training, and increased career longevity. Screening clinics may also help establish baseline data to monitor health and

performance, prior medical history, identify and rule out red flags, and determine readiness for the demands of dancing (Armstrong, 2019; Bronner, 2018). A systematic review and meta-analysis conducted by Armstrong and Relph (2018) found that the most utilized screening methods to predict injuries include the assessment of "range of motion (ROM), anthropometric data and posture, dance specific positions, hypermobility, clinical diagnostic tests, and musculoskeletal screening tools as current measurements that have been investigated as predictors of injury" (Armstrong, 2019). Although there is no consensus among researchers about what specific tests should be included in a standardized dance screen, we chose to model the framework of our outcome measures based on a study by Bronner (2018) which was conducted with collegiate-aged modern dancers. Similarly, the dance program at UNLV is heavily focused on modern dance. In Bronner's study, they were able to establish which screening tools were predictive of injury in a population of dancers that is very similar to the participants that were eligible to participate in our screening clinic. The screening tools selected test the mobility and strength of the dancers using positions that are common in dance.

Rationale and Justification of Need

Due to high injury rates reported in dancers, a screening clinic was thought to be beneficial in injury prevention and treatment for the dance students at UNLV. This clinic provided UNLV dance students with specialized care that they didn't have direct access to on-campus, unlike other college athletes at UNLV who have access to athletic trainers. For some dance students, it might have been their only access to specialized healthcare outside of the limited care that can be provided at the campus health center. In 2019, up to 41% of UNLV undergraduate students qualified were defined as low-income, which can limit their access to health insurance and care (Casey, 2019; CollegeSimply, n.d.). Therefore, this clinic was essential in providing UNLV dance students access to care they otherwise might not receive.

During our time running the screening clinic for the dancers at UNLV, the COVID-19 pandemic affected care delivery. Taking proper precautions to prevent the spread of this disease and maintain social distancing and safety required us to adapt and change our delivery of services to a virtual model, utilizing telehealth or telerehabilitation. In their position on telehealth, The American Physical Therapy

Association states that "Telehealth is a well-defined and established method of health services delivery. Physical therapists provide services using telehealth as part of their scope of practice, incorporating elements of patient and client management as needed, to enhance patient and client interactions" (American Physical Therapy Association, 2019). The use of telehealth services for screening and evaluation is a valuable resource to assist with the assessment of function and risk for injury in the dancers at UNLV.

Potential Impact and Clinical Significance

Providing a screening clinic for UNLV dance students allowed direct access to healthcare for the evaluation, prevention, and treatment of injuries. It also provided education and clinical practice experience for the physical therapy students who provided the screening services. These services helped to maintain an ongoing relationship between the UNLVPT Department and the College of Fine Arts and helped to promote health and wellness education for the community.

Purpose

This service-learning project was implemented to provide UNLV dance students with access to essential, specialized, and preventative care directly on campus. It also allowed us, as students, to gain valuable, hands-on experience working in the physical therapy field.

Methods

Recruitment

UNLVPT students attended each dance class at the beginning of the Fall 2020 semester, to pass out fliers and inform the students of the dance screening clinic and the benefits associated with participating in the clinic. During the Spring 2021 semester, COVID-19 precautions prevented in-person presentations, so the screening clinic information was given in a virtual format. Dancers were also informed of the evaluation and treatment services that were offered. Dancers were provided with contact information to email or text the student physical therapists to schedule appointments for either a screening or evaluation/treatment session. The virtual sessions were scheduled and conducted through the video conferencing platform Zoom.

Dance Screening Clinic

After scheduling an appointment, the dance students attended a Zoom meeting with two student physical therapists. The dance student was instructed before the meeting to be dressed in appropriate athletic clothing, in an open space with a sturdy chair or counter to use for balance and a camera placed at an appropriate distance so the entire body was visible. They were also emailed a demographics form to be filled out before the meeting. The student physical therapists instructed the dance student through several screening measures testing for strength, flexibility, balance, and specific dance techniques. These findings were recorded on a copy of the dance screening protocol. Listed below are the measures used on each dance student who participated in the screening. Following the screening process, the student physical therapists discussed the results of each test with the dance student. They also provided the dance student with a home exercise program of therapeutic exercises to perform to address specific deficits and risk factors that were discovered during the screen.

Outcome Measures

- Beighton Scale for hypermobility
- Brighton Criteria
- Muscle flexibility
- Single leg stance in parallel passé
- Dance based movement performance
    - Turnout - range of external rotation motion at the hips
    - Second position grand plié
    - Développé à la seconde: Stance side
    - Jumps in first position

These outcome measures were taken from a protocol designed by Shaw Bronner, PT, Ph.D., OCS in *Components of Adolescent Dance Screens: What Should We Include?* (Bronner, 2018). Her protocol is based on 20 years of screening pre-professional dancers and was created to prevent common injuries, and the components of her overall screening were most predictive of the risk of injury (Bronner,

2018). We selected this screening because of our similar population of dancers. However, due to the limitations presented with virtual screenings and being unable to physically assess participants, some items from the original screening design were removed or modified to fit the virtual format. This included much of the cardiovascular fitness testing, such as the 3-minute step test and step-down test, due to possible limitations in equipment available to participants.

Evaluations and Treatment Sessions

Dance students were provided with an opportunity to schedule and attend virtual physical therapy evaluations and treatment sessions. In addition, they completed demographics and outcome measure forms before their session. During the evaluation or treatment session, the dance student was questioned about their current level of function and any self-identified deficits related to a possible injury. They were then instructed to perform specific movements to assess their functional mobility and the impairments caused by the injury. Based on the results of these tests and questions, the student physical therapists worked with a licensed physical therapist to provide education and therapeutic exercises for the treatment of the identified problems and refer the dance student to other medical providers as needed. The dancer was also provided with a copy of the suggested therapeutic exercises via email. The exercises shared with the dancers were compiled from the home exercise program databases *Medbridge (https://www.medbridgeeducation.com)* and *Hep2go (hep2go.com)*. The evaluation and treatment sessions were electronically documented, printed, signed, and stored in a secure box with the licensed physical therapist. The student physical therapists checked in with the dancer via email one week and one month after their treatment session. The dancer was also given the opportunity to schedule follow-up appointments as needed.

Results

The COVID-19 pandemic provided some unique challenges to providing virtual healthcare. In our service-learning project, we were able to design a virtual screening protocol for dancers based on evidence-based protocols that are used in person and have been used in the screening clinic with prior service-learning groups from UNLVPT. Despite having the tools to run a virtual clinic, we had difficulty

with the recruitment of participants. Similar results were also seen for evaluation and treatment sessions. In the end, we were able to do one screening via Zoom and one evaluation in person.

Due to the difficulty of recruiting participants for the screenings, we set up two educational seminars: one on injury prevention and one on the structure of our screening program. These seminars were designed to be given during the dancers' seminar class to help reach out and educate the dancers on the importance of injury prevention. With the input and cooperation of Cathy Allen, an associate professor in the dance department, these seminars were presented to an estimated class size of 25 students. The seminars had to be done virtually and were pre-recorded due to the COVID-19 guidelines and scheduling conflicts between the dancers' class schedules and the physical therapy students' class schedules. This prevented us from being able to answer questions or concerns as the seminar took place.

In addition to setting up a virtual screening clinic, we were also asked to help set up CFA-CHIP. This new clinic was established to allow access to healthcare and injury prevention for all College of Fine Arts students. In order to facilitate the opening of the clinic, we wrote the standard operating procedures (SOP) guidelines that would pave the way for opening the clinic to students from the College of Fine Arts while following COVID-19 safety protocols. Once the SOP was approved, a screening room that will be used for screenings and treatment sessions was set up with the appropriate equipment needed to conduct thorough screenings and assessments.

Student Reflections

To grow and learn as professionals during this experience, we, the student physical therapists, have each compiled reflections that discuss what we discovered and learned from this experience before, during and after this project. Reflecting on our time during this project allows us to see how we have grown as professionals and how we can apply what we have learned to our future careers as physical therapists.

<u>Shaun Bean</u>

Pre-project reflection:

I am excited to be a part of this service-learning project that will provide a screening clinic for dancers as it will be an excellent resource for the performing arts students at UNLV, while also helping me to grow as a future clinician. For these students, access to healthcare and the education to treat and prevent injuries is important because of the high demand that is placed on their bodies due to the dynamic movements required for high-level performance. This service-learning project screening clinic will allow those students to maintain their health and learn how to recover from the demands of their chosen pursuit, without the barrier of access to services or funds. As I pursue a career in the field of Physical Therapy, I want to be able to work with athletes and help them pursue their own goals and get them back to competition, so this will be a great opportunity to develop some of the skills needed to do that. Providing this screening clinic will help us as physical therapy students develop clinical reasoning skills and apply some of the concepts that we have been learning about in the classroom. I believe I have the skills and knowledge necessary to help these students with the help of my classmates, and under the guidance of our faculty mentor I believe we will provide a valuable service that makes an impact in our community.

During project reflection:

This service-learning project was met with many challenges during the fall semester. The pandemic made it difficult to conduct any screenings or evaluations. Instead of the in-person screenings that we planned on doing, we had to transition to virtual screenings instead. This means that we had to adjust our screening protocol to only include the tests that didn't require hands-on touch. So far during this past fall semester, we were only able to recruit one participant for a screening. Even though we were not able to schedule more screenings and have a bigger impact, I am grateful for the opportunity to help that one dancer. The screening allowed us to identify some of the areas that she had weaknesses in and provide good resources and exercises for her to improve. Helping to conduct this screening allowed me to work on my clinical reasoning skills as well as my communication skills. I could see how limited we were however with conducting a virtual screening instead of a physical one. We may not have had as many participants as we would have liked, but I think even helping one person out makes this clinic a success.

Post-project reflection:

The past year has been difficult for a lot of projects, and ours was no exception. We were only able to recruit one more participant in the Spring semester for an evaluation. We were fortunate to have the opportunity to record two seminar presentations to share with the dance students, and I feel like that was helpful for them. We recorded a presentation on tips for injury prevention in dancers and another one on what happens at our screening clinic. As a future clinician, it was helpful to prepare these presentations and think about some of the dance-specific topics that we would need to discuss. This is something I will have to do as I evaluate and plan treatments for future patients, so it was good to get in some practice. Although we did not get as many participants as we would have liked, I still found value in what we did, and I hope that we can provide good insight for future cohorts to conduct this project going forward. As we helped develop a standard operating procedure to get the CFA-CHIP clinic going, we did see a need to think about future screenings for musicians since they have access to the clinic as well. We added more research about this to our project, and even though we didn't find a specific screening protocol we did find some good ideas for future students to use. I feel like this project is set up for exciting things in the future. As I reflect on what we worked on the past year, I feel grateful that we were able to help the students that we did. It helped me to grow as a clinician and apply the clinical skills that I have learned, and through the presentations and this paper I learned how to find the answers I need through research.

Joanna Centeno

Pre-reflection:

This service-learning project will provide essential and specialized care to UNLV dance students. As established in the literature, dance injuries are commonplace. This screening clinic will help prevent injuries and provide education for injury self-care and rehabilitation. I am passionate about helping fellow college students, knowing the limited amount of healthcare options that may be available to them. I am looking forward to utilizing the foundational clinical and reasoning skills I have learned in the UNLV Physical Therapy Program to reduce and treat dance students for this project. This project is not only beneficial to the dance students, but it will also provide us physical therapy students with a valuable educational and clinical experience.

During reflection:

Similar to other projects this year, we faced many challenges due to the pandemic. We were unable to perform screenings and evaluations in person during the Fall semester forcing us to adapt and restructure our screening protocol virtually. This made some components of the screening difficult to perform, such as the 3-minute step test, muscle flexibility tests and step-down test. Unfortunately, we were only able to recruit one participant this semester. However, I am grateful for this experience despite the difficulties we faced in performing the screening virtually. I learned how to adapt to challenging circumstances and gained experience in working with a participant virtually. I am also grateful for the opportunity to help a dance student and further develop my clinical reasoning skills by helping to create an exercise plan from the results of the screening.

Post-reflection:

We experienced many challenges throughout this project because of the COVID-19 pandemic. In the Fall semester, we were only able to perform one virtual screening and no treatment or evaluation sessions. Therefore, in the Spring semester, we tried additional strategies to recruit more participants. We sent out multiple emails to dance students and instructors. We also created a presentation and seminar videos for the dance students to watch. We hoped the videos would help provide education in injury prevention as well as encourage dancers to reach out to us. Recruitment during the pandemic was probably the most difficult challenge we experienced in this project. This semester we also helped set up the CFA-CHIP clinic. This clinic allowed us to expand the project to other Fine Arts students. After completing further research on this population, I learned how common injuries can be and how physical therapy can help. I think this would be an amazing opportunity for future physical therapy students completing this project to learn and help fine arts students with injuries. After the approval of our SOP, we were also allowed to perform screenings and evaluations in person. Unfortunately, we were only able to recruit one more participant at the end of the Spring semester. Although we did not get as many

participants as we would have liked, I am grateful for the opportunity to work on this project. The challenges we faced taught me to adapt to changing guidelines. They also helped me develop critical thinking and clinical reasoning skills that are necessary for developing our SOP for the CFA-CHIP clinic.

Elizabeth Williams

Pre-reflection:

This service-learning project is not only important to the community we are serving, but it is also important to me because I can relate to it on a very personal level. I grew up dancing for over 12 years. I was in the studio four or five nights a week learning routines and rehearsing for our annual show. During those years of dancing, I had several injuries that required me to go seek care from a physician or physical therapist, and oftentimes they didn't have direct knowledge about dance-related injuries or how to prevent them. Participating in this project allowed me to gain more knowledge of dance injuries and how to best treat them, which I plan to apply to patients in the future. For the dancers from UNLV who are seeking out assistance, the service-learning project allowed them to have direct and free access to specific screening tools to help prevent injuries during their dance careers. It also allowed the dancers to reach out and receive treatment from students who understand dance injuries, allowing them to have even more specialized treatment. I believed I was the right person for this service-learning project because I was better able to relate, through my personal experiences, to what the dancers were going through. This, coupled with the knowledge of physical therapy I have learned at school, helped make sure that the screening tools and care we gave the dancers were applicable not only to their injury but also functionally related to the skills needed to be a dancer. This service-learning project was of great benefit to the dancers of UNLV and the Doctor of Physical Therapy (DPT) students who have previously participated in the project. It gave dancers specialized care, as described above, and allowed the DPT students to gain essential, hands-on knowledge in the field of physical therapy that they can use in the years to come.

During reflection:

Initially, our project was somewhat put on hold due to the pandemic, but we were able to modify it to allow us to be able to hold our screenings virtually. In addition to this, we were able to put together

two seminars that we shared with the dancers during one of our classes. This allowed us to still connect with them and educate them on the importance of the screenings and seeking treatment when they are injured even when we couldn't go into their classes and speak with them. Having to transition to an online format wasn't too challenging, as there is already an in-person protocol from previous years that has been shown to be effective. Many of these tests we were able to do virtually, but the hard part was relying on what the dancer was telling us they were feeling and what we were seeing on a screen. By not being able to manually do some tests and only seeing them on a screen, it was harder to compare sides and see some limitations in motion. We also couldn't do additional tests if we wanted to look into something more. The experience of having to perform telehealth is still a valuable one and I am happy that I was able to learn about it and go through the full screening at least once. Telehealth will likely continue to be an option for patients in physical therapy in the future, and because of this project, I can take the skills I learned and apply them to future patients.

Post-reflection:

Our project faced a lot of challenges because of the pandemic, similar to many other projects. Because of the pandemic, we were only able to do one virtual screening and one in-person evaluation over the course of the year despite sending out lots of information to the Department of Dance. Because of this, we relied on the seminars that we organized to educate the dancers in the hope they would reach out to us. Recruitment is one potential area future groups should continue to work on to help give the dancers the best opportunity to stay healthy and prevent injuries. One major positive thing that occurred during the past year was the installation of the CFA-CHIP clinic. We had been told of the potential for this project to come to light and we were happy to be a part of its opening. The need for specialized care for all fine arts students is great and I think it is a wonderful opportunity for physical therapy students to gain more knowledge of this population while also fine-tuning their skills. To help future students who will be a part of the CFA-CHIP clinic, we worked to put together a screening protocol for all musicians. However, because there was no evidence-based protocol for all musicians, this protocol will likely change and evolve as more musicians are treated in the clinic. Overall, I learned a lot from this project. I was able

to challenge my critical thinking skills and learn to adapt to ever-changing safety guidelines. This was especially true when putting together the SOP for the CFA-CHIP clinic. These skills will continue to prove useful in the future as a physical therapist because I will see patients who won't fit a cookie-cutter mold of a diagnosis. I will need to be able to adapt to what they are feeling and how they are presenting to give them the best treatment possible.

Discussion

This servicing learning project was designed to provide free screenings to the dancers of UNLV and provide them with strategies to prevent injury during their dance career, as well as evaluate and treat those who may have become injured. Providing this service-learning project during this year of challenges gave us some great insight into the importance of this project for those that utilize it, and how we can implement changes for future DPT students who run it in the future. As we worked through adapting to the barriers that were placed before us, we were able to find out what worked and what didn't.

Due to the health and safety guidelines that were put in place during the pandemic, we had to transition to virtual delivery of the screenings and evaluations. This experience showed us that it was possible to adapt the screenings to this format if there are barriers to in-person meetings, but it also revealed that the screening can't be as thorough since we were not able to properly assess the range of motion or aerobic capacity. We were limited to assessments that we could see through video and the tools available to the participant where they were completing the tasks.

The pandemic regulations also may have had an impact on the interest in participation of the dance students. In previous years, this project has typically drawn interest from several students per semester. The group of physical therapy students from the class of 2021 that participated in this project last year screened 3 dancers, conducted 7 injury evaluations, and provided 8 treatment sessions, although they were also affected by the pandemic halfway through their Spring semester. The class of 2020 group that was unaffected by the pandemic conducted 14 screenings, 6 initial evaluations, and 11 treatment sessions.

This year we were only able to conduct one screening in the Fall and one evaluation in the Spring. We believe that part of this was a lack of perceived value from a virtual screening or a limited exposure to the availability of the screening due to reduced in-person classes across campus. We were able to present the information to the dance students in-person at the beginning of the Fall semester, but we could only share a video with the students at the beginning of the Spring semester. This limited exposure, especially during the Spring semester since we were only able to share a brief video during their class. This may have not allowed them to fully understand the importance of these screenings or the value that could be provided. We were also not present in the class, so they weren't able to ask any questions to help them understand it better.

As part of our adaptation process, we also provided some seminar videos that were shared with the dancers. The first video we shared was a seminar presentation on injury prevention for dancers. This provided a lot of the information that they might get from participating in a screening with us, along with some general health and wellness tips to prevent injuries. We also shared a video explaining our screening protocol in lieu of an in-person presentation to recruit participants. These videos were useful for providing information to the dance students, but since we were not able to attend in person it limited our ability to answer questions or convey the importance of our project to the dancers. Because of the limitation of being unable to present this information in person, our efforts to recruit participants were severely limited. With fewer participants, we were unable to determine if our video seminars were beneficial to the dancers since we did not receive direct feedback related to the content from the dancers.

During the Spring semester, we were able to draft and submit an SOP request to return to in-person screenings. This was in response to getting a space to conduct screenings in the new College of Fine Arts Consortium of Health and Injury Prevention Clinic, also known as CFA CHIP. This SOP allowed us to safely return to conducting screenings in person at the new clinic, where we had access to a room set aside for our use with the equipment necessary to complete all aspects of the screenings and evaluations. Even with this space, however, we were only able to conduct one evaluation during the Spring semester. Again, this may be due to being unable to recruit participants in person. However,

designing an SOP allowed us to gain insight into the intricacies of creating a safe place for healthcare professionals, a practice we will have to continue to perform upon starting our careers.

Limitations

Our ability to recruit participants in this project was limited due to the COVID-19 pandemic and a lack of access to in-person recruiting. The screenings themselves were limited to virtual screenings and this shortened our protocol, which will not allow for a full risk screening. This may lead to missing important information and might alter the suggestions that we can make to the dancers that were screened. As we moved into the new CFA CHIP clinic, we realized that we only had a screening protocol for dancers. This clinic is open to all College of Fine Arts students, so there is a need for injury risk screenings for other students.

Suggestions for future students

As we have expanded the scope of our project to look at screening protocols for musicians, we have decided to include suggestions for future students in the concluding paragraph at the end of the paper.

Part II: Musician Screening

Musician Background

Musculoskeletal disorders and injuries are highly prevalent in professional and student musicians, with a reported rate of 41 to 97% per year (Rotter et al., 2020; Steemers et al., 2020; Wolff et al., 2021). The incidence rate and location of injury can vary based on several factors including instrument type, practice and performance routines, and experience level (Wolff et al., 2021). Student musicians tend to report a higher rate of injury than professional musicians, with string players reporting the highest rate of injury (Wolff et al., 2021). Though there were varying rates and types of injury, some commonly reported risk factors were repetitive movements, prolonged asymmetrical posture such as an elevated arm position, playing a string instrument, and female sex (Kok et al., 2016; Rotter et al., 2020; Wolff et al., 2021). Injuries affect performance, career longevity, and musculoskeletal and mental health, and contribute to the high healthcare costs for professional musicians, with an estimated $187 million annually (Wolff et al., 2021). Therefore, it is important to prevent injuries and establish proper postures and healthy habits in musician students.

Review of Research

Using the PubMed database, searches were done using the following keywords and phrases: “musician injury screening,” “physical therapy and musicians,” “musculoskeletal screening for musicians,” “physical therapy and musician injury,” “musician injury prevalence,” “musician injury incidence,” and “musician injury risk factors.” Since this paper is meant to propose a potential screening protocol for musicians being seen at CFA-CHIP, articles were included if they contained relevant information concerning screening protocols, injury incidence and/or risk factors in musicians, and injury prevalence among musicians.

Based on these findings, we have learned that there are no generalized screening protocols that have been developed for musicians. As shown from research related to other areas like dance, screenings have proven to be effective in predicting and preventing injuries (Clark et al., 2013). With respect to musicians, it has been proposed that any developed screening should look at the musician as a whole

including “psychological, physical, and behavioral” viewpoints (Clark et al., 2013).” To create a well-rounded screening tool, those implementing the tool must have detailed knowledge on the variations of each instrument a musician may play, and the unique demands that are placed on different musicians. For the purposes of this project, a generalized protocol for all musicians will be proposed based on the idea that there are injuries that are more prevalent than others among musicians.

While playing their instrument, musicians are often required to sit with good posture and use their arms and hands for prolonged periods. Based on our knowledge of the human body, we know that staying still or performing the same motion repetitively can lead to injury. The same is true for musicians who experience musculoskeletal injuries (Hansen & Reed, 2006). Based on an article from Steinmetz et al in 2012, musicians were more likely to identify areas of pain in their body if they experienced playing-related musculoskeletal disorders than those who did not, making pain one common complaint of musicians. In those who play string instruments, common injuries include overuse injuries, focal dystonia, neuropathies, and hypermobility and hypomobility issues (H.-S. Lee et al., 2013; Steinmetz et al., 2012). These issues are often related to the spine and shoulders but may also involve any joint in the upper extremity (H.-S. Lee et al., 2013). Other sources have cited musculoskeletal issues related to posture, excessive force, overuse, insufficient rest, and osteoarthritis in more than those who play string instruments (Hansen & Reed, 2006; Kok et al., 2016; H.-S. Lee et al., 2013; Rotter et al., 2020). Many of the symptoms associated with these types of injuries can present as weakness, numbness, tingling, loss of range of motion or pain (Hansen & Reed, 2006). These injuries and symptoms can lead to decreased playing time, loss of speed or volume and difficulty playing one's instrument (Hansen & Reed, 2006).

Currently, the most common treatments used to treat symptoms the musician may be experiencing are use of NSAIDS, physical therapy, rest, and in severe cases surgery (H.-S. Lee et al., 2013). Other modifications can be done to help ease the musician’s symptoms such as room temperature, correcting the fit of the instrument, properly fitted chair and music stand, or being in a well-lit area (Hansen & Reed, 2006). Our proposed screening will address the musculoskeletal concerns or impairments of the musician while educating them and helping them to reach out to other music

professionals when a more specialized technique is needed. Current research has shown that physical therapy has helped to treat musculoskeletal injuries that are commonly experienced by musicians. Screening for these injuries should be comprehensive and look at many areas such as range of motion, strength, nerve tension, and other things related to a musician's playing time and posture (Clark et al., 2013; Hansen & Reed, 2006; Rotter et al., 2020). As discussed before, the screening should also address the psychological and behavioral aspects of the musician (Clark et al., 2013).

Proposed Screening Protocol

As discussed in our review of the research, we could not find a specific screening protocol to implement for future students that are conducting screenings and evaluations at CFA CHIP. Instead, we have decided to take the information that we gathered from the research based on common injuries and risk factors to make some suggestions for screening assessments. This list is not meant to be exhaustive or used as a checklist, as there are many different demands placed on musicians depending on what instrument they play. Screenings for musicians should be individualized examinations. Components of the exam should include a questionnaire that includes patient history and current load/intensity, and a thorough physical exam to assess posture, mobility, and musculoskeletal limitations. An outline of suggested assessments is listed in Table 1.

Table 1: Outline of Proposed Musician Screening

Musician Screening Outline	
Questionnaire	Playing experience Daily/Weekly playing time Any changes in load/intensity Injury history Current pain/limitations Fitness level Sleeping habits Nutrition Assessment
Playing Posture Assessment	Specific to the instrument played ● Seated ● Standing
Beighton Hypermobility Scale	
Range of Motion	Shoulder Elbow Wrist Hand Cervical Trunk
Manual Muscle Testing	Shoulder Elbow Wrist Hand Cervical Trunk
Nerve Tension Tests	
Pain Provocation Tests	

These tests along with the questionnaire will provide a good indication of musculoskeletal limitations and risk for injury for musicians. As many injuries for musicians are due to overuse, it will also be important to include patient education on proper rest and gradual load/intensity progression.

Summative Conclusions

In conclusion, injuries among dance and music students are very common. Injuries affect performance, career longevity, and health. Therefore, it is important to decrease rates of injury in these populations. A dancer screening clinic with a standardized screening protocol has been shown to be beneficial in preventing injury in dancers. However, specialized screenings with general components may be more appropriate for musicians due to the various types of instruments played (Chan & Ackermann, 2014). The CFA CHIP clinic will also provide specialized care for performing arts students for performance related injuries in the future. We recommend future PT students working on this project to use the outline above as a guideline when screening musicians. The outline we have developed should be continued to be updated as new evidence becomes available. Additional marketing strategies may be implemented in the future to increase awareness and participation for the clinic, such as Instagram posts on the UNLV official pages, frequent emails, and in-person presentations. The addition of regular screening events where physical therapy students will be available for 4-6 hours for screenings a couple of days a semester, or screening events during a dance class may be worthwhile avenues to explore to increase access to specialized care for dance and musician students.

References

American Physical Therapy Association (2008). Position on Telehealth. *TELEHEALTH HOD P06-19-15-09 [Initial: HOD P06-14-07-07] [Position]*. Retrieved from https://www.apta.org/siteassets/pdfs/policies/telehealth.pdf

Armstrong, R. (2019). Dance screening practices in dance companies, dance schools and university dance programmes: An international survey of current practices | Ross Armstrong, 2019. *OA Journal of Case Reports, Volume 1*. https://doi.org/10.33118/oaj.rep.2019.01.007

Armstrong, R., & Relph, N. (2018). Screening tools as a predictor of injury in dance: Systematic literature review and meta-analysis. *Sports Medicine - Open*, 4. https://doi.org/10.1186/s40798-018-0146-z

Bronner, S. (2018). APTA Combined Sections Meeting. In Components of Adolescent Dance Screens: What should we include? ADAM Center and Alvin Ailey American Dance Theater, New York, NY. Retrieved from https://www.researchgate.net/publication/323200113_Components_of_Adolescent_Dance_Screens_What_should_we_include.

Bronner, S., & Bauer, N. G. (2018). Risk factors for musculoskeletal injury in elite pre-professional modern dancers: A prospective cohort prognostic study. *Physical Therapy in Sport, 31*, 42–51. https://doi.org/10.1016/j.ptsp.2018.01.008

Bronner, S., Codman, E., Hash-Campbell, D., & Ojofeitimi, S. (2016). Differences in preseason aerobic fitness screening in professional and pre-professional modern dancers. *Journal of Dance Medicine & Science, 20*(1), 11–22.

Caine, D., Goodwin, B. J., Caine, C. G., & Bergeron, G. (2015). Epidemiological review of injury in pre-professional ballet dancers. *Journal of Dance Medicine & Science, 19*(4), 140–148.

Campbell, R. S., Lehr, M. E., Livingston, A., McCurdy, M., & Ware, J. K. (2019). Intrinsic modifiable risk factors in ballet dancers: Applying evidence based practice principles to enhance clinical applications. *Physical Therapy in Sport, 38*, 106–114. https://doi.org/10.1016/j.ptsp.2019.04.022

Casey, J. (2019, September 9). *UNLV to Offer New Tuition+ Award Program for Nevada Residents*.

University of Nevada, Las Vegas. http://www.unlv.edu/news/release/unlv-offer-new-tuition-award-program-nevada-residents

Chan, C., & Ackermann, B. (2014). Evidence-informed physical therapy management of performance-related musculoskeletal disorders in musicians. *Frontiers in Psychology*, 0. https://doi.org/10.3389/fpsyg.2014.00706

Clark, T., Williamon, A., & Redding, E. (2013). The value of health screening in music schools and conservatoires. *Clinical Rheumatology*, *32*(4), 497–500. http://dx.doi.org.ezproxy.library.unlv.edu/10.1007/s10067-013-2203-9

CollegeSimply. (n.d.). *University of Nevada Las Vegas Diversity & Student Demographics*. CollegeSimply. Retrieved April 29, 2020, from https://www.collegesimply.com/colleges/nevada/university-of-nevada-las-vegas/students/

Caine, D., Goodwin, B. J., Caine, C. G., & Bergeron, G. (2015). Epidemiological review of injury in pre-professional ballet dancers. *Journal of Dance Medicine & Science*, 19(4), 140–148.

Ekegren, C. L., Quested, R., & Brodrick, A. (2014). Injuries in pre-professional ballet dancers: Incidence, characteristics and consequences. *Journal of Science and Medicine in Sport*, *17*(3), 271–275. https://doi.org/10.1016/j.jsams.2013.07.013

Fuller, M., Moyle, G. M., Hunt, A. P., & Minett, G. M. (2020). Injuries during transition periods across the year in pre-professional and professional ballet and contemporary dancers: A systematic review and meta-analysis. *Physical Therapy in Sport*, *44*, 14–23. https://doi.org/10.1016/j.ptsp.2020.03.010

Hansen, P. A., & Reed, K. (2006). Common Musculoskeletal Problems in the Performing Artist. *Physical Medicine and Rehabilitation Clinics of North America*, *17*(4), 789–801. https://doi.org/10.1016/j.pmr.2006.08.001

HEP2go. (n.d.). Retrieved December 16, 2020, from https://www.hep2go.com/

Kenny, S. J., Palacios-Derflingher, L., Whittaker, J. L., & Emery, C. A. (2018). The influence of injury definition on injury burden in preprofessional ballet and contemporary dancers. *Journal of*

Orthopaedic & Sports Physical Therapy, *48*(3), 185–193.

Kok, L. M., Huisstede, B. M. A., Voorn, V. M. A., Schoones, J. W., & Nelissen, R. G. H. H. (2016). The occurrence of musculoskeletal complaints among professional musicians: A systematic review. *International Archives of Occupational and Environmental Health*, *89*(3), 373–396. http://dx.doi.org.ezproxy.library.unlv.edu/10.1007/s00420-015-1090-6

Lee, L., Reid, D., Cadwell, J., & Palmer, P. (2017). Injury incidence, dance exposure and the use of the movement competency screen (mcs) to identify variables associated with injury in full-time pre-professional dancers. *International Journal of Sports Physical Therapy*, *12*(3), 352–370.

Lee, H.-S., Park, H. Y., Yoon, J. O., Kim, J. S., Chun, J. M., Aminata, I. W., Cho, W.-J., & Jeon, I.-H. (2013). Musicians' medicine: musculoskeletal problems in string players. *Clinics in Orthopedic Surgery*, 5(3), 155–160. https://doi.org/10.4055/cios.2013.5.3.155

Mainwaring, L. M., & Finney, C. (2017). Psychological risk factors and outcomes of dance injury. *Journal of Dance Medicine & Science*, *21*(3), 87–96.

MedBridge. (2020, September 13). Retrieved December 16, 2020, from https://www.medbridgeeducation.com/

Rotter, G., Noeres, K., Fernholz, I., Willich, S. N., Schmidt, A., & Berghöfer, A. (2020). Musculoskeletal disorders and complaints in professional musicians: A systematic review of prevalence, risk factors, and clinical treatment effects. *International Archives of Occupational and Environmental Health*, *93*(2), 149–187. https://doi.org/10.1007/s00420-019-01467-8

Steemers, S., van Middelkoop, M., de Boks, G. G., van Rijn, R. M., Bierma-Zeinstra, S. M. A., & Stubbe, J. H. (2020). The impact of injury definitions on measures of injury occurrence in classical music students: A prospective cohort study. *BMC Musculoskeletal Disorders*, *21*(1), 534. https://doi.org/10.1186/s12891-020-03490-0

Steinberg, N., Siev-ner, I., Peleg, S., Dar, G., Masharawi, Y., Zeev, A., & Hershkovitz, I. (2012). Extrinsic and intrinsic risk factors associated with injuries in young dancers aged 8–16 years. *Journal of Sports Sciences*, *30*(5), 485–495.

Steinmetz, A., Möller, H., Seidel, W., & Rigotti, T. (2012). Playing-related musculoskeletal disorders in music students-associated musculoskeletal signs. *European Journal of Physical and Rehabilitation Medicine*, *48*(4), 625–633.

Twitchett, E., Nevill, A., Angio, M., Koutedakis, Y., & Wyon, M. (2011). Development, validity, and reliability of a ballet-specific aerobic fitness test. *Journal of Dance Medicine & Science*, *15*(3), 123–127.

Winden, D. P. A. M. van, Rijn, R. M. V., Richardson, A., Savelsbergh, G. J. P., Oudejans, R. R. D., & Stubbe, J. H. (2019). Detailed injury epidemiology in contemporary dance: A 1-year prospective study of 134 students. *BMJ Open Sport & Exercise Medicine*, 5(1), e000453. https://doi.org/10.1136/bmjsem-2018-000453

Wolff, A. L., Ling, D. I., Casey, E. K., Toresdahl, B. G., & Gellhorn, A. C. (2021). Feasibility and impact of a musculoskeletal health for musicians (MHM) program for musician students: A randomized controlled pilot study. *Journal of Hand Therapy*, *34*(2), 159–165. https://doi.org/10.1016/j.jht.2021.04.001

Yau, R. K., Golightly, Y. M., Richardson, D. B., Runfola, C. D., Waller, A. E., & Marshall, S. W. (2017). Potential predictors of injury among pre-professional ballet and contemporary dancers. *Journal of Dance Medicine & Science*, *21*(2), 53–63.

Curriculum Vitae

Shaun Bean, SPT

Department of Physical Therapy

University of Nevada, Las Vegas

Las Vegas, Nevada

Email: smbean10@gmail.com

Education

University of Nevada, Las Vegas

Doctor of Physical Therapy, 2022

B.S. Kinesiology, 2018

Joanna Centeno, SPT

Department of Physical Therapy

University of Nevada, Las Vegas

Las Vegas, Nevada

Email: joannamikhaella.centeno@gmail.com

Education

University of Nevada, Las Vegas

Doctor of Physical Therapy, 2022

B.S. Kinesiology, 2019

Elizabeth Williams, SPT

Department of Physical Therapy

University of Nevada, Las Vegas

Las Vegas, Nevada

Email: lizzyrbrooks@gmail.com

Education

University of Nevada, Las Vegas

Doctor of Physical Therapy, 2022

University of Arizona

B.S. Biochemistry and Molecular and Cellular Biology, 2017